BELARUSIAN STATE UNIVERSITY

Establishment of Education
«International Sakharov Environmental Institute»

ACTUAL ENVIRONMENTAL PROBLEMS

Proceeding of the VII International Scientific Conference of young scientists, graduates, master and PhD students

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November 23–24, 2017
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SECTION 1

SOCIAL AND ENVIRONMENTAL, ETHICAL AND PEDAGOGICAL PROBLEMS IN ACCORDANCE WITH A. D. SAKHAROV'S IDEAS

HUMAN AND MODERN ENVIRONMENTAL PROBLEMS

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The thesis is about current environmental problem and people's attitude towards this.

Keywords: environmental problems, greenhouse effect, problem of wastes.

Important elements of the concept of sustainable development are:

- economic development;
- social progress;
- responsibility for the environment.

In the list of environmental problems of our time, on one of the first places is the greenhouse effect. The first time this problem began to be discussed in 1827. The greenhouse effect of the atmosphere is the property of the atmosphere to transmit solar radiation, but to delay the earth's radiation and thereby contribute to the accumulation of heat by the Earth. The terrestrial atmosphere comparatively well transmits shortwave solar radiation, which is almost completely absorbed by the earth's surface, since the albedo of the earth's surface is generally small. Being heated due to the absorption of solar radiation, the earth's surface becomes the source of terrestrial, mainly long-wave, radiation, the transparency of the atmosphere for which is small and which is almost completely absorbed in the atmosphere. Thanks to the greenhouse effect with a clear sky, only 10–20 % of the Earth's radiation can, through the atmosphere, escape into outer space.

At present, as a result of anthropogenic impact, the content of carbon dioxide, methane, dust, other gases that absorb in the infrared range is constantly increasing (a mixture of dust and gases acts like a polyethylene film over a greenhouse: it passes sunlight to the soil surface well, but delays scattered over the soil heat – as a result, under the film creates a warm microclimate).

In addition to the effects of sunlight, thermal energy:

- is formed by burning fuel;
- is the primary product of production in solar power plants;
- is allocated at decomposition of waste on landfills;
- stands out on farms that breed livestock for meat production.

At present, a person can have information, however, a lot of advertising actively imposes someone else's opinion, which prevents an independent conscious life according to needs. It follows from this, that the solution of many environmental problems must begin from a single person.

BIOLOGICAL AND SOCIAL EVOLUTION OF THE PERSON

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The article examines the role of technical progress in the biological and social evolution of the person.

Keywords: superevolution, technical progress, technological sinuglyarnost, social processes.

The first representatives of a type of homo, appeared, according to different data, from 5,5 to 3 million years ago. The person of the modern type, or homo sapiens, appeared rather recently, some 50 thousand years ago, and process of its formation was and remains not to the linear. Genetic selection set qualities, necessary for survival:

mind, memory, ability to think abstractly. Our ancestors could not become stronger than other types, but could "adjust" to the world to themselves: began to build shelters from predators, to cultivate fields to depend less on a pasture, to sew clothes to escape from cold, to form families to protect posterity and to pass on to it the accumulated experience. The relative stability of physical type of the person is established.

About 8 thousand years ago, with the advent of agriculture and cattle breeding, there is new culture. This moment is called still neolytic revolution – transition from the appropriating farm patterns to making. Thus, time when the person himself produced the food consumed by it, is 10 percent from time of its existence. And if to take all the time of existence of a type of homo, then these are only 0,001 percent.

The production revolution began in Europe about 250 years ago, and it became one more epoch-making shift in the history of the mankind. The periods between revolutions are reduced. It is necessary to notice increase of speed of this process.

Evolutionary process since the most ancient times was defined not by natural adaptation under external conditions, and growing ability to change itself under these conditions. Routine evolution in fauna can be described often an arithmetic progression, but in the case with the person it is a geometrical progression, and its speed adjusted by a scientific and technological revolution increases with each step.

Today the person created on the planet islands with the Wednesday adapted for his needs. There are no more extreme conditions which would force it to change, improving itself. The person lives in the world in which not mechanisms of natural selection, and the social processes influence and affect a mankind gene pool, and separate genotypes.

In the next years there can be a high-quality transition, and the speed of technical progress will become inaccessible to our comprehension. Superevolution time will come. The technological sinuglyarnost is a certain point on a time axis in which, owing to a development exponentsialnost, scientific and technical progress will become so fast and the composite that it will be inaccessible to a comprehension of the modern person. And the person to survive, will be forced to become another. Changes, most likely, will look explosive, quicker than exponential body height.

Emergence of an artificial intelligence, self-replicating cars, the brain integrated with the computer and even the total failure from a physical body is not such far future as it seems to you.

ECONOMIC CONSEQUENCES OF THE WORLD OCEAN POLLUTION

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As the title implies the article describes the problems of the World Ocean pollution. Much attention is given to oil pollution. It should be stressed that the oil pollution is dangerous for two reasons. Firstly, a film is formed on the water surface, depriving the access of oxygen to marine flora and fauna, and secondly, oil is a toxic compound. The need is stressed to develop technical, organizational, legislative strategies for preventing from further pollution. In conclusion the paper points out that the problem of the World Ocean pollution is very acute and key.

Keywords: the World Ocean, pollution of the environment, the economy, supertankers, ecological disaster, humanity.

The role of the World Ocean in providing life on Earth can not be overestimated, since about 70 % of the oxygen in the planet is produced during photosynthesis of plankton. The World Ocean covers about ¾ of our planet and it is rich in mineral, energy, plant and animal resources. Using sustainably, the resources of the World Ocean are practically inexhaustible. Performing environment-forming, fishing, resource, transport and other functions, the Ocean is able to solve many problems facing the rapidly increasing population of the planet. For example, it can fill the lack of fresh water, provide the population with food products, supply the industry with raw materials, resolve energy crisis, etc.

But for the last 20–30 years, humanity, carrying out unreasonable economic activities, has polluted the Ocean to such an extent that it has brought this closed ecological system on the brink of survival. The total weight of polluting waste including oil, industrial and domestic sewage, rubbish, radioactive waste, heavy metals, spewing out into the World Ocean, amounts to billions of tons every year. There are different types of pollution: chemical, physical, mechanical, thermal. Let us dwell on the most dangerous and widespread which is oil pollution. The oil pollution is dangerous for two reasons. Firstly, a film is formed on the water surface, depriving the access of oxygen

to marine flora and fauna, and secondly, oil is a toxic compound. According to the specialists' research, every year about 10 million tons of oil are dumped into the World Ocean and about 2 million tons are discharged by river run-offs. As a result, about 20 % of the Ocean surface is covered with an untransparent oil film. The negative consequences of this, the largest in the history of the United States environmental disaster in the Gulf of Mexico has demonstrated. The explosions of the oil platform and the oil spill on the surface of the Ocean have led to an oil slick measuring 75,000 km^2. As a result, a dead area was formed where all representatives of the flora and fauna died. The long-term effect is still unknown. The real ecological disasters are oil spills during pipelines breaking and supertankers crash.

But most of all the Ocean is not polluted by catastrophes, but by planned extraction and transportation. Despite the huge environmental risk, ocean prospecting and production of oil are still going on. Over the past 30 years, about 2000 wells have been drilled and oil decreases annually by 0,1 million tons because of minor dumpings. Nowadays, the production of ocean oil is already one-third of the world's oil production, but the production growth continues and affects new seas and oceans.

The public is concerned about oil pollution that causes the growth of economic losses in various fields of activities. Currently, only fishing industry and sea fishing bring income more than 55 billion dollars. As for the inhabitants of China and Japan, they become a half of the animal proteins from the sea. The growing pollution of the World Ocean can deprive them of this resource.

In conclusion, it should be pointed out that the problem of the World Ocean pollution is very acute and key. Mankind is trying to develop technical, organizational, legislative strategies for preventing its from further pollution. In this situation, the main task of each of us is not to be indifferent. In our opinion, educational work can play a huge role in solving the problem. Maintaining the World Ocean, we will save life on the planet.

VIRTUAL REALITY AS A FACTOR OF DEVELOPMENT OF ADDICTIVE BEHAVIOR IN CONDITIONS OF MODERN ENVIRONMENT

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The phenomenon of the virtual reality and dependence on it is considered in the work. Also, the theoretical relationship between the mechanism of occurrence of other addictions is considered.

Keywords: virtual reality, addiction, psychoactive substances, mechanism

Rapid development of computer technologies and their unusually rapid introduction into everyday life activates the processes of biopsychic personality rearrangement in the "human-computer" bundle, manifested by new psychopathological symptoms. "Human-computer" bundle that generates a phenomenon called computer virtual reality.

The term "Internet addiction" have founded in 1996, Dr. A. Goldberg suggested to describe an unreasonably long, pathological, stay on the Internet. Internet addiction can be defined as a non-chemical dependence on the use of the Internet, characterized by the desire to escape from reality by achieving a special emotional state of satisfaction, self-confidence, which otherwise a person can not achieve, for various reasons. At the basis of Internet addiction is the obsessive need of the individual to use the Internet, accompanied by social desadaptation and marked psychological symptoms. K. Young described the symptoms of Internet addiction: 1) obsessive desire to check e-mail; 2) constant waiting for the next Internet connection; 3) complaints from others that a person spends too much time on the Internet; 4) complaints from others that a person spends too much money on the Internet [2].

There are number of psychological and physical symptoms closely related to each other. The psychological symptoms include: 1) good feelings or euphoria at the computer; 2) impossibility to stop; 3) increasing the amount of time spent at the computer; 4) neglect of family, friends; 5) feelings of emptiness, depression, irritation not at the computer; 6) lie to employers or family members about their activities; 7) problems with work, study. Among the physical symptoms there are: 1) "tunnel syndrome"; 2) dry eyes; 3) headaches; 4) back pain; 5) irregular meals, skipping meals; 6) neglect of personal hygiene; 7) sleep disorders, changes in sleep patterns [3].

One of themost weighty evidence of the dependence of addiction on virtual reality with addiction on psychoactive substances was a study that showed that using the Internet can cause physiological changes in the human body. The study involved 144 men and women aged 18 to 33 years. On average the participantssaid that they spent

about five hours a day on the network, while 20 % of them had more than six hours of Internet time. Over 40 % of the participants admitted that they have some degree of Internet addiction, during the day they spend too much time on the network and it is difficult for them to stop doing it. To test how the network affects the participants' condition, the researchers measured their heart rate and blood pressure level before and after short Internet sessions. In addition, participants underwent psychological testing for the level of anxiety. It turned out that those who themselves called «Internet addicted», experienced immediately after the termination of the session increased anxiety and, as a result, physiological arousal. At them on 3–4 %, and in some cases on 6-8% pulse increased and pressure raised in comparison with the parameters measured before the beginning of the session. Those participants who did not experience problems with the Internet, such changes have not observed. Although the observed effect is relatively weak and does not threaten life and health, it is based on a hormonal imbalance that can weaken the immune system. It has noted that the physiological and psychic reactions of Internet addicts are very similar to the "withdrawal syndrome" observed in drug addicts and alcoholics. To relieve tension and calm down, the Internet-addicted needs to reunite with the object of his obsessive passion - with his smartphone or laptop [1].

Taking into account the forecasts of the growth rates of Internet prevalence all over the world, the growth of the percentage of youth among Internet users, development of addiction on the virtual environment among many users in the first six months after the beginning of work on the Internet, we can conclude that the study of the influence of Internet addiction on the personal characteristics of modern youth is an actual problem of psychology. Studying this problem will allow us to develop a preventive and psych corrective program, as well as strategy of drug treatment to prevent physiological changes and changes in the personality of Internet-dependent users.

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POSITIVE AND NEGATIVE FEATURES OF THE CONSUMER SOCIETY

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Consumer society is a social and cultural phenomenon that was formed in developed countries in the second half of the twentieth century. Formed by this time, the middle class became the basis of consumer culture, which was heavily influenced by advertising, the media and cinematography.

Keywords: society, consumption, information, value, consumer culture.

Today, we are constantly surrounded by appeals: "Buy!". Mass media and advertising form public opinion, lay the system of needs, values, certain social norms, to which we all should strive together.

Consumer culture as an appropriate system of values, attitudes, patterns of behavior shapes a way of thinking and a way of life in which a person loses the notion of his own worth, identifying himself with the things he possesses. There is a substitution of values, the criteria of the truly human in man, on the artificial. A person in a consumption society feels valuable, self-sufficient, worthy of self-esteem, if he has a certain definite consumer behavior, and not personal qualities. In the structure of the self-worth of the consumer, criteria for the availability of various "toys": a prestigious brand car, a high-priced cellular phone, various services and goods dictated by fashion, and not an urgent need. And such a person begins to appreciate himself not for his own personal achievements, but for having different fashionable toys or excess things. In this setting, things become an extension of a person. And in some cases, replace the man himself. The consumer's internal criteria for their value disappear.

The consumer society has not only flaws, but its advantages. It gives an incentive and motivation for both consumers and producers, people want to work and earn. High consumer standards are an incentive for making money and hard work. Producers of goods and services in the struggle for the client are forced to take into account individual tastes and wishes of the person. At the same time, social tension, manifestations of extremism decrease, tolerance towards people of other races, nationalities and religions increases.

Within the consumer society, a new information space is formed and the sphere of communication expands. But at the same time, people in the consumer society become very dependent on the opinions of others and are not independent, forget about more important human values. form an opinion about each other, based on how much they consume, what they have and what they buy. Whoever consumes more is more important and interesting in society than he who is less. Education, primarily higher education, becomes a paid market service, loses its value.

The consumer society is a complex and ambiguous phenomenon. Perhaps, in the form in which it exists today, it is itself able to cope with its problems, and perhaps the costs of a culture of unrestrained consumption will lead to the collapse of our civilization.

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ECOLOGICAL DANGER OF MEDICAL WASTAGE

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The problem of medical wastes disposal in Belarus is the real danger, because it threatens the national health a pollutes the environment.

Keywords: medical waste, human health, disposal and storage of medical waste, cytostatic drugs, radioactive substances, the presence of medicines in the environment.

Nowadays the processing of medical wastage is becoming particularly significant around the world. The increase in the number of medical services and production of medicines results in the growth of medical wastage. According to the opinion of the specialists, the situation with medical wastage is critical. Annually 29,8 thousand tons of medical wastage is formed in Belarus, a part of which goes to household wastage and settles on dumps. Medical wastage is not just rubbish; it contains the activators of various infections, toxic and quite often radioactive substances. In that connection Basel convention of 1998 admitted medical wastage to be the most hazardous waste in the world. As medical wastage constitutes a threat for human health and the environment, the increased demands are placed to its storage, transport and utilization.

At present six installations on utilization of medical wastage are used in Belarus: in Brest, Grodno and in some clinics, but not all the installations meet up-to-date requirements. For example, cytostatic drugs need either to be burned at a temperature over 1200 degrees or be buried in the tight metal capsule in the hazardous waste landfill. There is one specialized landfill in Checherske (Gomel region). However there is no reliable information what substances are formed after its burning. The capacity of the hazardous waste landfill is not enough, therefore cytostatic drugs are stored frequently in hospitals, and indeed medical institutions are located, as a rule, in densely populated areas.

The process of collecting pharmaceutical wastage from the population remains to be defined. Many people do not know or do not think that the presence of medicines in the environment harms it a lot. Besides the population in general has no opportunity to utilize expired medicines. In this regard expired medicines appear in household wastage, fall to the soil and groundwater. According to data of the Centre of ecological decisions, 65 % of the consumers buy more medicine than it is necessary at present. Then 75 % of Belarusians throw expired medicines into a garbage bin without opening the packing; 19 % previously open the packing, 8 % open the packing and wash medicines away into a sewer; 7 % try to give drugs to acquaintances before their expiry date. 50 % of respondents would agree to hand over unusable drugs in chemist's stores and hospitals, if special containers were installed there. Some European countries have such practice. For example, in Belgium the process is organized within the partnership of pharmaceutical companies, pharmaceutical industry and drugstores in the community with the regional Environmental Protection Agency (EPA).

In our opinion, a common concept according to the collecting and utilization of pharmaceutical drugs from the population has to be developed in the republic. Besides it is necessary to increase people’s awareness about the danger of pharmaceutical wastage to human health and the environment.

THE INFLUENCE OF NATURAL TACTILE SENSATIONS ON THE HUMAN PSYCHE

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Since its inception, man has been and remains a part of nature. But with the development of society, he began to lose this connection. The return and harmonization of this connection will help restore and strengthen the natural development of a person based on his place and role in the environment. One of the simplest options for interacting with nature is practices based on tactile sensations that can significantly improve the overall psychophysical state of a person.

Keywords: nature, man, development, consciousness, sense organs, touch, psyche, social development, external world, tactile sensations, tree bark, fine motor skills, thinking, dendrotherapy, nerve endings.

Recently, man began to forget that he is a part of nature. The connection between the physical body of a man and nature can't be denied. However, if you think about it, our consciousness, our psyche is also connected with nature. Nature has always been and will be a place where a person can really relax, purify thoughts and harmonizes all human systems.

The combination of motor and skin sensations is the touch of the object. Skin sensations are caused by mechanical and thermal action on the surface of the skin. In the skin, including the mucous membrane of the mouth and nose, as well as the cornea of the eyes, there are important sensory organs that make up the system of special receptors. Touch is the first feeling that is formed in the individual development of a person. We can block almost all our senses, but we can't get rid of the fifth tactile feeling. It accompanies us always, and its artificial disconnection entails serious consequences for the psyche. Feelings share our psyche and the outside world. Nature, which has a wide variety of different surfaces, is an ideal place for developing and training the sensitivity of tactile sensations.

Touching the bark of trees, which has a highly rough surface with a number of depressions and bulges of different sizes, contributes to the development of fine motor skills. Fine motor skills in turn interact with such higher properties of consciousness as attention, thinking, optic-spatial perception (coordination), imagination, observation, visual and motor memory, speech. In addition to developing motor skills, touching the cortex has a positive effect on various internal organs of a person. Massaging certain points, you can affect the internal organs, which are connected with these points. The influence of trees on humans is much wider than just using them as massage surfaces. Trees treat the psyche, stimulate the heart, activate metabolism, relieve headache, reduce the effects of stress. Dendrotherapy is a method of treatment and prevention of human diseases, using the healing properties of trees.

Walking barefoot on natural surfaces helps to get rid of diseases and even the psyche changes – a person feels calmer and more confident. A person becomes more balanced and gentle, more kind. This is due to the fact that on the feet of a person there are more than 70,000 nerve endings forming reflexogenic zones that connect the foot areas with certain internal organs and with physiological system.

Having considered all these moments, it becomes clear that in nature we can find many auxiliary tools that will help us to activate the internal source of health, restore the body and return energy, which means - to become more harmonious and happier.

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THE PROBLEM OF HUNGER IN FOOD OVERPRODUCTION

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The article is about the problem of food wastes utilization in different countries.

Keywords: excess products, food production, food recycling, landfill, waste prevention, recycling, recovering.

According to the UN, quite enough food is produced to provide each consumer with 4,000 calories per day, but in fact, only 2,000 calories are used. The food reserves at the rate of 2,600 calories per day per person are sufficient for human needs. However, there are 3500 calories a day for each inhabitant of the European Union. This is excess volume of products, so most of them are sent to a landfill. According to the Food and Agriculture Organization of the United Nations about a third of all food products produced in the world are lost or used for other purposes. At the same time, the number of hungry people in the world reached 1 billion, and 1,5 billion suffer from chronic overeating. Analysis of the situation in developed countries shows that in the United States about 40 % of food production is in the garbage dump, in Europe 100 million tons of foods are thrown out every year. Food in these countries is only a small part of the list of expenses of a typical family.

But in developing countries there is opposite problem – the lack of food. This happens for various reasons. In India, for example, there is no shortage in the volume of food production, but the problem of storage facilities and refrigeration facilities exists. As a result, million tons of foods are thrown away. The poorest region in the world-Africa is the most starving country. If in the early 1970s there were 90 million hungry people, then in the mid-1990s – 210 million. In this region there are lots of countries where the starvation exceeds 40 % (Chad, Somalia, Uganda, Mozambique) or 30 % (Ethiopia, Mali, Congo, Zambia).

Besides, the problems of food production have a huge environmental impact. Today, the cost of food waste in the world is 750 billion. Significant amount of water and phosphorus is used in the production process to irrigate arable lands for growing crops. This amount can provide 9 million people with water. Furthermore food wastes emit 10 % greenhouse gases during decomposition. Environmental damage from such wastes is enormous.

The aimless waste of food resources is increasingly being considered by politicians and specialists. Therefore, technical solutions are being developed that will allow to utilize food wastes safety for the environment. According to EU Directive there are some ways to solve the waste problem: waste prevention, reusing, recycling and recovering.

In the UK the problem of wastes is trying to solve at the level of large stores. The famous trading network Waitrose has set the goal to achieve non-waste production .To that effect a variety of measures are taken – a regular markdown of goods the selling period of which expires, the surplus is used for charity and the spoiled products are sent to bio-factories where they are burned for producing heat and electricity.

In the USA the factory of Newtown Creek Wastewater Treatment Company accepts food wastes from local schools and restaurants for recycling. Inside the giant autoclaves, food wastes are mixed with sewage, heated and converted into methane and fertile sludge. The law banning the removal of food wastes to landfills was accepted in 2015 in New York State and helped to implement this project.

Nowadays it is a global problem for many countries. A lot of things have already been done but much more of development prospects are studying and researching.

ON THE ISSUE OF THE ENVIRONMENTAL, LEGAL AND ECONOMIC CONSEQUENCES OF THE USA WITHDRAW FROM THE PARIS CLIMATE AGREEMENT

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The thesis examines the reasons for the USA withdraw from the Paris agreement on climate. The negative and positive consequences of the state exit from the climate agreement have been revealed.

Keywords: Climate agreement, terms of the Agreement, consensual voting system, reduction of greenhouse gas emissions, environmental protection, global climate policy.

President of the United States Donald Trump said on June 1, 2017 that the United States is planning to withdraw from the Paris Climate Agreement. Trump listed the compelling reasons for withdrawing from the Agreement. According to the head of state, the treaty redistributes American wealth to other countries, and the implementation of the agreement could result in the country losing 2,7 million jobs by 2025. In addition, by 2040 the losses of individual industries of the country will increase from 12 % to 86 %. The GDP losses by this period are estimated at 3 trillion dollars. The president also stressed that for other major industrial countries like China and India, the terms of the agreement do not envisage such restrictions.

To date, the Trump solution is assessed in different ways by the world community. Companions-party members, leaders of both chambers of the US Congress supported Trump. Some analysts and journalists reacted positively to this decision. So, Luke Kemp, a lecturer at the Department of International Relations and Environmental Policy of the Australian National University, a professor at a number of European universities, regularly taking part in international climate negotiations, believes that there will be less harm from the USA withdrawal from the Treaty than if they stayed in it. If the USA remained in the agreement, they could use the consensual voting system that has been used by the United Nations in recent decades. This voting system is characterized by a way of coordinating the positions of the participating states without holding a vote and in the absence of formal objections to the decision in general. This means that solutions are being developed that all the participants in the conference can agree on. Thus, the USA could even insist on the suspension and overload of negotiations, demanding amendments to the Paris Agreement.

At the same time, many politicians of the country categorically disagree with Trump's decision: Democrats in the Senate and the USA Congress, as well as former Presidents Bill Clinton and Barack Obama, criticized Trump's decision. Thus, according to the UN, 17,9 % of the world's anthropogenic emissions of greenhouse gases are currently in the USA. One of the prominent Western experts in the field of global environmental policy, Jonathan Pickering acknowledges that both China and India plan to adhere to the Agreement, regardless of what the USA will do. However, Jonathan believes that it is not certain that the USA withdrawal from the Agreement will inspire China and India to do more than they are doing now. Also, the USA withdrawal from the Paris Agreement will weaken the financing of weak and vulnerable countries, especially African countries, parts of Asian and some South American countries. Moreover, the withdrawal from the USA agreement can also demotivate other countries. The decision of the American leader could encourage Russia to take similar actions, which is a big risk for the ecological well-being of Eurasia, as Russia is the fifth largest source of harmful emissions in the world. Russia does not plan to ratify the Paris Agreement until at least 2019. Also, there are other countries whose position can be affected by the USA decision. They are Saudi Arabia and the Philippines (who ratified the agreement), as well as Iran and Turkey (who did not). Therefore, the risk of the "domino" effect is a real problem for the world's ecological well-being.

Despite the fact that the USA plans to withdraw from the Paris Climate Agreement, Trump assured the world community that the USA will continue to implement environmental protection programs, but did not specify which ones and how. Moreover, the American leader did not indicate how much money is planned to be spent for these purposes. The question of whether the global climate policy will be more effective if one of the world's largest countries, including those on greenhouse gas emissions, leaves the Paris Agreement and what the environmental and economic consequences for the weak and vulnerable countries remain today is one of the most important for the world community.

DATABASE OF INTEGRATED INFORMATION SYSTEM FOR ANALYSIS OF POTENTIAL OF RENEWABLE ENERGY SOURCES

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Some characteristics and features of database of integrated information system for analysis of potential of renewable energy sources are considered, that will allow to analyze the energy potential of certain types of renewable energy sources and the economic efficiency of the decisions taken to use them, and will also be an information source on the technical characteristics of various renewable energy equipment.

Keywords: database, integrated information system, analysis of potential, renewable energy sources.

The development of information systems in the field of renewable energy is currently being given great attention in the countries of the far and near abroad. In particular, in the USA, many developments in this direction have been carried out by the National Renewable Energy Laboratory – with the use of geographic information system technologies databases of renewable resources of the country's states have been created and models and software tools for analyzing of the efficiency of renewable energy sources have been developed (HOMER, Interactive mapping tools, REFlex and others). Similar databases with different volumes of content have been created in other countries: China, Japan, Denmark and Latvia. There are also reports of the beginning of such developments in the Russian Federation and Ukraine. Proceeding from the above, the development of such systems is an actual scientific and practical task, the solution of which will create conditions for expanding of the use of renewable energy sources in the Republic of Belarus and improving the energy security of our country.

The architecture of the integrated information system for analysis of potential of renewable energy sources developed at the Belarusian National Technical University is flexible and open for expansion and implementation of additional functionality, in particular the development of special algorithms and software modules for interaction with the external database. A special logical level of access to information stored in this database has been created for use by means of the software user interface.

The general purpose of the database within the specified system is to implement certain remote calculations and store information. To perform both analytical calculations based on information stored in the database, and directly providing the data itself, the program code that performs the above operations can be placed both on the server side and on the client one. However, considering that the information system being created is a network resource, the program code that operates with data must be placed as close as possible to the processed data itself, that allows to avoid sending a lot of commands across the network and, in particular, the need to transfer large amounts of data from the client to the server. To implement the database, Microsoft SQL Server database management system was used, which provides the ability to host server-side code as stored procedures, user functions and views.

Basic information to be stored in the database is associated with:

- renewable energy equipment with reference to spatial coordinates (solar batteries, solar collectors, wind power plants, biogas plants, boilers and hydroelectric power stations);
- energy potential and efficiency of renewable energy sources linked to regions (solar radiation, wind flow, biogas, biomass and water resources);
- possible locations for the installation of renewable energy equipment (territorial-economic units of different levels).

Thus, the creation of a database as part of an integrated information system for analysis of potential of renewable energy sources will make it possible to analyze the energy potential of certain types of renewable energy sources and the economic efficiency of the decisions taken to use them, and will also be an information source on the technical and operational characteristics of various renewable energy equipment. Practical application of this development can also be found if to integrate it into the information system of the State cadastre of renewable energy sources.

V. I. VERNADSKY'S IDEA OF THE NOOSPHERE AS A WAY OF FORMING POSITIVE SPIRITUAL AND SOCIAL VALUES IN SOCIETY

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There is nothing stronger than thirst for knowledge, the power of doubt... And this search, this aspiration is a basis of any scientific activity... you look for the truths, and feel that I can die, I can burn down, looking for it, but it is important to me to find and if not to find, then to seek to find it, this truth, it is kind of bitter, illusive and nasty I was! (V. I. Vernadsky).

Keywords: noosphere, spiritual and social values, society.

In the conditions of modern society, it becomes especially necessary to study the various phenomena of human existence. At the present stage of the development of science and technology, the question remains open: "What is a man?" And it is impossible to answer it with the help of only one philosophy without involving natural sciences and vice versa.

Values in a person's life are the basis for choosing goals, ways and conditions of activity, and also help him answer the question, why does he do this or that activity? Values in modern society are the actual problem of philosophy, psychology, and other social sciences, as they influence the formation of the worldview of the individual and are an integrative basis for the activity of not only a single individual, but also a social group, and even an ethnos, a nation and all mankind.

When they talk about social progress, they mean empirically provable facts of the development of productive forces, the enrichment of science, technology, culture, the expansion of opportunities to meet collective and individual needs, and the improvement of relations among people. At the same time, the aspect of values remains uncovered, whereas it plays a key role in the future of mankind.

As a result of anthropocentric type of thinking, man's influence on the nature becames destructive. Modern society is in an active search for a paradigm that could help restore the disturbed balance in the "human nature" system.

Vernadsky, speaking of the idea of the noosphere, hoped that humanity would be changed spiritually, understand the great significance of scientific thought, would be guided by scientific ideas and high moral principles. But economic, social and environmental forecasts for the 21st century are disappointing, the depletion of natural resources, pollution of water and soils continues, the dynamic balance in the biosphere is significantly disrupted. The point here is not only in science and technology, but, above all, in the spiritual and moral qualities of people. Therefore, any good wishes will remain so, if there are no significant changes in the public consciousness, as well as in the social order itself.

Without an increase and further development of spiritual and social potential, it is impossible to implement a noospheric project. That is why the noospheric concept must be linked with the formation of positive spiritual and social values in the society. Now, at the beginning of the 21st century, the universal idea of the noosphere may (should) become an ideal project for the future socio-natural harmony, governed by the collective human mind.

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THE PROBLEMS OF ORGANIC FOOD PRODUCTION

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The text touches upon problems of organic agriculture’s development in Belarus and the results local organic agriculture has achieved.

Keywords: “green” economics, organic products, organic food, organic products’ market.

In the period of developed countries transition to the "green economy" there is a rapid development of organic products industry. According to experts, 20 % of Eco-friendly Products are produced annually. And the organic food production is developing especially fast. Only in 2015, retail sales of organic food and beverages exceeded $ 81 billion, which is almost four times more than in 2000.

For many countries, organic agriculture is a development priority for the agrarian sector. The area of organic land is 1 % of all farmland (50,9 million hectares); the largest areas are located in Australia (22,7 million hectares), Argentina (3,1 million hectares) and the United States (2 million hectares). Certified organic farming exists in 141 countries around the world. The largest organic products markets are in the USA (35,8 billion euros per year), Germany (8,6 billion euros per year) and France (5,5 billion euros per year). The most Eco-friendly Products are used by people in Switzerland (262 euro per capita per year), Denmark (191 euros per capita per year), Sweden (177 euro per capita per year). In Asia, Latin America, Africa the demand for organic products is growing.

In Russia, as well as in our country, the market of Eco-friendly Products is just starting to develop (about 120 million euros; people spend about 0,8 euro per capita per year on organic products). This industry is developing very fast in Russia which is in the top ten countries with the highest rates of development of this industry. The term "organic farming" was introduced by GOST (State standard). In Belarus today only 10 farms produce and sell organic foods. These are vegetables, berries, goat milk, yoghurts, pond fish, crops. Only 6 farms export birch sap,

medicinal herbs, wild herbs, berries and other products. More than 20 farms are produced uncertified products because since do not have the financial means to get them. At the same time, the analysis of the food situation in the republic shows that consumers are interested in healthy eating. According to the Ministry of Health, about 20 % of diseases are caused by poor-quality drinking water, food, air pollution. Today, the demand for purely organic, chemical-free products grows. Especially people who have health problems (food allergies), children are interested in it. But almost all organic food is imported from the European countries. According to polls, most consumers are ready to pay for organic products more than for inorganic ones. All these facts help to create the opportunities for organic food production and bring an eco-friendly product to market of Belarus. It should be noted that world environmental trends have given an impetus to develop it.

Since 2008 the "Natural product" sign is applied, the draft law "On the production and circulation of organic products" is developed. The document establishes requirements for certification bodies for such kinds of products, for expert auditors, and for the certification procedure itself. However, there is a number of constraints that complicate the development of the market for organic products. The lack of an explicit legislation in this matter, images similar to EU and individual labeling, are becoming marketing moves for sales growth, which in turn leads to the discrediting of this product among consumers.

In order to resolve this problem it is necessary to create a favorable legislative, tax and credit climate for the development of the market for environmentally friendly products, which in turn will improve the quality of life of the population, taking into account the requirements of the "green economy".

NEW CHALLENGES FOR PEOPLE HEALTH IN XXI CENTURY AND CHANGE OF MEDICINE STRATEGY

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New challenges for people health in XXI century and change of medicine strategy are described.

Keywords: disease, medicine strategy, stem cell, therapy.

The beginning of the 21th century has demonstrated new trends in people health's priority. The previous 20th century has demonstrated substantial improvement in the fields of environmental pollution, pandemic infections, health care. As a result, life duration increased and quality of people's life improved dramatically. The results are in change of people disease profile. The rate of dangerous acute infections, trauma and acute poisons decreased and oncological, chronic degenerative diseases, metabolic disorders and mental diseases became dominant. Therefore new medical strategies of therapy should be elaborated to meet new demands. One of them is cell-based therapy. This strategy includes administration of cell-based products into patient`s body. Several sources of cells can be applied. The immune cells such as dendritic cells, T cells, natural killer cells, natural killer T cells are widely used for patients with oncological diseases. Mesenchymal stem cells (MSCs) form bone marrow and / or adipose tissue becomes the top product for therapy of neurodegenerative diseases, insufficient osteogenesis, trauma, cardiovascular diseases. Stem cells from cord blood and umbilical cord are the promising tool for medical implication in pediatrics and for hematopoietic cell transplantation. Big adventure of stem cell therapy is their efficiency for therapy of pharmacoresistant chronic degenerative diseases. The functions of stem cell therapy are not only to substitute damages or absence of tissue structure but also to support tissue function by releasing growth factors and prevent cell apoptosis. New directions are application of gene modifying cell products and cell-based tissue engineering. These approaches are currently under great interest for medical applications.

In conclusion, cell-based therapy is becoming the new attractive field of medicine in the 21th century.

SOME PECULIARITIES OF THE REALIZATION OF GREEN ZONES POLICY IN THE REPUBLIC OF KOREA

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The reasons for the emergence of the domestic policy of green zones in the Republic of Korea are analysed in the theses. The negative and positive features of the implementation of the policy of green zones in the territory of the given state were revealed.

Keywords: environment, green zone, industrialization, urbanization, chemicals, fertilizers, ecosystem, social justice.

Each state, aware of the importance of preserving our planet, develops own environmental policy, own approaches and methods for it's implementation. Many states are trying to protect and preserve the natural resources of their territory. The Republic of Korea is a developed industrial country. In a short time, South Korea has achieved impressive economic successes and entered the elite of the world economy. However, rapid industrialization, urbanization and the growth of domestic consumption inevitably caused pollution of the environment. Household and industrial waste, as well as the excessive use of chemicals and fertilizers, caused the pollution of the seas, rivers and lakes. Therefore, the environmental pollution became one of the most serious national problems in the 70s in South Korea.

In 1980, the Constitution of the country was supplemented by a new article proclaiming the human right to life in a normal natural environment. At the same time, the Office for Environmental Problems was created, which in January 1990 received the status of a ministry. When the Republic of Korea became an industrial country, the population and trade of the country were concentrated in the cities. For example, the rate of annual population growth in the 1970s and 1980s in Seoul exceeded 100 %. In this regard, the government has developed a policy of a "green zone" (restricted development zone, RDZ) with three fundamental objectives: national security, prevention of urban sprawl, conservation of natural objects near urban centers. The green zone is a natural area, a tightly fitting city or urban area where the layout should be permanent or at least very difficult to change. Green zones are designed as buffers to protect open space, pristine nature, ecosystems and for a more compact development of cities and urban areas. These areas include areas (areas) in which there is a need to limit urbanization, in order to prevent chaotic urban sprawl or the connection of urban areas to neighboring cities. The goal is to preserve the natural environment and ecosystem around the city and provide a healthy environment for citizens.

Unlike other countries, the Republic of Korea has always strived to control the development of own green zones strictly. This domestic policy for three decades has caused a constant flow of complaints from residents of these zones. This is due to the fact that the "green zone of Seoul", for example, has generated both significant disadvantages and advantages. Some environmentalists insist that the green zones should be canceled, that "the policy of the green zone is not very successful and caused the sprawl of cities around Seoul, and this has led to a distortion of the structure of urban growth. Meanwhile, other environmentalists argue that the green zone should remain, because its advantages are significant: the green zones have become an instrument of control over the expansion of Seoul, which allowed to conserve natural resources in the vicinity of the capital. Also green areas are a source of land resources for the future.

In general, the green zone policy in the Republic of Korea is not fully socially just, as it was implemented by an authoritarian government's decision. The green zone system was adopted as a precaution against the side effects of the National Economic Development Plan of the Republic of Korea, which accelerated urbanization and population growth in Seoul. Ensuring social justice was not a priority when the authoritarian government decided on the arrangement of green areas. As practice showed, planners of green zones did not fulfill the role of negotiators, but demanded from residents to agree with the state's policy on this issue. Also, no one educated the residents of the green zone on its potential impact on their daily lives. In order not to increase the infrastructure of residents of green zones is prohibited on its territory to conduct business. But, on the other hand, the policy of the green zone in Seoul made it possible to slow down urbanization and save the ecosystems near the capital.

APPLICATION OF INTERACTIVE METHODS OF TRAINING AT THE ORGANIZATION OF OUT-OF-CLASS WORK ON BIOLOGY

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In modern education, interactive methods of learning are gaining popularity, with the most effective combination of the material and the ability of students to make use of the knowledge gained in practice afterwards. In this regard, this research was carried out to test the effectiveness of interactive teaching methods in organizing out-of-class work.

Keywords: out-of-class work, interactive methods, environmental education

Out-of-class work is an important tool for the formation of the schoolchildren's environmental competencies. Out-of-class work makes volunteer-based, purposeful classes of students, that take place in their free time, under the supervision of the teacher, to excite and display their cognitive interest and creative initiative in expanding and supplementing the school curriculum on biology. Forms and methods of conducting out-of-class work are various.

Interactive learning offers the logic of the educational process that differs from the ordinary one: not from theory to practice, but from the formation of new experience to its theoretical comprehension through application. Interactive forms and methods of teaching are among the innovative and conducive to the activation of cognitive activity of students, independent comprehension of educational material. Interactive methods give the teacher an excellent opportunity to change pedagogical interaction, present it as a compulsory circumstance for optimal development of participants in the pedagogical process.

Formation of the schoolchildren's environmental competencies in the sphere of environmental protection through the use of interactive teaching methods will effectively solve the issues of sustainable development of the Republic of Belarus.

Out-of-class work was carried out on the basis of the Ostrovskaya secondary school among pupils of 8–11 forms,. Before and after the activities with the students, a questionnaire was given to determine the level of the students' ecological culture in order to make a conclusion about the effectiveness of interactive teaching methods. Based on the questionnaire data, two extra-curricular activities were developed. One extracurricular event included brainstorming and the composing of sinquane and was conducted with a group of students of 8 and 9 forms (27 students). The second extracurricular activity included the construction of a cluster and the composing of a sinquane and was carried out with a group of pupils of the 10th and 11th forms (23 students).

As a result of the research, it was found that the use of interactive teaching methods is effective in organizing out-of-class work in biology (the percentage of interested students in environmental activities grew from 36 % to 96 %). The most effective method for mastering new material is the cluster construction method (85,1 % of students coped with the task). These interactive methods are also effective in mastering the material and motivation for students, they help to keep the students interested and attract their attention to a particular environmental problems.

THE EXPERIENCE OF APPLICATION OF INNOVATIVE PEDAGOGICAL TECHNOLOGIES OF STUDENT-ECOLOGISTS TRAINING

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The work evaluates the use of innovative technologies during the process of training on the "Human Anatomy" discipline.

Keywords: innovative technologies, computer technologies, method of discussion.

Educational technology - is a special set of forms, methods, ways, techniques and tools of teaching systematically used in the educational process on the basis of the declared psychological and pedagogical attitudes, which

always leads to the achievement of a predictable educational result with an acceptable rate of rejection. The relevance of the work due to the need of introducing in the learning process of modern practice-oriented methods of teaching in order to identify the most productive methods of teaching.

Innovative teaching methods were used during the learning of the discipline "Human anatomy" by the students of 1 course of Ecological Medicine Department of educational establishment "International Sakharov Environmental Institute of Belarusian State University". 114 students of the specialties of the Medico-biological affair and Medical ecology were involved into the research.

During the classes we used the following methods: the method of computer technology and the method of discussions. The introduction of computer technologies in the learning process creates the prerequisites for the intensification of the educational process. Computer technologies make it possible to use in practice psychological and pedagogical developments that ensure the transition from the mechanical assimilation of knowledge to mastering the ability to acquire new knowledge independently. Discussion methods are the group of methods of active socially-psychological training, based on communication or organizational communication participants in the process of solving their educational and professional goals. The control group classes were conducted according to the traditional methods of teaching.

As a result of the analysis of students' tests checking the level of students knowledge obtained during the lesson on the chosen methodology, it was established that the discussion method is more effective and cognitive than the method of computer technologies. The computer method of training was the least effective in this discipline and has low indicators of the results of testing due to the specificity of the discipline of human anatomy. Thus, this method of teaching is undesirable for use in this discipline and requires further development in the technique of its conduct.

The most effective and successful method in terms of the results obtained was the classical method of teaching in the control group. This is due to the fact that a classical lesson is the most common form of education for students of these specialties and the most convenient for teaching the discipline "Human anatomy".

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PROBABILITY OF HUMANLIKE COMMUNICATION AMONG VIRTUAL ASSISTANTS – CHAT-BOTS

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Chat-bots are programs that can simulate a user's communication with one or several companions. As a rule, they are created on the basis of applications such as Telegram, Facebook, Skype, Viber, etc. The main idea of using chat bots is to automate repetitive processes and interact with the user.

Keywords: chat-bot, Telegram, communication, artificial neural networks, automation.

One of the important features of the chat-bot is its dialogue with the user. Such dialogues can be divided into two types: rigidly constructed answers and simulating a dialogue based on an artificial neural network (ANN).

The problem of a dialogue built on unchanging answers is that the end user can't get the information he needs. If a question is not correctly formulated, the chat-bot will respond with the stub in it – "I don't understand you. Put the question differently".

The solution to the problem of understanding the user and the virtual assistant is the use of ANN. An artificial neural network is a mathematical model, as well as its software or hardware implementation, built on the principle of the organization and functioning of biological neural networks – nerve cell networks of a living organism. This concept arose when studying the processes occurring in the brain, and when trying to simulate these processes.

For the simulation of human-like communication, recurrent neural networks are used – the kind of neural networks in which feedback is available. The presence of feedbacks allows one to memorize and reproduce entire sequences of reactions. The relationship of the RNN is shown in picture 1.

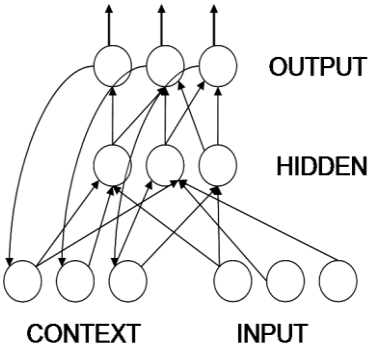

Figure 1 – The recurrent neural networks

The input vector of the signal goes to the group of neurons INPUT, on the group of neurons CONTEXT the zero signal. Then the signal spreads to the group of neurons of the hidden layer HIDDEN, and then it is converted by them and hits the neurons of the output layer OUTPUT. At the next iteration along with the signal vector INPUT, the context group of neurons receives copies of the signals from the OUTPUT layer of the last iteration.

To use an artificial neural network, you need a knowledge base. The CONTEXT, INPUT, and OUTPUT layers have one neuron each, the output value of which is set according to the word index in the word set. ANN is consistently trained in the following sentences: "Hello. How are you? _end_ Hello. Fine. _end_" (_end_ is entered corresponding to the end of the sentence).

To mark the knowledge base, the markup language AIML (Artificial Intelligence Markup Language) is used. The keywords in the language are category, pattern and template.

The category tag is the parent of the pattern and template tags that store the question and answer templates. The random tag allows you to specify multiple answers to a question that the interpreter selects randomly. It is proposed to introduce additional tags corresponding to the history and theme of the dialogue.

The algorithm for building a chat bot based on the extended markup of AIML and a recurrent neural network facilitates the creation of a chat-bot with the ability to communicate. A recurrent neural network allows you to get answers to questions that were not in the knowledge base, with the help of the network's ability to generalize.

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FORMATION OF AESTHETIC EDUCATION BY MEANS OF PROJECT ACTIVITY

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The role of project activity of students in the formation of their aesthetic education is defined. The types and forms of project activities that can be used to improve the aesthetic culture of students are analyzed.

Keywords: aesthetic education, aesthetic culture, personality, project activity, project.

At the present stage of the society development, the Belarusian education system faces the task of preparing highly educated citizens, capable of active, creative activity for the benefit of society. In its solution, the development of creative principles in man, the ability to transform the surrounding life, is of increasing importance. In connection with this, the role of aesthetic education and upbringing, which involves the formation of aesthetic judgments, tastes, improvement of the inner emotional world of a young person, serves to strengthen consciousness, ideological conviction, and the development of the entire spiritual image of a person.

Aesthetic culture is a complex and multifaceted phenomenon, representing one of the main components of the general culture of the society and, simultaneously, an aspect of each of these components. It explains the many approaches to the scientific interpretation of this concept.

The leading task of the aesthetic education formation and training of students is the formation of the need-motivational component of aesthetic culture, expressed in the interests and needs for the acquisition of artistic and aesthetic knowledge and a variety of activities on the aesthetic transformation of the surrounding reality. As noted earlier, all the components of the aesthetic culture of the individual, including interests and needs, are formed mainly in aesthetic activity. Hence the need to actively include students in it.

Any aesthetic activity is inherently creative and transformative. One of the forms of transformative activity is creative project activity. It is defined as "an integrative type of activity for the creation of products and services that have objective or subjective novelty and that have a personal or social significance" [5, p. 123].

The youthful age is a period of the person's increased desire for beauty, the formation of his moral and aesthetic views, ideals and tastes. Aesthetic interests of the student are quite diverse and rich in content. As a rule, a modern young man reads a lot, loves art, seeks to try his abilities and abilities in various areas of creativity.

A feature of the aesthetic interests of students is that they are of a selective nature. I believe that aesthetic education will be more effective if students are given the opportunity to "discover" the laws of beauty and harmony themselves and apply them in the process of their own creative activity. Thus, more qualitative acquisition and assimilation of knowledge is conducted, as well as the development of the outlook of students and the education of feelings.

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USE OF DNA ANALYSIS IN PALEOANTHROPOLOGICAL RESEARCH. HISTORY AND STATE OF THE PROBLEM

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The work is devoted to the review of the history of DNA analysis use in paleoanthropology and the possibilities of applying the results of such studies.

Keywords: DNA, paleoanthropology.

For many years, paleoanthropologists have used and are using methods of craniometry, somatometry, anthroposcopy, etc. In the early 1980s molecular genetic studies of DNA have been developed; they are used today in medicine, forensic science, archeology, paleoecology, population genetics, paleopathology, paleoanthropology itself, and so on. Due to this, a new perspective direction of complex studies in paleoanthropology – paleogenetics appeared.

Due to the modern methods of molecular biology, it became possible to isolate and study ancient DNA. This method is used to study the ways of settling and migrating peoples, the sexual structure of the population, to test the concepts of the origin of certain peoples that previously remained contentious. The analysis of DNA stored in bone remains can help reconstruct the history of the occurrence of Homo sapiens, identify diseases, identify genetic predisposition to diseases or identify their pathogen in the remains of people who died during the mass epidemics. For example, in 2003, the bone remains of Napoleon's army soldiers who died in Vilnius during the retreat of the French army were studied. Paleoentomologists found in the soil at the burial site the remains of lice, and from them the DNA of rickettsia was obtained, the causative agent of typhus. This allowed biologists and physicians to analyze the spread of typhus among soldiers of the army of Napoleon. DNA is extracted from the remains of bones, hair,

plant remains, etc. However, teeth are best for analysis, because this is a kind of capsules of time, covered with enamel, where an uncontaminated organic is well preserved. From there it is easier to get DNA from both the human and pathogenic microorganisms. Further stages of the study after DNA extraction are the amplification of DNA in vitro by polymerase chain reaction, which results in a large number of copies of DNA, and sequencing, i. e. determination of DNA nucleotide sequence. Recently, new high-performance DNA research approaches have emerged, for example, high-performance parallel sequencing, which will allow a greater amount of information to be obtained, using less initial DNA material. However, these methods are rarely used, because of the high cost of experiments.

The following problems in the study of ancient DNA can be determined: the high cost of some approaches in the study; the ability of DNA to degrade and contaminate, insufficient amount of material from which DNA can be isolated. As for contamination, when using high-sensitivity polymerase chain reaction variants for the amplification of ancient DNA, the presence of even a small amount of modern DNA often leads to false results. In this case, the researcher gets a sequence of contaminating DNA instead of the old one. There is also a problem with the preservation of ancient DNA. Studies of biochemical processes of DNA degradation after the death of the organism, their influence on the results of the analysis of the structure of ancient DNA, the influence of various environmental conditions on the degree of DNA preservation began. In connection with this, the prerequisite for the analysis of ancient DNA was the availability of the correct layout and equipment of the laboratory, which would ensure the isolation of "clean" DNA. and reduce their contamination.

THE PROCESS OF THE FORMATION OF THE NOOSPHERE

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The work is devoted to the philosophical understanding of the concept of the noosphere, the problems associated with its formation and the influence of man on it. The concept of V. I. Vernadsky, the basic ideas of his teaching in the noosphere, contributing to the more safe and productive development of mankind and nature.

Keywords: noosphere, biosphere, nature, development, scientific and technological progress.

The notion that living beings interact with the external environment and influence its change on the basis of observations of natural phenomena arose long ago. The general idea of the doctrine of the noosphere belongs to Vernadsky (1863–1945) and appeared in the end of the 19th century. The concept of "noosphere" means "the sphere of the mind" (from the Greek "noos" – the mind). V. I. Vernadsky was the first who realized and tried to implement a synthesis of natural and social sciences in studying the global activity of a person who is actively restructuring the environment. The noosphere is the highest stage of the biosphere, connected with the radical transformation of not only nature but a man himself as well.

At the end of the 20th century, the modern civilization, confronted with environmental, demographic, raw material, spiritual and moral problems, began to show special interest in Vernadsky's concept. The main points of Vernadsky's teaching can be formulated in the form of the following:

– human activity becomes the main factor of the evolution in the biosphere of the Earth and the space;

– for future development, a person will have to take responsibility for the nature of the course of the main evolutionary processes of our planet.

The noosphere is the result of the interaction of society and nature. A human should reasonably and expediently direct and control the course of natural processes. Vernadsky wrote: "Human becomes a geological force capable of changing the face of the Earth." This warning was prophetically justified.

In the noosphere, human becomes the largest geological force. He can and must reconstruct with his work and thought the realm of his life. The origin of the noosphere is the result of interrelated processes: the development of production and the scientific, technical and social revolution.

Proceedings of Vernadsky allow us to identify a number of specific conditions necessary for the formation and existence of the noosphere, namely: the transformation of communication and exchange among countries; expansion of the boundaries of the biosphere and spacewalk; the discovery of new sources of energy; equality of people of all races and religions; freedom of scientific thought and scientific search from religious, economic, political pressure and the creation in the state system of conditions favorable to free scientific thought; exclusion of wars from the life of society.

The strategy of the 21st century should not be more, but rational: it is more rational to extract, use, consume.

From Vernadsky's point of view, the process of formation of the noosphere is hampered by "state entities that do not ideologically recognize the equality and unity of all people" trying to stop this objective process. Vernadsky came to the conclusion that only social backwardness prevents the manifestation of the process of creating the noosphere in its real power. In the process of the formation on the noosphere, one should distinguish between spontaneous and purposeful stages. The first stage in the formation of the prerequisites for the formation of the noosphere, spontaneous, began with the appearance of man. The second, purposeful – the stage of conscious, intelligent, creative, planned transformation of nature in the interests of present and future generations of people by man, society.

Currently, the noosphere is understood as the sphere of interaction between man and nature, within which reasonable human activity becomes the main determining factor of development.

AN ASSESSMENT OF THE LEVEL OF ECOLOGICAL COMPETENCES OF TEACHERS

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The article assesses the level of ecological competence among teachers as a result of the distance course "Project Activities in Ecological Education of Students".

Keywords: Ecological competence, distance education, questionnaire, project activity, research work.

In the framework of the international project Tempus 543707-TEMPUS-1-2013-1-DE-TEMPUS-JPHES – Ecological education for Belarus, Russia and Ukraine, "a distance-learning course was developed for teachers of general education schools:" Projects within Ecological Education of Students". The main goal of the course is the formation of the ecological competencies of teachers for the organization and realization of research work of pupils in the field of ecology. The course is aimed to systematize and supplement theoretical knowledge and practical skills of organizing projects into a single system based on the application of system analysis.

A questionnaire survey was selected by the research method to identify the effectiveness of increasing the level of environmental competencies ownership. The questionnaire includes twelve questions and includes main points that allow to determine the level of teachers' competence to carry out ecology-pedagogical activity. The respondents were 26 distance learners.

A list of ecology-pedagogical competences was formulated during the development. The possession of competences must be assessed on a five-point scale using a questionnaire. The questions were combined in such a way as to provide an opportunity for teachers to assess their level of development of skills that determine the operational-activity component of the teacher's readiness for ecology-pedagogical activity before and after the course.

As a result of the survey it was revealed that the listeners believe the level of ownership of ecological competencies after the distance course has increased by 76,5 %. The level of possession of environmental knowledge has grown by 80 %, and the ability to extract them from literary sources and apply by 95 %. The level of ownership of the project technology has grown by 78 %, and the ability to apply it in practice as an organization of its own environmental project has improved by 69 %.

The information obtained as a result of the questionnaire makes it possible to develop directions that increase the effectiveness of formation the competence of teachers to implement environmental and pedagogical activities.

ECOLOGICAL EDUCATION OF YOUTH AS ONE OF THE DIRECTIONS OF THE ACTIVITIES OF "ASSOCIATION OF BELARUS GUIDES"

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Activities of association of belarus guides for ecological education of children and youth are described.

Keywords: Guiding, ecological education, sustainable development, research activity.

Guiding is a very interesting and unusual children's movement that has been uniting girls and young women around the world for more than a century. The main idea of the founder of the organization Robert Baden-Powell was that with children from the earliest years they could learn to live in harmony with nature and take care of themselves. Over the centuries guiding has become very popular around the world. Today the members of the movement are more than 10 million girls in 145 countries.

In Republic of Belarus more than twenty years there is a children's public association "Association of the Belarusian Guides" (ABG). In 2002 association became the full member of the World association of girls guides and girls scouts. The fundamental principles of the movement of guides are 10 laws which the girl guide makes a promise to carry out. One of these laws has ecological focus – "the guide the friend of animals and preserves the nature".

In summertime the organization organizes summer the camp: girls live in tents, in the wood, in some picturesque corner of our country. Life outdoors is one of methods of a gayding which promotes formation of the personality, improvement of social skills and development of a responsible attitude to the nature. Programs of the camp of 2017 were the cornerstone of 17 purposes in the field of sustainable development accepted by the UN, many of which are directed to ecological sustainability. The subject of the program of every day included several sustainable development goals. By means of interactive exercises, playful ways of the girl studied a problem and made necessary decisions.

The group of guides of Secondary School No. 8 of Zhodino took part in the republican camp "Green Cow" which passed on the bank of the Zaslavsky reservoir in July, 2017. In actions of the camp research activity was actively used. Such form of work promotes informative and creative activity of children, acts as the most important source of personal development and self-development, broadens horizons, intensifies development of creative abilities, forms a set of certain competences [1].

For example, participating in informative quest "The coast left – the coast right", girls have learned history of emergence of an artificial reservoir and its role in an ecosystem of the region, and during participation in drawing up and carrying out "A forest track" which route has been laid by means of grain, peas, berries of bushes, studied plants of the wood and signs of life of animals. Much attention throughout the camp was paid to separate collecting garbage. Girls participated in a competition in independent production and decoration of garbage containers for each of types of waste. The most interesting containers in a consequence were used in the camp. Interesting was an experiment "What is in a sock?". In one sock have put different types of waste: a peel from banana, paper, a grass, glass, plastic. All this was dug, actively watered 9 days. Thus, by practical consideration children have come to a conclusion that biological waste decays quicker, and glass and plastic during experience haven't undergone changes at all.

During the camp the water purification problem was covered. Interesting was a task for purification of very dirty water with sand and leaves by means of make-shifts. Also by means of a pantomime each group had to show one of ways of extraction of fresh water. We have learned about use of rain water, water from thawing of icebergs, desalting of sea water and extraction of ground waters.

Development and implementation of independent small ecological projects not only promotes development of motivation at younger generation to careful attitude to natural resources. Having necessary knowledge, possessing an accurate position, and being able to reason competently it, the girl guide grows up the active citizen of the country which the behavior broadcasts commitment to sustainable development and ecological safety.

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SECTION 2

MEDICAL ECOLOGY

SENSITIVITY OF M.HOMINIS AND U.UREALITICUM TO ANTIBIOTICS

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In this work diagnostics of biomaterial on existence miko-and ureaplasmas by means of the standard test system "Mycoplasma IST 2" through of selective hydrolysis of an arginin and urea has been carried out. The sensitivity miko-and ureaplasmas to nine antibiotics of three classes is defined.

Keywords: mycoplasma, ureaplasma, mycoplasmosis, antibiotic resistance, tetracyclines, macrolides, fluoroquinolones.

Introduction. The causative agent of mycoplasmosis is mycoplasma, a microorganism taking an intermediate position between bacteria and viruses. A peculiarity of mycoplasmas is the absence of a cell wall (due to the lack of intrinsic enzymes that synthesize its components (muram and a-E-diaminopimelic acid)). When detecting mycoplasmas in genital scrapings in amounts exceeding 10^4 cells / ml, antibiotic therapy is necessary. Mycoplasmas are not sensitive to all antibiotics; moreover, individual resistance to certain antibiotics can develop. Mycoplasmas are known to be resistant to drugs, which action is associated with biosynthesis of cell wall proteins. Most mycoplasmas are sensitive to drugs that inhibit the synthesis of membrane and intracytoplasmic proteins. Therefore, conducting a sensitivity test is relevant in the selection of treatment with frequently used antibiotics.

Materials and Methods. As a test material, scrapings from the vagina of 100 female patients of reproductive age in Minsk (19–44 years old) were used. Standard test systems "Mycoplasma IST 2" (BioMerieux, France) were used. They include Urea-arginine broth and a 22-well panel that allows to identify a microorganism (M. hominis or U. urealyticum), the number of detected microorganisms (> 10^4 cells / ml or < 10^4 cells / ml) and their sensitivity to nine antibiotics of three classes. The strips with added components were incubated at a temperature of 36 °C ± 2 °C for 24 hours (growth of U. Urealyticum) and 48 hours (M. Hominis growth). In the presence of growth in the medium, specific substrates (urea for U. Urealyticum and arginine for M. hominis) and an indicator (phenol red) with microorganisms changed their color as a result of a pH change from yellow to crimson red. The obtained data was processed using Microsoft Office Excel 2012 spreadsheets and the Statistica 8.0 software package. Nonparametric methods were used for data processing. To determine the reliability of differences in the groups with mono- and mixed mycoplasmal infection, the $\chi 2$ criterion with the Yates correction was used.

Results. Of the 100 patients examined, 47 had urea- and mycoplasmas. In 24 (51,06 %) cases of 47, U. urealitycum was identified as a monoinfection (group I). In the remaining 23 (48,94 %) samples of both U. Urealyticum and M. Hominis (group II) were detected. Simultaneously, the sensitivity to antibiotics was determined. In group I, sensitivity to tetracyclines (tetracycline and doxycycline) was 100 %, to macrolides (josamycin, clarithromycin and pristinamycin) was also 100 %. Ureaplasma infection was resistant to fluoroquinolones: resistance to ofloxacin and ciprofloxacin was 74 % and 91,3 %, respectively. In group II, sensitivity to tetracycline and doxycycline was 95,7 % and 87 %, respectively. The effectiveness of macrolides is significantly reduced in mixed mycoplasmal infection; the sensitivity was the following: to josamycin – 39 %, to erythromycin and azithromycin – 4,3 %, to clarithromycin – 13 %. Patients of both groups were resistant to fluoroquinolones; resistance to ciprofloxacin was 95,7 % and to ofloxacin 87 %.

Conclusion. In general, ureaplasma and mycoplasma were sensitive to antibiotics of the tetracycline series, since the antibacterial effect of tetracyclines is to suppress the biosynthesis of the bacterial cell protein at the ribosome level inhibiting the initial stage of protein synthesis. High sensitivity to macrolides in monoinfection can be explained by their reversible binding to the 50S subunit of ribosomes, which leads to multiple disturbances of its functions. The development of the resistance of mycoplasmal infection to fluoroquinolones can be associated with mutations in the areas determining the resistance to quinolones.

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ISOLATION AND CHARACTERIZATION OF RODENT NERVOUS TISSUE-DERIVED CELL CULTURE

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Tissue-derived cell culture has been widely used in medical research. The ability to produce *in vitro* cultures of neuronal cells has been fundamental to advancing our understanding of nervous system functions. The perspective direction in the treatment of socially significant diseases is the application of cell replacement therapy. Therefore the development of methodological approaches to establishment of viable cell cultures is currently important.

Keywords: cell culture, nervous tissue, morphology, phenotype.

The development of methods of obtaining viable cell cultures of nervous tissue, which can be further used for modeling of pathogenic mechanisms of neurodegenerative diseases, new therapeutic protocol testing and the evaluation of treatment effectiveness are very important and actual up to date. The complexity of neuronal cell culture isolation is determined by the heterogeneity of nervous tissue (neuronal cells, astrocytes, oligodendrocytes, radial glia, ependymal cells, and microglia) and the lack of the standardized protocol of the establishment of cell culture. Therefore the development of methodological approaches to produce the cultures of neuronal cells *in vitro* is currently important and has been fundamental to advancing our understanding of nervous system functions.

Aim. The optimization of the neuronal cell culture isolation method and the estimation of its morpho-phenotypic specific features *in vitro*.

Materials and methods. Neuronal cells were isolated from the rodent brain (n=6) using three protocols: only the mechanical disaggregation of the tissue with the subsequent cultivation of the explants (1) and the combination of mechanical disaggregation with the treatment of the tissue with collagenase I type (2) or trypsin (3). The cell suspension was plated in the concentration of 10^6 cells per well of a 24-well plate, covered partly with fibronectin for improvement of cellular adhesiveness. The cells were cultivated in DMEM-F12 supplemented by 10 % fetal bovine serum, 1 % antibiotic-antimycotic and 1 % L-glutamine at 37 °C under 5 % CO_2 condition. The monitoring of cell cultures morphology and growth *in vitro* was done by a phase contrast microscopy method. The phenotype of the cell cultures was determined using the immunocytochemistry with the immunoperoxidase visualization of nestin, vimentin and nerve growth factor receptor (NGFR).

Results. It was established that the neuronal cell cultures isolated using the mechanical tissue disaggregation protocol formed the multicellular aggregates attached to a substrate on the 4–6th day, with the proceeded cellular growth. The majority of the nerve tissue cells (95 (90÷96) %) prone to the formation of sprouts and further intercellular contacts were observed after a mechanical tissue disaggregation combined with enzymatic treatment with trypsin solution. However, the neuronal cell cultures cultivated in the presence or absence of the special adhesive fibronectin cover did not significantly differ in the adhesive capacity.

It was shown, that the cell cultures obtained from the rodent brain via the mechanical and enzymatic treatment of nervous tissue had higher proliferative activity and colonial growth compared to the cell culture obtained via only the mechanical method. On the 10–14th day of cultivation, the cells acquired the typical morphology of nerve cells, characterized by the formation of neuritis, the tendency to form intercellular contacts, and also the expression of specific markers (vimentin, nestin, and NGFR) after a mechanical tissue disaggregation combined with enzymatic treatment with trypsin solution. The cell cultures were characterized by certain heterogeneity and can include stem / progenitor nerve cells, mature neuronal and glial cells. It was established that the cells isolated from the brain tissue of rodents via mechanical and enzymatic disaggregation revealed the expression of vimentin (93(89÷95) %), nestin (90(87÷91) %) and NGFR (91(89÷93) %) and there were no statistically significant differences in their expression in different isolation protocols.

Conclusion. The obtained results allowed us to determine the optimal method of the separation of rodent nervous tissue-derived cell culture, which can be further used for modeling of pathogenic mechanisms of neurodegenerative diseases and for the evaluation of treatment protocol effectiveness including cell therapy.

EXOSOMES AS BIOMARKERS IN PATHOLOGY

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Exosomes can be used as biological markers for both negative and positive changes in the environment that surrounds the object under the study. It could be done through tracking the amount of the exosomes, which are secreted by cells before and after changes in the environment. It is also possible to determine the changes in the qualitative composition of exosomes.

Keywords: Exosomes, molecular organization, functions, exosome detecting methods, exosome content, applications of exosomes.

Environmental factors constantly affect biological objects. Consequently, cells secrete special vesicles, as a specific way of communication. Communication between cells is the most important way of regulating of vital activity of all multicellular organisms [1].

Most eukaryotic cells secrete membrane vesicles (exosomes) that can affect both neighboring and distant cells. Exosomes formed inside secretory cells in endosomal compartments are called multivesicular bodies. Exosomes are produced by a number of cell types: reticulocytes, platelets, B and T cells, mast cells, dendritic cells, macrophages, Schwann cells, astrocytes, neurons, melanocytes, mesothelioma cells, intestinal epithelial cells, adipocytes, fibroblasts, and tumor cells. Exosomes have been described to exist in many biological fluids (for example, breast milk, blood, urine, amniotic fluid, saliva, cerebrospinal fluid etc.). An exosome can contain up to 4563 proteins, 194 lipids, 1639 mRNA and 764 miRNA [2].

Exosomes have multiple functions and can be considered as an alternative method of intercellular communication. The physiological functions of exosomes include the participation in intercellular communication, the transportation of various molecules from the donor cell to the recipient cell, the stimulation of the immune system, the presentation of the antigen, immunosuppressive effects on immune and tumor cells.

The role that exosomes play in malignant and virus-infected cells is widely known. For instance, pathogenic organisms can use exosomes for intercellular communication. The pathological role of exosomes in the development of such diseases as Burkitt's lymphoma, Glioblastoma, Creutzfeldt-Jakob disease, Systemic amyloidosis, Alzheimer's disease, Huntington's disease is widely known as well [4].

Exosomes can be studied both *in vitro* and *in vivo*. The main approaches for isolating exosomes are the use of monoclonal and polyclonal antibodies, a western blot analysis, a FACS analysis, electron microscopy.

In addition to the application in clinical therapy, exosomes are utilized as a cancer vaccine (Sipuleucel-T became the first immunotherapeutic vaccine that functions using the antigen presentation that involves dendritic cells); diagnostic biomarkers, and drug delivery vesicles.

Thus, exosomes can be used as biological markers for both negative and positive changes in the environment that surrounds the object under the study. It could be done through the tracking of the amount of exosomes, which are secreted by cells before and after changes in the environment. Moreover, it is also possible to determine the changes in the qualitative composition of exosomes.

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MORBIDITY AS NEGATIVE INDICATOR OF POPULATION HEALTH

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The issues of the formation of the basic indicators of public health, the prevailing tendencies in the incidence as the most important component of the integrated public health assessment, the impact of various factors on the level and the nature of morbidity were considered in the study.

Keywords: health, morbidity, environmental factors, tendency, mortality, non-infectious chronic pathology.

Morbidity plays an important role in characterizing public health, since the level of health and mortality depends on it. Health was traditionally defined as the absence of disease and external defects. According to the current definition adopted by WHO, health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Health is understood as something opposite, different from illness, that is, the concept of "health" is still defined through the concept of "ill health" and depends on the prevalence of certain diseases, developmental defects, accidents, and mortality.

The incidence is the most important component of a comprehensive public health assessment. In the broadest sense of the word, morbidity should be understood as the distribution of diseases among the population or its individual groups. The level of morbidity varies under the influence of many factors: shifts in demographic processes, occupational and industrial conditions, advances in medical science and health care, changes in the influence of environmental factors, general and sanitary and hygiene culture. Since most of the factors mentioned above underwent significant changes last decade, this could not but affect the level and nature of the incidence. The formation of the basic indicators of health of the population of Belarus in the 90s. was characterized by negative tendencies: the increase in morbidity and mortality. First of all, the growth of non-infectious chronic pathology (cardiovascular, oncological, etc.) and a high level of injuries should be noted. [2]

Today, cardiovascular diseases not only determine the public mortality in the country and are the main cause of disability, but also play a significant role in reducing the average life expectancy. The relevance of this problem is also caused by the high prevalence of this pathology and the leading role of diseases of the circulatory system in the reasons of the days away from work of the population of the republic. The importance of pathology is determined by its consequences, which account for more than 40 % of disability. The ongoing increase in morbidity, diseases that attack people of a younger age make cardiovascular diseases the most important medical and social health problem. The second place among the causes of death of the population of the republic for many years was occupied by oncological pathology and significantly influenced the average life expectancy and the size of irreplaceable losses. Malignant neoplasms cause death in 13,1 % of the total deaths of the population, second only to mortality from diseases of the circulatory system. In addition, malignant neoplasms take the second place in the structure of the primary disability of the Belarusian population, total 21,2 % and conceding again only to disability from diseases of the circulatory system. One of the most important current medical and social problems is traumatism. The concern is not just the growth of injuries in Belarus (especially in recent years), but the fact that there is an increase in fatal injuries, connected with disability or with temporary disability. Neuromuscular diseases (diseases of civilization) are also becoming very important today.

The reasons that led to such an unfavorable situation are multifaceted and ambiguous; they are both objective and subjective. The greying of the country's population, the deterioration of the ecological and socio-economic situation, psycho-emotional overload and the consequences of stress, the increased consumption of alcohol and narcotic drugs are among them. [1]

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INFLUENCE OF IONIZING RADIATION IN DOSE OF 1 GY ON CALCIUM TRANSFER IN RATS' PLATELETS

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The object of research was the specific changes in calcium transfer in rats' platelets, which were irradiated in dose of 1 Gy. Ca2+ is an essential second messenger in virtually all cells, regulating a wide range of fundamental cellular processes. In platelets, the elevation of endocellular calcium contributes to various steps of cellular activation, such as reorganization of the actin cytoskeleton, degranulation or inside-out activation of integrin aIIbß3. Therefore, the activation of platelets has to be regulated with high fidelity to ensure that they become activated only under appropriate conditions. Platelets possess various adhesion receptors and sophisticated regulatory machinery in order to adhere in response to a well-defined set of stimuli. Platelet activation is triggered by various agonists, including subendothelial collagens, thromboxane A2 (TxA2) and ADP released from activated platelets, and thrombin generated by the coagulation cascade. Although these agonists act on different platelet receptors and trigger different signaling pathways, all lead to an increase in the intracellular Ca2+ concentration ([Ca2+]i).

Keywords: calcium, platelet, store-operated calcium entry, radiation, thrombin

Research was made on male rats aged 3–6 months. Animals were irradiated (once and evenly) on IGUR device with γ – quants of ^{137}Cs in dosage of 1 Gy (power of dose 0,62 Gy/min, time – 2 minutes). Condition of calcium transfer was investigated on 3rd, 10th, 30th and 90th day. For quantitation of calcium concentration in platelets was used fluorescent probe Fura – 2/AM.

In rats' platelets on 3rd day after irradiation was seen increased level of basal calcium ions in non – calcium – containing and calcium – containing environment. On 10th day it was noted decreased level of calcium ions in cytoplasm and its' normalization in calcium – containing environment. On 30th day after irradiation concentration of calcium in non – calcium – containing and calcium environment almost matched values of control group, and on 90th day was slightly lower than control group's.

	Control	3rd day after irradiation	10th day after irradiation	30th day after irradiation	90th day after irradiation
Basal calcium level (100 umol/l EDTA), nmol/l	44,2±4,6	85,9±5,2*	31,1±6,2*	49,6±3,2	30,9±3,0
Basal calcium level (1 mmol/ $CaCl_2$), nmol/l	74,9±11,8	181,7±0,5*	75,4±8,4	79,1±4,0	53,9±5,1

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ANTIOXIDANT ACTIVITY OF JUICE OF SMALL-FRUIT CROPS

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A comparative study of antioxidant activity of juices of black and red currant, raspberry and blackberry, cherry and sweet cherry, bilberry and blueberry, black chokeberry, and strawberry is carried out. The dependences of fluorescence intensity of fluorescein on a logarithm of concentration of juice from which IC_{50} indicators are graphically defined are received.

Keywords: antioxidant activity; juice of black and red currant, raspberry, blackberry, cherry, sweet cherry, bilberry, blueberry, black chokeberry, strawberry; fluorescein.

The excess concentration of free radicals in an organism is the central risk factor of cardiovascular and oncology diseases, and other pathologies. Flavonoids have strong antioxidant properties and can be used as preventive treatment for various diseases. Such flavonoids as Quercetinum and Rutinum as well as antotsiana, and other phenolic glycosides acting as inhibitors of free radicals [1–3] are the part of many berries.

A comparative study of antioxidant activity (AOA) of these flavonoids in juice of black and red currant, raspberry and blackberry, cherry and sweet cherry, bilberry and blueberry, black chokeberry, and strawberry is conducted.

The method of AOA determination in relation to activated oxygen forms (AOF) is based on the measurement of fluorescence intensity of the oxidized compounds and its reduction under the influence of AOF. In the present study fluorescein, which possesses high extinction coefficient and close to 1 fluorescence quantum yield, is used for detecting free radicals. The generation of free radicals is carried out using Fenton's system, in which hydroxyl radicals are formed through the interaction of iron compound (Fe^{2+}), etilendiamintetrauksusny acid (EDTA) and hydrogen peroxide [4; 5].

The dependences of fluorescence intensity of fluorescein on a logarithm of concentration of juice are received for all the samples. The study is conducted on 0,01–10 % juice concentration. The juice samples begin to show AOA at the concentration of 0,01–0,02 %. With the subsequent increase in juice concentration the increase in suppression of free radicals action and the increase of fluorescein fluorescence are observed. The studied samples restore fluorescein fluorescence to 51–78 % (A_{max}) at their concentration of 0,2–1 % (table 1). IC_{50} indicators, which are the concentrations of juices at which 50 % inhibition of free radicals is reached, are graphically defined. The IC_{50} indicators of black currant, sweet cherry, raspberry, blueberry, black chokeberry, strawberry, red currant, bilberry, blackberry, cherry respectively are $2{,}95\cdot10^{-2}$–$13{,}2\cdot10^{-2}$ % (table 1) that demonstrates high antioxidant abilities of the juices studied. The comparison of the couples of juices of the berries having similar structure is carried out. The highest antioxidant activity is defined in blackcurrant juice. The fluorescence intensity of fluorescein is restored up to 78 % at the juice concentration of 0,2 %.

Table 1

Indicators of antioxidant activity of juices

Juices	A_{max}, %	C, %	$IC_{50}\cdot10^{-2}$, %
black currant	78	0,2	2,95
sweet cherry	76	1	3,47
raspberry	64	0,2	6,17
blueberry	64	1	6,3
black chokeberry	61	0,2	7,5
strawberry	66	1	8,77
red currant	56	0,2	9,1
bilberry	55	0,2	12,3
blackberry	59	0,2	13
cherry	51	0,2	13,2

Due to the high content of flavonoids, juices of small-fruit crops can be considered as highly effective inhibitors of free radicals.

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ANALYSIS OF HUMAN CHORIONIC GONADOTROPIN USING BOTTOM-UP PROTEOMIC APPROACH

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Human chorionic gonadotropin (hCG) is mainly the product of placental syncytiotrophoblast cells. It can also be secreted by several normal non-placental tissues and trophoblastic or non-trophoblastic neoplasms. Human chorionic gonadotropin is included in the lists of illegal drugs in some sports. In this study the methodological approach to human chorionic gonadotropin detection by HPLC-mass spectrometry is developed.

Keywords: Human chorionic gonadotropin, human chorionic gonadotropin structure, high performance liquid chromatography, mass-spectrometry.

Human chorionic gonadotropin has a molecular weight of 38 000 Da with 237 amino acids organized in two subunits, alpha and beta, each consisting of a single polypeptide chain. Seventy percent of its structure is represented by the protein chains and 30 % by carbohydrate chains. The carbohydrate chains covalently bound to the peptide chains are of two types: O-linked and N-linked oligosaccharides. Regarding endogenous forms of hCG, there are various ways to categorize and measure them, including total hCG, free β-subunit hCG, β-core fragment hCG, hyperglycosylated hCG, nicked hCG, alpha hCG, and pituitary hCG.

In this study the methodological approach to human chorionic gonadotropin detection by high resolution mass spectrometry based on their prior tryptic hydrolysis (“bottom-up method”) is developed. The peptides obtained from tryptic hydrolysis are separated by HPLC method on reversed-phase column and are analyzed using a high resolution mass spectrometer Agilent 6550 iFunnel Q-TOF. The designed approach allows detecting 7 hCG peptides (figure 1).

The 3 peptides of the alpha subunit and 4 peptides of the beta subunit at various degrees of protonation are detected. Analyzing the peptides obtained after the tryptic hydrolysis of hCG, it is found that two peptides derived from the cleavage of the β-subunit correspond to peptides that come out during hydrolysis of the beta-core fragment.

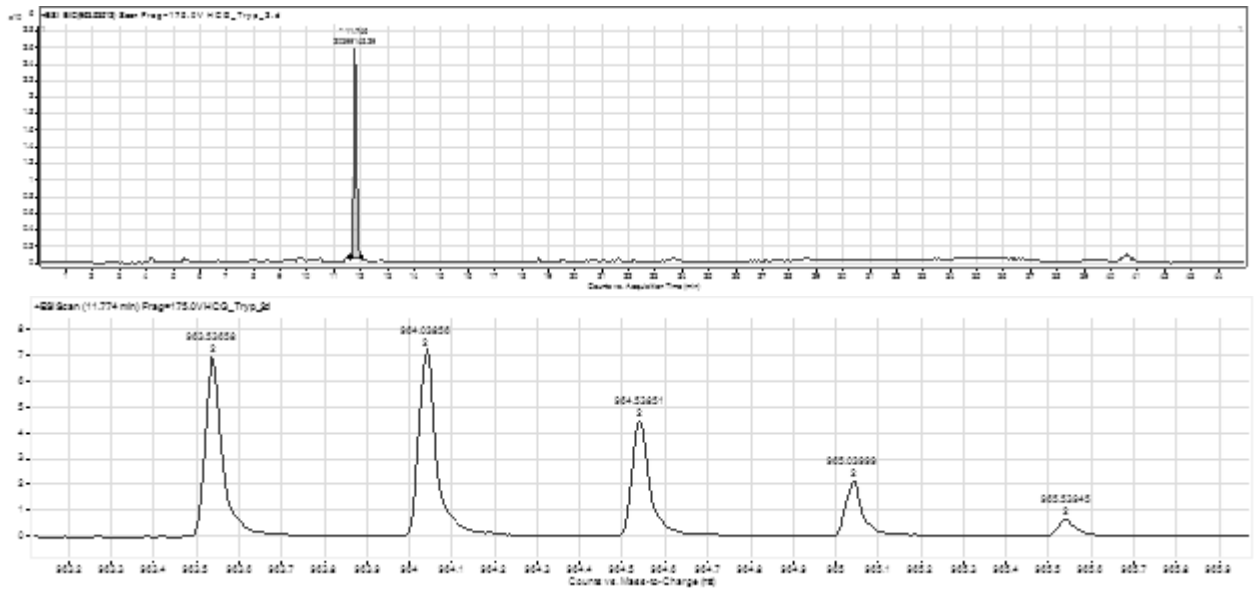

Figure 1 – Chromatogram and mass spectrum of peptide VLQGVLPALPQVVCNYR with m/z 963.5351 (+2)

Additionally, the mass spectrometric data analysis shows the presence of peptides with molecular masses that correspond to the glycopeptides of the chorionic gonadotropin. Due to the heterogeneity of the oligosaccharide fragments structure of this protein, the data obtained require additional processing and modeling.

Based on the data obtained, a list of peptides that can be used as specific for further studies has been compiled. The obtained data will be used to develop a method of quantifying chorionic gonadotropin in human urine.

CONTENT OF ALPHA-FETOPROTEIN IN PATIENTS WITH SYSTEMIC SCLERODERMA

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The analysis of the content of alpha-fetoprotein in patients with systemic scleroderma shows that serum alpha-fetoprotein levels could be used as a marker in the differential diagnosis of systemic scleroderma.

Keywords: alpha-fetoprotein, systemic scleroderma, embryonic markers.

Alpha-fetoprotein is a protein contained in mammalian embryonic serum, the level of which decreases to trace amounts in the blood of adults, but rises again in the case of hepatocellular carcinoma or a teratoblastoma of a testicle or ovary. In this regard, alpha-fetoprotein is widely used in the primary differential diagnosis of these tumors, as well as to evaluate the effectiveness of their treatment.

Normally, alpha-fetoprotein can be detected in the fetal serum as early as during the 4th week of pregnancy. Its concentration peaks between the 12th and 16th weeks and then gradually decreases until birth. In adults, alpha-fetoprotein is detected in normal hepatic tissue using an immunoblotting technique, as well as in follicular fluid. Since alpha-fetoprotein penetrates the placenta, it can be found in a fairly high concentration in the mother's serum, reaching a maximum between the 32nd and 36th weeks of pregnancy. This serves as an important indicator in monitoring the antenatal period. With the increase in pregnancy and in children in the early postpartum period, the level of alpha-fetoprotein decreases.

In man in the first year of life, the level of alpha-fetoprotein is subjected to strong fluctuations. A stable and regular increase in the level of alpha-fetoprotein in childhood is observed with tyrosinemia and ataxia – telangiectasia. Developmental delay or a liver structure disturbance in these conditions is responsible for maintaining a high level of alpha-fetoprotein.

An increase in the level of alpha-fetoprotein is observed in non-tumor liver diseases. It is temporary; sharp in acute viral hepatitis and less pronounced, undulate in cirrhosis of the liver.

An increased level of alpha-fetoprotein in the blood of pregnant women is a diagnostic sign of congenital pathology, mainly of neural tube defects; a low level is a marker of a high risk for Down's syndrome.

Alpha-fetoprotein is widely used in oncology clinic and in obstetrics. It is an excellent system for studying the regulation of tissue-specific and embryo-specific proteins in normal development.

The aim of the work is to analyze the content of alpha-fetoprotein in patients with systemic scleroderma.

The content of alpha-fetoprotein is determined in the blood of twenty of the observed. Ten of them are a control group, the rest are sick with systemic scleroderma. Alpha-fetoprotein is determined by immunoradiometric assay *kit.*

In the patients with systemic scleroderma, serum alpha-fetoprotein levels are increased in comparison with the control group.

Statistical analysis shows that the differences in the groups are statistically significant, suggesting that serum alpha-fetoprotein levels could be used as a marker in the differential diagnosis of systemic scleroderma.

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THE COMPARISON OF EXPRESSION LEVELS FOR THE YELLOW GENE AND ELONGATION FACTOR GENE DROSOPHILA MELANOGASTER AT DIFFERENT STAGES OF THE DEVELOPMENT

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The expression levels for the yellow gene and elongation factor gene Drozophila melanogaster at different stages of the development are very different which is due to the peculiarities of synthetic processes at these stages.

Keywords: yellow gene, elongation factor gene, polymerase chain reaction, Drosophila melanogaster

Drosophila melanogaster is so good object in genetic. Drosophila melanogaster is a small, easily reared insect with a short lifecycle.

The key advantages are a balance between genetic power and biomedical relevance, and rapidity and low cost of generation and maintenance of mutant and transgenic stocks. The genetic toolbox available for Drosophila allows precise intervention in specific, defined cells in an atherwise normal organism, opening unique opportunities for functional biology. Approximately 70 % of human genes have clear Drosophila homologues.

We stady expression of Drosophila melanogaster genes.

The yellow gene is involved in pattern-specific melanin pigmentation of the cuticle of the adult fly and of laval mouth parts of Drosophila melanogaster.

We estimated the expression levels for the yellow gene and elongation factor gene Drozophila melanogaster at different stages of the development. We worked in Dzelepov laboratory of nuclear problems.

We obtained the RNA extraction from lavals and adult fles. Then looked at the results of presence of this materials on electrophoresis in agarose gel. On the gel we saw not only mRNA and rRNA fragments, but the part of degradete dRNA and part of gDNA. We saw DNA as getting a pure RNA is so difficunt.

We conducted a reaction of reverse transcription with enzyme reverse transcriptase for converting RNA sequence to complementary DNA (cDNA). Then we fulfilled real-time polymerase chain reaction. Levels of amplified cDNA are measured by fluorescence with SYBR Green.

Analys by specific computer program showed that expression of lavae yellow gene is low er in 10 times compared to the expression of lavae elongation factor gene and expression of lavae yellow and elongation factor genes is higher in 1000 times compared to imago (adult flies).

This differences are due to the fact in the early stages of development, in any organism, synthetic processes are more intensify, they need more nucleic acids to construct the necessary proteins.

In this way the expression levels for the yellow gene and elongation factor gene Drozophila melanogaster at different stages of the development are very different which is due to the peculiarities of synthetic processes at these stages.

HYPERGLYCEMIA UNJUST-CHANGE OF NEUTROPHILS MICROBICIDAL

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The influence of simulated conditions of light and moderate severity hyperglycemia on the activity of enzymes of the "respiratory explosion" of human peripheral blood neutrophils in vitro was studied.

Keywords: hyperglycemia, neutrophils, NADPH oxidase, diabetes, hyperglycaemic coma, hyperglycemic syndrome.

The question of the participation of neutrophils in the regulation of the immune and other parts of homeostasis is currently under close scrutiny. neutrophils are not only eliminating, auxiliary and effector cells, but also cells involved in the initiation and regulation of immunological reactions [1].

NADPH oxidase is the leading enzyme of oxygen dependent microbiocidal neutrophils. Increase in the concentration of glucose in the blood is noted with an increase in hormonal activity of the pituitary gland, thyroid gland, diabetes mellitus, acute and chronic pancreatitis. The enzyme catalyzes the reduction of molecular oxygen to a superoxide radical, which is then converted into hydrogen peroxide and other toxic forms of oxygen. The assembly of the NADPH-oxidase complex is induced on the inner side of the neutrophil membrane [1; 4].

In our experiments it was found that under the conditions of experimental modeling of the state of mild hyperglycemia (6,5 mM), a direct dependence of the development of the activation effect of NADP oxidase on the time of incubation of neutrophils in a medium containing glucose is observed. This process is sequential in the form of a stepwise increase in activity and 60 minutes are necessary to achieve the activation maximum (2,34 times the control value).

The incubation of NP in the simulated conditions of moderate hyperglycemia (11 mM) leads to a significant activation of the NADP oxidase complex compared to the control in the first 30 minutes – 2,63 times. The further stay of NF in a medium containing 11 mM glucose (60 minutes) leads to an increase in enzyme activity with a maximum of 3,51 times the control value, with continued activity after 90 minutes and after 120 minutes of incubation.

When analyzing the obtained data on the experimental modeling of the state of hyperglycemia of small and medium severity it is obvious that an increase in the glucose concentration in the neutrophil precursor incubation medium correlates with an increase in the enzymatic activity of the NADP oxidase complex. The effect is dose dependent and has a maximum manifestation after 60 minutes of incubation of cells under conditions of hyperglycemia of both small and medium severity.

Massive entry of glucose into cells using the mechanisms of active and passive transport leads to activation of the processes of glycolysis and the Krebs cycle, oxidative phosphorylation in the mitochondria and leading to acceleration of the processes of cellular respiration and ATP synthesis, and also causing the phosphorylation of a number of key activation enzymes such as Ras protein and protein kinase C. Thanks to the activation of these enzymes, the phosphorylation of the components of the NADP oxidase complex, the main component of the farm system of the "respiratory explosion" and its faster assembly on the inner surface of the cytoplasmic membrane. All this leads to a rapid launch of a cascade of reactions leading to the formation of reactive oxygen species and the development of oxidative stress, which is one of the significant factors of damage in the pathogenesis of many diseases associated with the state of hyperglycemia [1–4].

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BIOCHEMICAL ASPECTS OF ECOLOGICAL - HYGIENIC CHARACTERISTICS OF THE DOMESTIC PLANT GROWTH REGULATOR "AFALAMIN"

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As a result of the development of protective and stimulating compositions for the treatment of agricultural seeds at the Institute of Bioorganic Chemistry of the National Academy of Sciences established a promising plant growth regulator – hexyl ester of 5-aminolevulinic acid (H-ALA) with a pronounced growth stimulating properties against a number of crops. For safe use of the H-ALA in the agricultural sector must be allowed to complete toxicological and hygienic assessment of the rationale of hygienic standards in the working area, air, water reservoirs, food, as well as to calculate the acceptable daily intake dose in humans. The basis for such studies is the toxicological experiment on warm-blooded animals, which allows you to define the threshold of harmful action of chemical factors.

Keywords: hexyl ester of 5-aminolevulinic acid, xenobiotics, cytochrome P450

The research goal of the study of biochemical parameters of white rat's that received perorally an active substance of the new plant growth regulator 5-aminolevulinic acid hexyl ester.

In the context of the thirty-days' experiment the drug showed marked dose-dependent effects of cumulative properties manifestation at the level of lethal outcomes. Intragastric administration of the drug to white rats led to the change in a number of laboratory biochemical parameters of the liver function, which was reflected in an increase of the activity of alanineaminotransferase and dose-dependent increase in the level of bilirubin was also observed.

Among the laboratory parameters is the state of white rats, receiving treatment, he-ALA in the subchronic experiment, we observed a statisticall significant increase in the content of the component C3 at 1,5 times of immunoglobulin G by 28 % compared with the control values.

The study of biochemical mechanisms associated with the functioning of microsomal monooxygenases smooth endoplasmic reticulum of the liver, allows to reveal the peculiarities of the damaging effect of the poison, determine the type of its influence on the cytochrome P450 system, and also serves as a basis for prevention and treatment intoxicaci

Study of the detoxification system of xenobiotics produced in rats that received intragastric maximum tolerated dose subchronic exposure 440 mg/kg he-ALA. The initial research phase describes the microsomal fraction of the liver of group IV content cytohromom P450 and P420, and also determined the total protein concentration and activity of P450 reductase.

Introduction 5-aminolevulinic acid hexyl ester was increased to 1,4 times the specific content of cytochrome P450. It was observed increase of level of the specific content of cytochrome P420 3 times relative to the control. P420 cytochrome is a membrane-bound protein and the expression of its activity is possible only in the presence of a phospholipid environment, which stabilizes the enzyme in a functionally active conformation.

As a result of all three experiments revealed changes in biochemical parameters in experimental animals treated with the studied substance in the subchronic experiment. These data are informative to assess the response of the organism to the action of 5-aminolevulinic acid hexyl ester.

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CHARACTERIZATION OF THE CYTOTOXIC EFFECT OF DMSO AND SDS ON MSC CULTURE USING MTT ASSAY

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In this work presents the results relating to determine the dose-response relationship in the culture of MSCs under the influence of chemical factors such as DMSO and SDS and the optimal regimens for the experimental effect using MTT assay.

Keywords: mesenchymal stem cells, cell culture, DMSO, SDS, MTT assay, cytotoxic effect.

There are different changes in cell morphology, cell growth rate, death time and degree of disintegration during the influence of various chemical agents. Therefore, it is necessary to evaluate the harmful effect of each potential damaging substance on cell survival [1].

As a test components were chosen dimethyl sulfoxide (DMSO) and sodium dodecyl sulfate (SDS). DMSO is one of main component of cell medium during the freezing [2]. SDS is an effective agent for tissue decellularization for the production of cell-free scaffolds [3]. A quantitative assessment of the cytotoxicity associated with these substances was performed using MTT assay [4].

It was found that DMSO has a suppressive effect on the cell growth after increasing the concentration in the medium above 2,5 % and induces suppression of cell viability at a concentration of 10 % in the medium by almost 50 %. In turn, SDS demonstrates a pronounced cytotoxic effect. With increasing concentration of this compound in the medium to 0,1 % was observed intensive cell lysis and decreasing of metabolic activity of MSCs to zero. At the same time, the concentration causing a 50 % reduction in cell viability was 0,012 %.

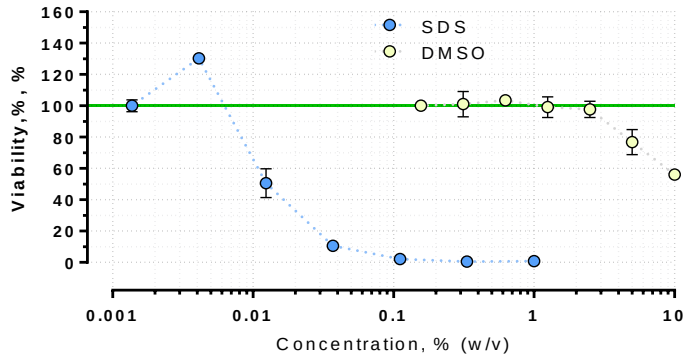

Figure 1 – The cytotoxic effect of DMSO and SDS on hMSC culture

Thus, according to the data obtained using the MTT assay indicated that the substances under study have a negative effect on human MSCs. Consequently, DMSO shows the *cell-damaging effect* in concentrations similar to those used for cryopreservation. It is points to the need for minimizing the time of action and the concentration of the cryopreservatives during defrosting procedures. For example, by diluting the contents of the vial with the cell culture with a higher volume of culture medium immediately after defrosting. Furthermore, it is necessary to minimize the DMSO content in the medium after completion of the cultivation process of MSCs.

As for SDS, it also shows a cytotoxic effect on MSC culture and even low concentrations of this substance leads to cell death. So using SDS in tissue decellularization processes for the production of cell-free scaffolds requires careful monitoring of residual concentrations.

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PREGNANCY IN WOMEN AFTER ASSISTED REPRODUCTIVE TECHNOLOGIES

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During the study, the course and outcomes of pregnancy as a result of IVF were analyzed. The causes and factors of infertility are considered. The comparative characteristic of the health state of children born as a result of the use of IVF children and natural childbirth is given.

Keywords: assisted reproductive technologies, infertility, in vitro fertilization, multiple pregnancy

One of the most important and relevant aspects of family planning is the treatment of infertility, which makes it possible to have coveted children.

According to the definition of WHO (1986), marriage is considered sterile, in which a woman does not develop a pregnancy in a single year with a regular sexual life without using contraception, provided that the spouses are of childbearing age. WHO data suggests that infertility has a greater impact on demographic indicators than miscarriage and perinatal pathology combined [1].

Today in Belarus there are about 10 thousand women and 2 thousand men suffering from infertility. Because of health problems, about 14 percent of couples can not have children. The chance to become parents is given by modern medical technologies, and in particular, the method of in vitro fertilization. In the Republic of Belarus, about 1,500–1700 IVF are performed every year, 500–700 of which end in childbirth. In total, more than 5,000 children were born in Belarus with the help of this method [2].

The aim of the study was to investigate the features of the course and outcome of pregnancy in women after using assisted reproductive technologies.

Materials and methods of the research

A retrospective analysis of medical records of 35 women was made to conduct this research. All of the women were divided into 2 groups:

The first group consisted of women with infertility, whose pregnancy was the result of in vitro fertilization (n = 20). The second group included women who had a natural pregnancy (control), (n = 15).

Results

The main contingent of the IVF program are women aged 31–35 with a duration of infertility from 1 to 5 years.

The causes of infertility in women of the IVF group were: endometriosis (30 %); endocrine pathology (15 %), tubal peritoneal factor (15 %), male factor (20 %), combined factor (15 %).

When studying obstetric-gynecological history of women of the IVF group, it was found that 80 % of women had a complicated course of pregnancy (anemia, infectious and inflammatory diseases of the reproductive system).

When analyzing pregnancy outcomes in women of the IVF group, it was found that 52 % of children were born from a multiple pregnancy of them 44 % with prematurity of varying degrees. In 90 % of cases, cesarean section was used as a delivery in connection with multiple pregnancies and a complicated course of the perinatal period.

Comparative analysis of newborns of the IVF group and newborns of the control group revealed that in 81,4 % of the children of the IVF the Apgar score was 8/9, while in the control group, the index was 100 %.

In 11,12 % of the children in the main group, the Apgar score was lower than 6, the children were transferred to IVL on 5 minutes, which was associated with hypoxic CNS damage in the ante- and intranatal periods.

The increased risk of possible complications in children born after the application of IVF is primarily a consequence of pathology in the parents that caused infertility.

Thus, pregnant patients of the IVF program constitute a high-risk group for miscarriage, development of preeclampsia and placental insufficiency.

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ANEMIES IN CHILDREN FROM 0 TO 3 YEARS

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The article shows the prevalence of anemia among children, based on the example of Soligorsk.

Keywords: children's population, anemia incidence, ecological causes.

In the Republic of Belarus, diseases of the respiratory system, trauma, skin and subcutaneous tissue diseases, diseases of the digestive system, as well as infectious and parasitic diseases take the leading place in the structure of the primary incidence of children. At the same time, the fact that, according to the National Statistical Committee of the Republic of Belarus, an increase in cases of diseases of various kinds of anemia is also important.

To improve the health of the younger generation, it is necessary to take active measures on the part of the state, health authorities and institutions: to increase the effectiveness of providing medical care to children, and to develop preventive programs aimed at reducing the incidence [1].

According to statistical data of the Ministry of Health of the Republic of Belarus, registered cases of anemia in children in 2016 were found to be 2566,9 per 10000 population [2]. This indicator in 2015 has increased sufficiently in comparison with previous years. Over the past three years, the incidence rate in children under 14 years of age has been recorded at a high level. In 2016, the total incidence of children under 14 years of age increased by 7,8 % compared with 2015 [2].

The study of the incest rates of various types of anemia in children aged 0 to 3 years in Soligorsk was carried out by means of an analysis of the reports on the number of cases in the Soligorsk Central District Hospital.

The results of our study allowed us to draw the following conclusions:

1. Morbidity of the child population of the Republic of Belarus in the period from 2012 to 2016. has a significant increase: the total incidence of children increased by 32 %, primary incidence – by 45 %. On the city of Soligorsk these indicators, on the contrary, tend to decrease, but the number of children standing on dispensary records increases.

2. The deteriorating state of children's health is based on a whole range of medical, socio-economic, environmental causes.

3. The total incidence of anemia in the children's population (aged 0–3 years) in Soligorsk as of 2016 was 312 cases per 1000 inhabitants, which is several times less than in 2015 (412 cases) and higher than in 2010 (300 cases).

4. Among the various types of anemia, predominant are iron deficiency anemia, the lowest in number of cases – anemia of a mixed type.

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ENGINEERING OF BACTERIAL STRAIN PRODUCING FUSION PROTEIN

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As a result of the study, a new recombinant strain *Escherichia coli* AA17, producer of chimeric protein consisting of human annexin A5 (AA5) and bacterial adenosine deaminase (ADase) was constructed. 18 mg of purified protein was recovered from 1 liter of cultural liquid. The protein content was about 7 % of the total cellular proteins

determined using electrophoretic analysis in polyacrylamide gel. The chimeric protein is planned to be studied as a promising antitumor agent.

Keywords: fusion protein, human annexin A5, adenosine deaminase, *Escherichia coli*, promising antitumor agent.

It is known that phosphatidylserine (PS) can serve as a marker on the surface of a cancer cell, which makes it possible to distinguish it from normal cells and to carry out, if necessary, targeted delivery of various pharmacological agents to the tumor [1]. To realize the delivery of the pharmaceutical substance into the tumor, a molecular transporter capable to recognize the PS on the surface of the cancer cell is essential. Human AA5 can act as such conveyor, binding with high affinity mainly to PS [2]. AA5 can be cross-linked with anti-tumor proteins or enzymes to deliver them to the tumor.

Sufficient experimental findings collected to date allow to state that one of the key factors responsible for the formation of tumor microenvironment repressing anticancer immune response is accumulation of extracellular adenosine [2]. In our opinion, it is possible to eliminate adenosine (protecting the tumor from host immunity) with the aid of a chimeric protein containing ADase and AA5 domains. The resulting chimeric protein introduced into the body of patients suffering from cancer diseases will bind with tumor cells and decompose adenosine protecting these cells from immune response.

This study was aimed at engineering of *E. coli* strain producing protein made up by human AA5 and ADase.

At the first stage of the research, the genetic construction of the vector was accomplished by inserting the AA5 and ADase genes into the plasmid. The resulting plasmid was transfered into *E. coli* BL21 (DE3) cells and bacterial biomass was obtained.

At the second stage, the chimeric protein was isolated and purified from cell biomass by affinity chromatography on Ni^{2+}-NTA resin.

At the third stage, ADase activity was determined *via* the rate of adenosine transformation into inosine.

As a result of the study, a new recombinant strain *E. coli* AA17 was constructed as a source of chimeric protein of the above-mentioned structure with molecular weight of 73,8 kDa, which corresponds to the theoretically calculated value. At the same time, 18 mg of purified protein was produced from 1 liter of cultural liquid. The protein content was about 7 % of the total cellular proteins determined using electrophoretic analysis in polyacrylamide gel.

Summing up, the bacterial strain producing chimeric protein consisting of human annexin A5 and bacterial adenosine deaminase was designed by recombinant DNA technology. Such protein has to "pull out a brake" from the human antitumor immunity and can serve as a highly effective drug for therapy of a wide range of oncologic diseases.

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ANALYSIS OF MORBIDITY OF THE POPULATION OF THE REPUBLIC OF BELARUS FROM ALCOHOLISM IN 1995-2015

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Excessive alcohol consumption in most cases is a major cause of serious diseases and social problems. The problem of alcoholism significantly affects the health and the welfare of the population. Due to high levels of alcohol consumption in the Republic of Belarus is carried out to search for new measures to prevent alcoholism.

Keywords: alcoholism, diseases, analysis, tendencies.

Today the problem of alcoholism remains relevant both in the Republic of Belarus and throughout the world. Excessive consumption of alcohol in most cases is one of the main causes of serious diseases and social problems. Republic of Belarus refers to countries with a high level of alcohol consumption and problems of alcoholism.

The purpose of the work is to analyze the incidence of alcoholism in the population of Belarus in 1995–2015.

The subject of the study is the data on the incidence of alcoholism among the population of the Republic of Belarus in 1995–2015. In the work, a retrospective analysis of morbidity indicators was carried out, dynamics was analyzed and main trends were determined. The statistical processing of the obtained data and the graphical construction of the diagrams were completed using statistical packages of the application programs Statistica and Microsoft Excel 2010.

There is an annual increase in the primary incidence of alcoholism from 1995 to 2006, when the maximum number of newly diagnosed cases of alcoholism was recorded. Since 2007, there has been a decrease in the number of patients with a first-time diagnosis of alcoholism, but the level at the end of the study period remains higher than at the beginning.

In the structure of the incidence of alcoholism, about 70 % of the cases are men. Over the past few years there has been a slight decrease in the proportion of the female population in the overall pattern of morbidity.

To identify territorial differences, a comparative analysis of the incidence of alcoholism in the regions of the Republic of Belarus was conducted. The highest incidence of alcoholism in 2015 is noted in Grodno region.

Nowadays, we can observe a marked tendency to reduce the incidence of alcoholism (which is more pronounced in the last decade). This may be due to the influence of external socio-economic factors and the implementation of preventive and recreational activities aimed at reducing alcohol consumption and promoting healthy lifestyle.

EPIDEMIOLOGICAL ASPECTS OF DONORSHIP. SAFE BLOOD TRANSFUSION IN THE REPUBLIC OF BELARUS

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Literary sources on the epidemiological aspects of donorship and safe blood transfusion in the Republic of Belarus were analyzed and studied in this work. Current data on the role of donorship, blood and its components, as well as the risk of disease of recipients is presented. Particular attention is paid to the issues of arthropod-borne infections Positive changes in donors who donate blood on a regular basis were identified.

Keywords: blood, blood transfusion, blood components, donorship, arthropod-borne, isesorology of blood, blood groups.

While the research, the characteristics of blood donorship and its components in the epidemiological aspect in the world and in the Republic of Belarus were studied, the ways to improve the efficiency and safety of donorship in the Republic of Belarus were identified.

Transfusion of blood components is an integral part of high-tech and specialized medical care in multi-purpose hospitals.

The current stage of the development and advancement of medical technologies is characterized by the increase in demand of medical and preventive institutions in the donor blood and its components. In the Republic of Belarus, complex high-tech surgeries have been performed more often, which requires the use of a large number of transfusion facilities. Introduction of modern methods of treatment (transplantation of liver, heart, kidney, bone marrow, high-dosage chemotherapy, coronary artery bypass grafting, etc.) changes the nature of transfusiological care for patients. Thus, donorship of blood and its components is one of the most important and basic factors for the development of high-tech medical care.

Improvement of approaches to donor organizations is becoming especially important. Introduction and development of modern methods of donorship activation search for new approaches to participation in activities to attract donor personnel and improve the level of infection security of the blood and its components are the task of prime importance of the development of transfusion medicine all over the world.

Donorship is intended to ensure the development and effective functioning of many branches of clinical medicine. As far as with the development of medical technologies, the need for donor blood and its components increases, insofar emerges the necessity to improve the approaches to donorship organization as well as when making managerial decisions in the work of the blood service. It is donors who are the main and most valuable resource of blood service. This means that working with them is just as compulsory as the solution of donor-related technological issues or the training of transfusion physicians.

In the course of the work:

1) The literature on the problem of blood donorship and its components in the world and in the Republic of Belarus was successfully analyzed. Also, the socioeconomic and medical significance of the institution of donorship were defined.

2) Blood groups, products from donor blood, aspects of their production and application, a range of problems which can be solved with the help of donor blood and products based on it were described.

3) Biological risks of donorship (blood-borne infections, post-transfusion reactions and complications in recipients, etc.) and ways of their diagnosis, as well as a decrease in occurrence, were characterized.

4) The data on the physiological changes in regular donors was given. Positive factors of donorshipwere also noted.

5) Risk groups and ways of risk reduction were identified in connection with donorship and use of blood and its products at all stages in different contingents.

Thus, transfusion medicine is inherently a multidisciplinary science: not only medical, biochemical, pharmaceutical, bioengineering, but also social issues, which illustrate the relationship between people, and also affect the interests of our entire society.

INCIDENCE OF CEREBRAL PALSY IN SOLIGORSK DISTRICT

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The object of research of this article are data on the children's neurological morbidity in the Soligorsk region for 2013–2015. For the research work was carried out with the journals of hospitalization of patients and selectively with the history of the disease of the neurological department of the Soligorsk CRH. Data on patients of children who are registered with a neurologist with cerebral palsy are analyzed. Comparative analysis of the incidence of cerebral palsy in Soligorsk and in the Republic of Belarus as a whole showed no significant differences in the quantitative indicators and in the dynamics of changes in morbidity.

Keywords: cerebral palsy, morbidity, age structure, neurological department.

One of the main problems of our time is the problem of infantile cerebral palsy. Children's cerebral palsy is a complex disease of the central nervous system, leading not only to motor disorders, but also causing delay or pathology of mental development, speech insufficiency, hearing and vision impairment, etc. The severity of disability in 20–35 % of patients is so significant, that they do not serve themselves, do not move, are uneducable. The problem of infantile cerebral palsy was the most urgent in recent decades, as the disease began to occur more often. The importance of the problem of cerebral palsy is also determined by the social significance of the disease, which entails severe disability.

The purpose of the work – the study of the incidence of cerebral palsy in children 0–17 years old in Soligorsk and the Soligorsk district. The paper presents an analysis of the structure of the incidence of infantile cerebral palsy by the example of the Soligorsk CRH for 2013–2015, the age structure of children with cerebral palsy of the neurological department in the period 2015–01.01.2016.

In the city of Soligorsk and Soligorsk district as of 01.01.2015, 26566 children live from 0 to 17 years inclusive. On the account of the neurologist is 275 people, incl. up to a year – 18. Diagnosis of cerebral palsy in the region of 63 children and adolescents (68 % of the number of children with disabilities with neurological diseases).

The leading form of cerebral palsy in Soligorsk district for the period 2013–2015 is double hemiplegia, which is 34 % of the total number of cases (for the period of 2015). Then there is a spastic diplegia – 28 % of the total number of cases. The hemiparetic and atonic-astatic forms of cerebral palsy are 26 % and 12 % inclusive.

Children from 1 to 15 years make up the majority of the total number of cases: 87 % as of 01.01.2016.

In 2014, 2015, all children with disabilities with neurological diseases, including cerebral palsy, underwent a course of rehabilitation every year, while 87 % of the patients experienced improvement in their health status.

ANALYSIS OF SCREENING RESEARCH OF DISEASES OF THE GASTROINTESTINAL TRACT IN THE REPUBLIC OF BELARUS

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The object of the study is diseases of the stomach and intestines. The work purpose is analysis of screening studies of diseases of the gastrointestinal tract in the Republic of Belarus.

During the work it was found that precancerous diseases of various organs of the gastrointestinal tract can be acute and chronic inflammation, functional changes, and erosion. Presents screening program of endoscopic studies has proved effectiveness not only in detecting malignant diseases. It demonstrated high effectiveness of the principle of very endoscopic studies.

Keywords: screening, diseases of the gastrointestinal tract, esophagus, stomach, duodenum, colon

Screening is the practice of mass population screening with the goal of early detection of widespread among the population and socially significant diseases. The fundamental principle of screening the program is early detection of diseases with the aim of prescribing timely and radical therapy. This method was developed in 1968 by the World Health Organization as a methodological guide to the early diagnosis of diseases and especially life-threatening people (tumors, cholelithiasis, peptic ulcer and duodenal ulcer, etc.).

However, simple registration of statistical indicators, without assessing their quality, does not allow making appropriate decisions, moreover, for this, analysis of the received statistical data is necessary, while analytical methods of statistics are the most difficult in medicine and their use is based on principles and methods scientific evidence with a clear view of their capabilities and limitations.

One of the promising measures of screening examination is mass endoscopic diagnostics. Endoscopic research is difficult to evaluate as screening, based on the definition of World Health Organization, because they are very expensive, they put high demands on the quality of equipment and its processing, qualification of specialists, which limits their mass use in small offices and endoscopy departments.

In connection with the foregoing, the purpose of this work is to analyze the screening of the gastrointestinal tract in the State Institution "Republican Clinical Medical Center" (Minsk).

Based on the data of the population study conducted among the adult population of the State Institution «Republican Clinical Medical Center» of the Republic of Belarus, the features of the currently existing screening models for the detection of diseases of the stomach and intestine are considered.

Evaluation of the screening study was carried out using the criterion of validity of diagnosis sensitivity.

In the work for the period from 2012 to 2016 a screening survey of residents of the Republic of Belarus was analyzed (95 % in Minsk). The purpose of his conduct was to identify people with diseases of the gastrointestinal tract (GI tract).

Analyzing the results of a screening study of the esophagus in the examinees, it was found that among the pathologies of this organ, functional changes, chronic inflammatory processes and erosion. Also in the dynamics it is established that in comparison with 2012 in 2016 the incidence rate of chronic inflammatory processes decreased significantly, a similar situation for functional changes.

When assessing the results of the examination of the stomach, it was found that among the pathologies of the stomach the most widespread chronic inflammatory processes and erosion. As in the case of diseases of the esophagus, the frequency of occurrence of erosion increases. The most common diseases for the duodenum are functional changes, chronic inflammation and erosion. For the colon is characterized by a high incidence of such pathologies as polyps, and tracing the dynamics from 2012 to 2016gg. It can be noted that the amount of the revealed pathology tends to constant growth.

In the course of the screening study, malignant formations of the entire studied GI tract. Taking into account the received results, the endoscopic screening program seems to be an effective and real way to detect malignant neoplasms.

INFLUENCE OF BLOOD IRRADIATION BY A HELIUM-NEON LASER ON ITS CELLULAR AND BIOCHEMICAL INDICATORS

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Blood parameters are one of the most striking reflections of the general state of the body. Influencing them in patients with a violation of their normal ratio can achieve a significant therapeutic effect. In general, this is done by chemical preparations that can have side effects or individual intolerance in the patient. Therefore, as an alternative, you can choose another method of action - low-intensity laser therapy. Currently, the most popular for this purpose, a helium neon laser through low cost and optimal performance. Its main targets are proteins involved in energy metabolism of cells and iron metabolism. This makes it possible to use it to normalize the operation of these systems, which in turn will affect the general condition of the human and contribute to his recovery.

Keywords: cellular blood indices, biochemical blood indices, low-intensity laser therapy, helium neon laser.

Blood parameters are one of the most striking reflections of the general state of the body. This is determined by the fact that blood is a liquid tissue that provides transport of nutrients, oxygen and metabolic products between all cells of the body, which is its main function. In addition to this function, it performs other, equally important, such as immunological, regenerative, signaling and many others. In accordance with its functions, the blood has several different indicators, which are conventionally divided into 2 large groups: cellular and biochemical. Biochemical parameters of blood include such indicators as total protein, albumin, urea, creatinine, cholesterol, bilirubin, glucose, ions and pH. Among the cellular blood indicators the most informative are leukocytes, neutrophils, lymphocytes, monocytes, eosinophils, erythrocytes, hemoglobin, thrombocytes, ESR.

Influencing these indicators in patients with a violation of their normal ratio can achieve significant therapeutic effect. In most cases, this effect is carried out by chemical preparations that can have side effects or individual intolerance in the patient. Therefore, as an alternative, you can choose a more neutral way of action - using low-intensity laser therapy. It is performed by laser devices that emit light in the red and infrared ranges, causing the effect of photobiological biostimulation in the blood. Irradiation leads to various events: acceleration of wound healing, anesthesia, reducing inflammation, etc. The mechanism of action is assumed by means of the action of laser light on chromophores capable of absorbing light of a certain wavelength. Photobiological biostimulation can be caused both by direct absorption of energy by chromophores with subsequent improvement of the system's operation dependent on the state of the chromophore, and by subsequent reactions, for example, the effect of the laser is capable of expanding the vessels in this way. Currently, there are two main ways of affecting the blood by the laser, which are used in medical practice: percutaneous laser irradiation of blood (PLIB) and intravenous laser irradiation of blood (ILIB). Both methods have their merits and demerits, of which the main ones are the loss of radiation energy during irradiation and invasiveness. Loss of energy is the main disadvantage of PLIB, since irradiation occurs through the skin, which absorbs most of the energy, but this method is non-invasive, thus being absolutely safe. ILIB on the contrary, is invasive, which gives some contraindications for its conduct, such as low blood pressure, but its main advantage is the practically absent loss of irradiation energy.

Currently, helium neon laser with a wavelength of 632,8 nm has gained the most popularity in clinical practice. This laser has become popular due to its low cost and optimal characteristics, which are excellent for irradiating blood. However, other lasers such as gallium arsenide laser ($\lambda = 904$ nm) and ruby laser ($\lambda = 694$ nm) are also used in therapy, but they have not gained such popularity. According to the wavelength of the helium of the neon laser, it has specific chromophores, which are the main absorbers of its energy. The main cellular chromophores are hemoglobin in erythrocytes and mitochondrial cytochrome c-oxidase, which absorb in the red range, respectively, the target of light-cells that have them in their composition. The main biochemical targets: bilirubin, iron ions, ferritin and hemoglobin. The remaining biochemical parameters can change under the influence of lasers after physico-chemical reactions and enzymatic cascades induced by the energy of absorbed light. Thus, it can be noted that the main targets are proteins involved in energy metabolism of cells and iron metabolism. This enables the use of helium neon laser to accelerate the energy metabolism in the cells and normalize iron metabolism, which in turn will affect the general condition of the person and contribute to his recovery.

ANTIOXIDANT ACTIVITY OF HEXAHYDROQUINOLONES

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Comparative characteristics of the antioxidant properties of five different structures held hexahydroquinolones conducted. The dependence of the fluorescence intensity of fluorescein from the logarithm of the concentration of hexahydroquinolones, of which graphically determined indicators IC_{50}.

Keywords: antioxidant activity, hexahydroquinolones, fluorescein.

The development of chemistry of non-aromatic nitrogen-containing heterocycles is essential to generate analogues of natural compounds with specific biological activity and play a unique role in living systems. Nitrogen-containing heterocycles are one of the main classes of compounds used for research and selection of new drugs with a wide range of physiological activity. Among the compounds of the hexahydroquinolones class, substances showing cardiovascular, hepatoprotective, antioxidant, antidiabetic, antiulcer, antituberculosis, antibacterial, antiviral activity have been found [1].

In the present work, a comparative characteristic of the antioxidant properties of 5 hexahydroquinolones of different structure was made: 2,7,7-trimethyl-4-propyl-3-carboethoxy-hexahydroquinolone-5 (HQ I), 2,7,7-trimethyl-4-benzyl-3-carboethoxy-hexahydroquinolone-5 (HQ II), 2,7,7-trimethyl-4-(2'-methoxyphenyl)-3-carboethoxy-hexahydroquinolone-5 (HQ III), 2,7,7-trimethyl-4-(3', 4'-dimethoxyphenyl)-3-carboethoxy-hexahydroquinolone-5 (HQ IV), 2-methyl-4-(2'-methoxyphenyl)-3,6-dicarboethoxy-7-(2'-thioethylpropyl)-hexahydroquinolone-5 (HQ V).

The method for determining the antioxidant activity (AOA) relative to the active forms of oxygen (AFO) is based on measuring the fluorescence intensity of oxidizable compounds and its decrease under the influence of the AFO. In the present work for the detection of free radicals used a fluorescein. The generation of free radicals was carried out using Fenton system, which produces hydroxyl radicals by the interaction of iron complex (Fe^{2+}) with ethylenediaminetetraacetic acid (EDTA) and hydrogen peroxide [2; 3].

The study of inhibition of reactions of the free radicals generated in the Fenton system the obtained dependences of the fluorescence intensity of fluorescein from the logarithm of concentration of all samples hexahydroquinoline. Studies were carried out in a wide range of concentrations of 10^{-12}–10^{-3} M. Depending on the structure, hexahydroquinolones began to show AOA in the concentration range of 10^{-12}–10^{-8} M. Subsequent increase in the concentration hexahydroquinoline an increase in the suppression of free radicals and the increase of fluorescence of fluorescein. The test samples restored the fluorescein fluorescence to 76–94 % (A_{max}) at the concentration of 10^{-4} M (Table 1). Graphically, IC_{50} values were determined - the concentration of hexahydroquinolones, at which 50 % of free radical inhibition is achieved. These indicators varied in the range 0,32–5,5·10^{-7} M (Table 1).

Table 1

Indicators of antioxidant activity of hexahydroquinolones.

Sample name	A_{max}, %	C_{max}, M	$IC_{50}\cdot10^{-7}$, M
HQ IV	94	10^{-4}	0,32
HQ V	82	10^{-4}	1,62
HQ III	76	10^{-4}	4,17
HQ I	92	10^{-4}	4,22
HQ II	93	10^{-4}	5,5

Evaluating indicators of A_{max} and IC_{50} can be concluded about hexahydroquinoline high inhibitory abilities against free radicals. A comparative study of the antioxidant activity of hexahydroquinolones of five different structures showed that AOA depends on the presence of ester groups, such as methoxy groups and carboethoxy groups, in the structure of these compounds, as well as their number and location relative to each other.

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THE IDENTIFICATION OF MUTATIONS IN THE GENES BRCA1 (185DELAG) AND BRCA2 (6174DELT) ON THE DEVELOPMENT OF PANCREATIC CANCER

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In the course of work, a study was conducted in the presence of mutations in the genes BRCA1(185delAG), BRCA2(6174delT) in patients suffering from pancreatic cancer.

Keywords: pancreatic cancer, mutation, expression, heterozygotes, BRCA1, BRCA2.

According to the WHO 2012 pancreatic cancer is the 10th highest incidence and the 4th place in the 5-year survival rate in the world [1]. In Belarus died more than 700 people in 2010, and according to the 2012 – 809 [2]. Diagnosis of pancreatic cancer is difficult operation. The disease has no specific symptoms in the early stages.Patients seek treatment at stage 3 or 4 when the tumor is large or metastatic.On the development of this disease affected gene mutations: BRCA1 (a factor of the development hereditary forms of pancreatic cancer, is involved in DNA repair); BRCA2 (increase to developtumor at earlier age, is involved in maintaining genetic stability of an organism) [3].

Materials and methods.Molecular genetic identification of mutations in the genes BRCA1,2 was carried out using reagents PRONTO (Israel) by PCR (BstNI (REMS-PCR)) and ELISA(Assay Solution). The study includes the following steps: 1) DNA extraction ((QJamp DNA Blood Mini Kit Qiagen (Germany)); 2) amplification; 3) postunification; 4) amplification with primers; 5) enzyme-linked immunosorbent assay.

Results. During the work were studied the clinical data of 19 patients suffering from pancreatic cancer and were treated at the State institution "Republican scientific and practical center of Oncology and medical radiology N. N. Alexandrov". Among patients revealed that cancer of the pancreatic head is found in 73,68 % in the body is 15,79 % and the tail is of 10,53 %. The average age of patients with cancer of the pancreas – 59±3,12 years.

During the work was the molecular-genetic study of patients with pancreatic cancer the presence of mutations in a heterozygotes (185delAG, and 6174delT) genes BRCA1,2. The analysis of the obtained data, it was found that 10 % of patients have a mutation in the gene BRCA1 (185delAG) in geterozigotes. And 5 % of the patients were identified mutation in the BRCA2 gene (6174delT).The age of patients with a mutation in the BRCA1 gene is 56±10,99 years and, in BRCA2 – 43. The average age of patients without mutations 60,38±3,403 years. The prevalence of the disease: stage 1A – 5,26 %; stage 2A – 31,58 %; 2B, stage – 31,58 %; stage 3 – 5,26 %; stage 4 is 15,79 %; 10,52 % of indefinable.

Thus, based on these data, it was found that all patients with detection of mutations in the genes BRCA1,2, the disease was at stage 2B. This indicates the presence of metastases in regional lymph nodes. Based on the data, it can be assumed that the mutation in the BRCA2 gene is a risk of developing pancreatic cancer at an early age. To establish the effect of mutations in the BRCA1 gene failed due to the small difference in age between the patients diagnosed with the mutation and without it.

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INFECTIOUS AND CLINICAL LABORATORY MARKERS IN CHILDREN WITH DIFFERENT FORMS OF RHEUMATOID ARTHRITIS

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Potential biomarkers of the diagnostic forms of the JRA course can be the specific amount of leukocytes and neutrophils, as well as the calcium and glucose concentration in the synovial fluid, which can be used for early diagnosis of the disease.

Keywords: Juvenile rheumatoid arthritis, oligoarthritis, monoarthritis, synovial fluid, blood, clinical laboratory markers, infectious markers.

Juvenile rheumatoid arthritis (JRA) refers to autoimmune diseases; hereditary, genetic and environmental factors are involved in its development. While some of the rheumatic diseases are associated with infections, the etiological significance of the infection is assumed for JRA, but it has not yet been proven. Children with JRA have quite specific features that distinguish this disease from rheumatoid arthritis in adults. The aim of the work is to study infectious and clinical laboratory markers of various forms of juvenile rheumatoid arthritis.

Infectious and clinical diagnostic markers in synovial fluid and peripheral blood were studied in juvenile rheumatoid arthritis (n = 46) proceeding as mono- and oligoarthritis. In the process of work, a set of laboratory diagnostic tests such as ELISA, PCR, microbiological methods, immunodiagnostic tests of blood, complete blood count, and physicochemical, biochemical and cytological investigation of synovial fluid were used. Statistical analysis of the obtained data was carried out using nonparametric criteria using the program "Statistica 8.0".

In the blood serum of children with JRA, the presence of antibodies to infectious agents was identified: *Herpes viridae-1, 2* (57,1 %), *Epstein-Barr virus* (48,6 %), *Cytomegalovirus* (25,7 %), *Chlamidia psittacii* (42,8 %), and *Borrelia burdgorferii* (28,5 %) in the absence of DNA infectious agents in the synovial fluid, which indicates the trigger role of bacterial and viral pathogens in the pathogenesis of JRA.

With JRA, which proceeds as oligoarthritis, a tendency to leukocytosis is registered in the synovial fluid due to an increase in the relative amount of neutrophils ($p < 0,05$) including the ragocytes, and the presence of macrophages, in combination with an increase in the calcium concentration ($p < 0,05$) and glucose ($p < 0,05$), which indicates the pathogenetic role of calcium-binding proteins secreted by activated neutrophils and monocytes. Children with oligoarthritis are characterized by a decrease in platelet counts and a relative amount of basophils with an increased relative monocyte content compared to the same figures in the group of children with monoarthritis ($p < 0,05$).

In JRA that proceeds as a monoarthritis there is a statistically significant increase in the amount of leukocytes in the synovial fluid due to the expressed neutrophilia ($p < 0,01$), which may indicate the predominant role of Th17 cells in the pathogenesis of the disease.

Potential biomarkers of the diagnostic forms of the JRA course can be the specific amount of leukocytes and neutrophils, as well as the calcium and glucose concentration in the synovial fluid, which can be used for early diagnosis of the disease.

COMPARATIVE ANALYSIS OF MORTALITY OF PNEUMONIA IN CHILDREN OF MOLODECHENO DISTRICT

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The work considers the definition and classification; clinical features of pneumonia in children; diagnosis and treatment of this pathology. A practical study of the features of the course of pneumonia in children and a comparative analysis of the incidence of children in the Molodechno district.

Keywords: pneumonia, respiratory system.

Diseases of the respiratory organs occupy the first place in the structure of the general morbidity of children and adolescents, accounting for almost 50 % among children under 14 and about 30 % among adolescents. There is a tendency to increase the spread of respiratory diseases in recent years.

In the Republic of Belarus, the incidence of pneumonia is an average of 4 to 17 cases per 1,000 children. Children of early age are ill 2–3 times more often than teenagers.

The purpose of the survey was to study the features of pneumonia in children, as well as to conduct a comparative analysis of the morbidity in the Molodechno District in connection with the current trend towards an increase in the spread of respiratory diseases in recent years.

For pneumonia in children, there is a high probability of severe course and development of complications.

In the Republic of Belarus, pneumonia is diagnosed in about 15–20 cases per 1000 children of the first year of life, in 36–40 cases per 1000 children at preschool age, and at school and adolescence, the diagnosis of "pneumonia" is established in approximately 7–10 cases per 1000 children and adolescents.

The frequency of hospital pneumonia depends on the contingent and the age of the patients (up to 27 % of all cases of nosocomial infections) and is maximum in young children, especially in newborns and premature babies, as well as in children who underwent surgery, trauma, burns, etc.

The mortality from pneumonia (together with the flu) averages 13,1 per 100 000 population. Moreover, the highest mortality is observed in the first 4 years of life (30,4 per 100 000 population), the lowest (0,8 per 100 000 population) – at the age of 10–14 years.

The incidence is sporadic, but in rare cases, outbreaks can occur among children who are in the same team.

In total for the year of 2016, 563 cases of pneumonia in children were registered in Molodechno and Molodechno District. Of them, under the age of 1 year – 112 cases; from 1 year to 3 years – 127 cases; from 4 years to 5 years – 68 cases; from 6 years to 17 years – 256 cases.

In Molodechno and Molodechnorayons, there is a large incidence of pneumonia in children up to a year from the republican one – 20 % compared to 11 %, but a much lower incidence of children aged 4–5 years – 12 % compared to 34 %.

Since there is a high incidence of children under one year, a detailed study of neonatal pneumonia and the causes of their occurrence are relevant.

THE USE OF LASERS OF LOW INTENSITY IN DERMATOLOGY.LASEROUS REJUVENATION

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The paper describes the main indicators of laser therapy. The anatomical and physiological structure of the skin is considered to explain the effect of laser beams on its functional abilities; various types of lasers and their individual effect on the human skin; the changes in its functions and structure under the influence of low-intensity lasers are analyzed.

Keywords: cosmetology, lasers of low intensity, laser therapy, age changes of women's skin.

Low-intensity laser radiation (LLLI) is primarily used for laser therapy of skin diseases. The effect of LILS is the activation of cell membrane enzymes, the increase in the electrical charge of proteins and phospholipids, the stabilization of membrane and free lipids, the increase in oxyhemoglobin in the body, the activation of tissue respiration processes, the enhancement of cAMP synthesis, the stabilization of oxidative phosphorylation of lipids (reduction of free radical complexes).

There are some types of lasers used in dermatology:

1) Laser co2.2) Erbium laser

When NILI is exposed to biotissue the following main effects are observed:

1) Anti-inflammatory effect
2) Antioxidant effect
3) Anesthetic effect
4) Immunomodulating effect

To study the effect of low-intensity lasers in dermatology, a study was conducted.

Sixty women aged 20 to 55 years were examined.

The I group consisted of 10 women aged 45 to 55 years without significant pathologies that were exposed to LILS. The second group included 10 women aged 45 to 55 years without severe pathology, which was laser guided by GC Lasmic®.

The third group consisted of 10 women aged 45 to 55 years without severe pathology, which was carried out laser phaceresis of HA, which is part of the gel Hialurox.

The IV group included 10 women aged 45 to 55 years without pronounced pathologies, which was carried out laser phaceresis of the GK, which is part of the gel BYONIK-Hyaluronic Gel XOO.

After exposure to lasers, the following parameters were calculated: 1) Microcirculation index. 2) Relative volume of the erythrocyte fraction. 3) Saturation with oxygen of mixed blood. 4) The index of perfusion oxygen saturation in the skin microcorrosion

The received data prove the higher efficiency of the combined effect of low-intensity laser radiation and hyaluronic acid on the skin in comparison with the exposure to low-intensity laser radiation alone.

THE STATE OF NEWBORN CHILDREN FROM MOTHERS WITH ENDOCRINE PATHOLOGY

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The nature of the course of pregnancy and childbirth in various types of thyroid pathology in the mother was studied. It was found that newborn children from mothers with thyroid pathology had a violation of the postnatal adaptation period and pathological condition in the neonatal period.

Keywords: pregnancy, childbirth, health, thyroid gland, hormones.

Despite significant achievements in solving the problem of endocrinopathies, thyroid gland diseases still occupy one of the dominant places in the world. The pathology of the thyroid gland is found 10–17 times more often among the female population. One of the factors in the development of pathology is pregnancy itself.

In the structure of the endocrine pathology of Minsk, the pathology of the thyroid gland takes the second place and is 35 % among endocrine diseases.

According to studies conducted by the Endocrinology Research Center of the Russian Academy of Medical Sciences together with WHO and the International Council for the Control of iodine Deficiency Diseases, the prevalence of endemic goiter in the central part of Belarus is 15–25 %, and in some regions reaches 40 % [1].

The most common are pathological processes in the thyroid gland, which can cause disturbances in the reproductive system, including infertility, impaired gestation, as well as pathological effects on the fetus [1].

In addition, pregnancy itself causes changes in the functioning of the thyroid gland, and under certain conditions acquire a pathological course.

For normal intrauterine development of the fetus throughout the entire pregnancy and especially in the early stages of embryogenesis, an optimal amount of thyroid hormones in the maternal organism is needed [2].

It is established that thyroid disease has an adverse effect on fetal development and the condition of the newborn. Newborns are at the same time a high risk group for perinatal morbidity.

The pathology of the thyroid gland complicates the course of pregnancy and childbirth and is accompanied by the development of the threat of interruption, preeclampsia, premature birth, anomalies of labor.

At the same time, adequate and timely correction of various pathological conditions of the thyroid gland in most cases enables the normal functioning of the reproductive system of a woman and the possibility of pregnancy with minimal risks of fetal pathology.

Medical records of children from mothers with endocrine pathology (n = 10, main group), and medical records of children without endocrine pathology (n = 9, control) were analyzed to conduct their own research and evaluate the health indicators of children born to mothers with endocrine pathology. .

The study found that most women with endocrine pathology had a history of gynecological complications (colpitis (50 %), chlamydia (40 %), ureaplasmosis (70 %), thrush (80 %). In 96 % of cases, pregnancy occurred against the background of gestosis (80 %) and the threat of interruption (50 %).

In newborn children from mothers with pathology of the thyroid gland, there was a violation of the postnatal adaptation period and pathological condition in the neonatal period (cerebral ischemia-90 %, intrauterine hypoxia-90 %, transient metabolic disorders-80 %, neonatal jaundice-30 %).

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EVALUATION OF THE LEVEL OF HEALTH OF MEN OF MILITARY AGE IN THE REPUBLIC OF BELARUS

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The object of this study was to assess the health of men of military age. Health study of men of military age is primarily due to the factor of decrease of military resource of the country, which is a significant part of the working population, and provides defenses, labor, and economic and social welfare of the state and health of its future generations.

Based on the established medical commissions of the dynamics of the ratio of healthy and sick recruits developed a model for predicting the health of men of military age on population and individual levels and justifies preventive measures.

Keywords: health, the age of conscription, defense, health and social protection, moral, mental, physical health, factors, morbidity, medical examinations

Assessment of health status of youth of military age is an important public task in matters of recruitment of the armed forces.

The analysis of the situation shows that in the Republic of Belarus over the past quarter century, the incidence of persons of military age had more than doubled. About 40.0% of recruits on the level of their physical and mental development are not able to handle the loads arising during military service.

In recent years there has been a negative trend to an increase in the incidence of men of military age (over 5 years at 42,6 %) through reliable increase of therapeutic pathology declining not therapeutic. Disease with which the soldiers are recognized and successfully recruited into armed forces, usually requires the physician portion carrying dispensary observation with a view to preserving the health of such troops when passing them.

For the formation of a full-fledged military resource, first of all, it is necessary to provide medical and social protection of defenders themselves. Therefore, the urgency of the problem of staffing the armed forces of the Republic of Belarus healthy contingent is increasingly growing. Features of the health status of young conscripts will determine a further course of development of our State, but that State is free, that can defend them.

The aim of the study was to examine the nature of the pathology, with which soldiers were being recruited into the armed forces of the Republic of Belarus for fixed-term military service, as well as establishing community surveillance needs doctor parts to individuals.

The analysis was made of the findings of improper military garrison Medical Commission on 475 soldiers in January 2015 in 120 separate mechanized brigades (Uruchcha district). To determine the degree of fitness for military service, the Commission had been guided by normative and legal documents approved at the State level.

The studies included: a study of anthropometric characteristics, physical fitness, the adaptive capacity of the cardiovascular and respiratory systems, physical performance, study heart rate variability at rest and during physical activity, assessment of Psychophysiological characteristics, study of morbidity, social-hygienic status. To get data suitable for subsequent evaluation and comparison, anthropometric studies were standard tools being validated using a generally accepted method.

It was found that out to troops successfully without limitation was recognized only the fourth part.

Level of health to individuals from various regions of the country as a whole is comparable. The worst health conditions are different in Minsk and Vitebsk region. Personnel serving on an appeal, the most frequently observed diseases of the musculoskeletal system and connective tissue, followed by diseases of the circulatory system, organs of sight. Noteworthy that every tenth soldier is characterized by a low level nerve psychological stability. It can lead to difficulties in adapting to military service. Out to persons with pathology, allowing passing urgent service in the armed forces, clinical monitoring and conducting preventive treatment is subject to a third part.

FEATURES OF USE OF PSYCHOACTIVE SUBSTANCES IN VARIOUS AREAS OF THE REPUBLIC OF BELARUS

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The work shows that abuse of psychoactive substances in the Republic of Belarus is more prevalent among men than in women. There were significant regional differences in the number of registered drug users: the highest prevalence rates of consumption of psychoactive substances were observed in the city of Minsk and the Gomel region.

Keywords: drug substance, psychoactive substances, mental addiction, opium addiction, drug treatment, narcological situation.

In the Republic of Belarus, the abuse of narcotic and non-narcotic psychoactive substances is more prevalent among men than in women. Most of the men and women who were registered with the narcological facilities of the Ministry of Health of the Republic of Belarus used opium group drugs, mainly opium extracts. To a lesser extent, the use of illegal methadone, heroin and other opioids was common. In 2016, the proportion of opiate and opioid users among men was 65,8 %, among women – 79,2 %. The age range of people registered in narcological records of the Ministry of Health of the Republic of Belarus ranged from 9 to 72 years. However, the overwhelming majority of registered drug users in Belarus were between the ages of 20 and 39 years. Drug users of different ages differed in their preference for certain types of psychoactive substances. So, in younger age groups of registered users, consumers of inhalants, cannabis preparations, including smoking drugs containing synthetic cannabinoids, prevailed. njection of opium drugs is found only in drug users over 20 years of age, and the proportion of people who use these drugs increases with the age of the consumer of psychoactive substances.

In this way, for the four period (2012–2016) in the Republic of Belarus there was a moderate (by 36 %) increase in the prevalence of drug addiction. The significative "Prevalence of consumption of opiates" increased 1,4 times during this period. There is an increase in the prevalence of consumption of extraction opium, methadone, and also some synthetic opioids (tramadol, 3-methylfentanil, dextromethorphan). However, the number of registered heroin users shows a downward trend. The spread of selected opiates has pronounced regional characteristics. The largest number of consumers of this group of drugs is registered in the city of Minsk, Minsk region and Brest region. In the Vitebsk and Mogilev regions, only half of registered drug users use opiates and opioids. Consumers of extraction opium predominate in the Brest and Minsk regions, the least of which is registered in the Vitebsk and Mogilev regions. The largest number of people who use heroin and methadone, is registered in Minsk, Mogilev and Vitebsk regions. The least synthetic opioids are found in Grodno and Brest regions.

THE COMBINED EFFECT OF PHYSIOLOGICAL AND PHYSICAL FACTORS ON HOMEOSTASIS OF CALCIUM IONS IN THE CELLS OF THE IMMUNE SYSTEM

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The object of the study was the thymocytes of intact rats and the cells of rats after the influence of chronic γ-irradiation with the dose of 1 Gy. The measurement of cytoplasmic $[Ca^{2+}]_i$ in thymocytes was carried out by using the fluorescent probe Fura-2/AM. The exogenous dexamethazone was added to the suspension of the cells and analysis of above-mentioned parameters was carried out. The analysis of the change of the concentration of the intracellular calcium under the influence of dexamethazone showed an activated role of this physiological substance on the given parameter in the intact cells. The amplification of the effect of dexamethazone was marked after chronic irradiation with the dose of 1 Gy.

Keywords: thymocyte, cytoplasmic $[Ca^{2+}]_I$, chronic γ-irradiation, dexamethasone, Fura-2AM.

In the case of exposure to ionizing radiation stress mobilized implements systems, which regulators are primarily glucocorticoid hormones. These substances can be one of the possible causes of death of immune cells of

the body, i. e. apoptosis. However, the mechanism of launching and implementing glucocorticoid -induced apoptosis remains largely unclear. The effect of glucocorticoids on target cells is carried out mainly at the level of gene transcription regulation. There is also the evidence that the start-up phase of such cooperation is the formation of the complex with specific membrane hormone regulatory protein-receptor. In this case, an important role in modifying signal transmission inside the cell, apparently, can play a radiation-induced damage to the plasma membrane affecting its lipid and protein component.

Of particular interest there are studies indicating that calcium ions may play a role marker glucocorticoid – induced apoptosis of thymocytes and lymphoid cells. It is expected that the increase in intracellular calcium concentration in cytoplasm appears to be the only trigger Ca2 +-mediated cell death.

The aim of this work was to study the homeostasis of calcium ions in the midst of glucocorticoid -induced apoptosis of thymocytes in rats on the 30th day after exposure to chronic (exposure at a dose of 1. Experiments were conducted on thymocytes and irradiated rats. For the measurement of intracellular Ca2 + concentration ([Ca2 +] I) were using fluorescent probe Fura-2AM (Molecular Probes, SIGMA).

It was found that intracellular cytoplasmic Ca2 + ion concentration increases at the time of incubation with dexamethasone. The visible effect of GIBBERELLIC ACID on the levels of Ca2 + ions in the thymocytes occurs after 15 minutes of incubation with the above link (20 %). The most significant persistent increase in concentrations of [Sà2 +] I is approximately 1,5 times compared with controls; there is through incubation 1:00 with this product.

Preincubation for 1:00 suspension thymocytes control animals with dexamethasone resulted in an increase in the concentration of calcium ions in cytoplasmic cells approximately 2 times. However, on the 30th day after chronic exposure at a dose of 1 g in the cytoplasm of rat thymocytes declining concentrations of cytoplasmic calcium ions by almost 40 % compared with control cells irradiated suspensions interactions of animals with dexamethasone in the above conditions also caused an increase in the concentration of calcium ions in the cytoplasm. However, there was only 50 % from the original values.

The results obtained in this work seem to be able to provide further disclosure of important problems related to the breakdown of the molecular mechanisms of action of glucocorticoids in the cells of the immune system that may eventually help to address the issues of violation of adaptive systems of the body when exposed to ionizing radiation.

PSYCHOLOGICAL PECULIARITIES OF PREGNANT WOMEN

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The psychological profile of pregnant women suffering from arterial hypertension is characterized by a tendency to psychosomatic reactions, the expression of anxiety at the somatic level, disadaptative in the experiences of stressful situations. As a result of psychological testing, it was found that pregnant women with hypertension have a high level of anxiety and stress.

Keywords: pregnancy, arterial hypertension, psychological state, reactive anxiety, stress.

It is known, that even physiological pregnancy is influencing psychological state of women. Several authors consider pregnancy as crisis.

Arterial hypertension is one of the main reasons of complications as for mother and for fetus. These complications sometimes may be mortal.

Last investigations lead to conclusion, that many complications in pregnancy have psychosomatic origin. In addition, psychoemotional tension plays very important role in the development of psychosomatic disturbances.

The aim of research was to analyze the psychological state in pregnant women.

We tested 60 women: 20 pregnant women without arterial hypertension; 20 pregnant women with arterial hypertension being developed during pregnancy; 20 healthy women of fertile age (medical workers).

The psychological state was investigated with the help of Spilberger Trait Anxiety Inventory (trait and reactive anxiety) and with Holms and Ray stress scale.

Pregnant women with arterial hypertension had reactive anxiety level distinctly higher then healthy women from control group (45,7+1,3 and 38,0+1,7, $p < 0,001$). In addition, most of the pregnant women with arterial hypertension had high levels of reactive anxiety. None of them had low levels of reactive anxiety.

Pregnant women with arterial hypertension had in the most cases high levels of reactive anxiety (in 70 % of cases). Most of the pregnant women with arterial hypertension and healthy ones had middle levels of reactive anxiety (in 60 % of cases).

No difference in levels of trait anxiety between pregnant women without arterial hypertension and pregnant women with arterial hypertension was noticed (47,5+ 1,0 and 49,2+1,2). However, these levels are appraised as high.

Most of the women in all groups, even healthy ones, had high levels of trait anxiety (pregnant women without arterial hypertension and group with arterial hypertension 70 %; healthy women medical workers 60 %).

Stress level was highest in the group of pregnant women with arterial hypertension (221,1 +26,7). This level was distinctly higher, than in pregnant women without arterial hypertension (165,2+15,3, $p < 0,05$). It is interesting, that healthy women (medical workers) had higher stress level, then pregnant women with arterial hypertension (194,5+23,1).

The data of psychological examination indicated that pregnant women with arterial hypertension being developed during pregnancy have high levels of trait anxiety and stress. Therefore, they need psychological rehabilitation.

THE ANALYSIS OF THE EPIDEMIOLOGICAL ASPECTS OF ABORTION

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The methods of analyzing epidemiological aspects, the impact of various social factors that have changed the position of women, the issues of carrying out activities on the level of abortions are considered.

Keywords: reproductive system, abortion, fertile age, childbirth, contraception, epidemiological aspects of abortion.

The social transformations that took place in the world over the past decades significantly changed the position of the woman, contributed to the growth of her economic independence and psychological independence. According to the numerous studies, urbanization, industrialization, the increasing employment of women, creative attitudes to the career are in inverse correlation with the birth rate. Studies and a later onset of professional maturity often cause the desire to temporarily postpone the birth of a child with a positive attitude towards motherhood. In this respect, the tendency of conscious regulation of procreation is becoming more and more evident. However, a certain part of women uses the artificial termination of pregnancy for this purpose, and not to the prevention of it by modern reliable contraceptives.

The objective of the study is to conduct the analysis of the epidemiological aspects of abortion in the Republic of Belarus using quantitative methods of assessment,

The subject of the study was statistical reporting data on the number of abortions performed in the Republic of Belarus per 1,000 women of childbearing age as well as per 100 births.

The analysis of the statistical series by the method of the first-order parabolic curve graduation of the number of abortions per 100 births in the Republic of Belarus (1995–2016) made it possible to reveal the statistically significant tendency towards a decrease in the indicator over the period under analysis ($R2 = 0,93$, $A1 = (–8,9)$ %). A stable tendency to decrease the indicator for 1000 women of fertile age ($R2 = 0,89$, $A1 = (–3,0)$ %) was also identified. It was revealed that Grodno region has the lowest percentage in the number of abortions performed. Significant difference in the decreasing number of abortions performed in the Republic of Belarus in 2016 in comparison with 1995, calculated for 1000 women of fertile age ($t = 9.81$, $p < 0,01$) and for 100 births ($t = 5,7$, $p < 0,01$). There is a 6-fold decrease in the absolute number of abortions carried out in the Republic of Belarus at the end of the study period compared to the beginning. In all regions, as well as in the whole of the Republic of Belarus, there is a decline in the number of abortions per 100 women of childbearing age and per 100 births for the period from 2011 to 2016. The lowest number of abortions per 100 births in 2016 was registered in Minsk region, 13,8 %; the highest number was registered in Minsk – 33,1 %. The lowest number of abortions per 1000 women of childbearing age was also registered in Minsk region – 8,4 %, whereas the highest was in Gomel region – 17,9 %.

The formation of the young women's attitude to the family and childbearing, the improvement of the level of health habits and knowledge about the basic processes in the formation and functioning of the reproductive system not only among girls themselves but also among their parents and teachers are included in the list of priority social

measures in the Republic of Belarus. The activities held to reduce the level of abortions give effective results, which was confirmed by the quantitative analysis of the epidemiological aspects of abortion. The main efforts to prevent abortions should be directed to the implementation of family planning programs, to the counseling on contraception, as well as to the implementation of sexual education programmes, since this problem is socially significant and leading in terms of improving the demographic situation in the Republic of Belarus.

CHARACTERISTICS OF MORTALITY FROM EXTERNAL CAUSES OF THE REPUBLIC OF BELARUS

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In 2015, among all deaths of the population in Republic of Belarus, deaths from external causes took the third place. Alcoholism, drug addiction, traffic accidents, poisoning and drowning – these factors took away a huge amount of lives. Every year thousands of men, women and children of different age categories die for various reasons.

Keywords: mortality, external causes, analysis.

Death from unnatural causes is one of the most important problems of our time for most countries in the world. External causes of death include those causes that are not caused by illness, but by various external influences. They may be intentional (murder and suicide) or unintentional (accidents involving traffic or traffic caused by fire, drowning, poisoning, falling) have been isolated as damage with uncertain intentions.

In the course of the work, a retrospective analysis of the mortality rates of the population from external causes for the period 2005–2015 was conducted, the dynamics was analyzed and the main trends were determined. It should be noted that in the Republic of Belarus there is a favorable dynamics of a decrease in the relative weight of mortality from external causes among all causes of death.

The retrospective analysis of the population mortality of the Republic of Belarus from external causes for 2005–2015 was carried out from the point of view of mortality from external causes both for the population of the Republic of Belarus as a whole and separately for the adult and children population and showed that in all studied groups there is a tendency to decrease.

The mortality rates of men are statistically significant (p 0,001) higher than similar rates of female mortality. The mortality of the male population is four times higher than that of the female population. The average mortality of the rural population is higher than for the urban population ($p < 0,001$).

Among the external causes of death, the first place among all external causes is alcohol poisoning (15,6–19,3 %). In dynamics, the share of alcohol poisoning has generally decreased, but their share in total mortality from external causes remains significant, which is a sign of social unhappiness. The second leading cause of death from external causes is intentional self-harm, which contribution was 16,1 % (in 2011) to 19,6 % (in 2015). Moreover, the share of this cause in the structure of mortality from external causes is increasing. The third place is occupied by transport accidents (9,8–13,5 %), the fourth by drowning (4,8–9,2 %).

In the long-term dynamics of mortality, both for external reasons in general and for individual reasons, the tendency to decrease for the period 2005–2015 was observed. High productivity due to high mortality, not for any individual causes of death in this class, is an unreasonably high mortality rate from virtually all of its components: traffic accidents, suicides and murders, accidental poisoning, etc. It is significantly higher, than in developed countries, despite the positive dynamics.

STUDY OF FACTORS THAT HAVE A STIMULATING EFFECT ON GROWTH AND CAROTENOGENESIS IN YEAST *RHODOTORULA* GLUTINIS BIM Y-253

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Every year more and more attention is paid by science and various branches of the national economy, such as the chemical, food industry, cosmetology and pharmaceuticals to carotenoids, which require an increase in the potential sources of their production. Due to the fact that yeasts are able to synthesize a wide spectrum of carotenoids, and also have the ability to accumulate a sufficient amount of biomass in the process of fermentation and grow on cheap nutrient media, this group of eukaryotic microorganisms occupies strong positions in modern biotechnology, including the field of microbiological synthesis Carotinoids. Previously, it was shown that yeasts of the genus Rhodotorula have a high level of carotinoid production. The present study is devoted to the search for factors that have a stimulating effect on carotenogenesis in yeasts of the genus Rhodotorula.

Keywords: carotenoids, yeast, *Rhodotorula*, floral oils, organic acids.

According to the literature, it is known that the biosynthesis of carotinoids in yeast cells is regulated by a number of external and internal factors. Such factors may include lighting, the addition of organic acids or floral oils to the nutrient medium. The purpose of this study is to study the effect of the addition of organic acids or floral oils to the nutrient medium on the production of carotenoids in yeast strain *Rhodotorula glutinis* BIM Y-253. Yeast strains are deposited in the Belarusian collection of non-pathogenic microorganisms. Yeast cultivation was carried out on beer wort with the addition of vegetable oil, as well as fumaric, citric, malic acids under periodic cultivation conditions in 0,3 L. Erlenmeyer flasks on a shaker for 4 days at 26 °C and artificial lighting. To inoculate the nutrient medium, a 3-day yeast culture grown on beer wort was used. The biomass levels of yeast per liter of nutrient medium are shown in the table. [1]

Table 1

Indicators of the level of yeast biomass

	Biomass (g/l)					
	Control	oil	fumaric acid	citric acid	malic acid	control for malic acid
Mean value	2,61±0,09	2,57±0,27	2,76±0,47	3,07±0,19	3,75±1,56	2,01±1,04

The obtained results made it possible to state that the highest level of production of Rhodotorula glutinis biomass BIM Y-253 is observed when using a nutrient medium with the addition of malic acid in a concentration of 0,05 g per 100 ml (0,005 g/l) of beer wort. With the addition of vegetable oil, carotenogenesis increased per 1,5 points. In this way, new data have been obtained on the level of biomass production by yeast strain of the genus Rhodotorula glutinis BIM Y-253 and the nutrient medium components that have a stimulating effect on the growth and carotenogenesis of the yeast Rhodotorula glutinis have been selected.

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PROSPECTS OF USING PHOTON BEAMS WITHOUT THE FLATTENING FILTER (FFF BEAMS) IN THE RADIATION THERAPY OF MALIGNANT TUMORS

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Currently, the vast majority of medical electron accelerators (linacs) are equipped with flattening filters (FF). Dosimetric characteristics and applications of the FF beams are thoroughly studied. Developments of accelerator technology, the emergence of new, high-tech methods of irradiation have significantly reduced the need to use the flattening filters. Currently, throughout the world, including the Republic of Belarus there is an active accumulation of experience in using flattening filter-free beams (FFF beams) in treatment of malignant tumors.

Keywords: medical physics, linacs, FF beams, FFF beams, flattening filter.

Medical electron linear accelerators (linacs) are the most commonly used beam delivery devices for radiation therapy of majority of cancer cases.

The vast majority of accelerators are equipped with flattening filters (FF) of conical shape, which is located between the primary collimator and monitor ionization chamber. The filters task is the weakening of the central part of the beam and to make the photon beam dose distribution uniform at reference depth within the allowed variations [2].

Flat dose distribution facilitates the calculation of the dose received by the patient during treatment planning. On the other hand, the presence of the filter significantly reduces the dose rate and increases the time of treatment, as well as making a significant contribution to the scattering of photons and increase the dose in the air [4]. However, the use of filters is currently the standard in the dosimetric planning of radiotherapy parameters. The characteristics of photon beams of FF linac have comprehensively been studied in the last five decades and all the aspects related to its clinical applications have been standardized [2].

The introduction of high-tech methods of radiotherapy (SRT/SRS, IMRT, VMAT) into clinical practice of oncologic institutions allows physicians to create conformal radiation field with the other technical devices (multileaf collimators). Multileaf collimator (MLC) is a device consisting of a large number of individual leafs made of a material with a large Z, usually tungsten, that can move independently from each other, statically or dynamically changing the size and configuration of the irradiation field. The implementation of conformal radiotherapy with MLC allows to form the therapeutic beam of a linear accelerator, which coincides with the boundaries of the irradiated volume (tumour) [1].

The presence of such technologically complicated elements have led to the fact that the use of flattening filters to obtain a clinically acceptable volume dose distribution for most types of tumors and their localization is no longer mandatory. More critical characteristics of modern linacs that are used for the irradiation of oncological patients are the treatment period (which is especially important for stereotactic irradiation) and reduction of scattering received dose of ionizing radiation by patients in the treatment by small fields. The importance of these factors has increased the interest of clinicians in the use flattening filter-free beams (FFF beams) of photons with energies up to 10 MeV.

Most modern linacs of new generation allow to generate photon beams as with the filter and without it. The use of FFF beams allows us to increase the dose rate by 2–4 times, which is extremely important for hyperfractionated stereotactic radiotherapy. The change of the energy spectrum leads to a slight shift of the maximum dose to the surface. The head scatter variation for an unflattened beam is typically about 1,5 % as against about 8 % of the flattened beam for the field sizes in the range of 3×3 to 40×40 cm^2. The lateral transport is reduced, which may result in greater control over gradients with the field and at target boundaries [3; 4].

Currently in Belarus there are no approved regulatory documents concerning the use of photon beams without flattening filters in the implementation of the dosimetry planning of radiation therapy. Specialists of N. N. Alexandrov National Cancer Centre of Belarus are carrying out intensive work in this direction.

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EPIDEMICALLY IMPORTANT TYPES OF BLOODSUCKING MOSQUITOES (DIPTERA, CULICIDAE) IN THE TERRITORY OF BELARUSIAN POLESIE

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The comparative study of the species composition, biotopic confinement, epidemically significant species of bloodsucking mosquitoes (Diptera, Culicidae), which participate in the circulation of pathogens of vector-borne infections and invasions in the territory of the Belarusian Polessyie.

Keywords: bloodsucking mosquitoes, Belorussian Polessyie, places for hibernation, arboviruses diseases, epidemically significant species.

Bloodsucking mosquitoes have a negative impact on human life, hindering its economic activities and, in addition, they have great medical significance as carriers and intermediate hosts of pathogens of vector-borne infections and human and animal invasions (Western Nile Fever, Sail-Whitefish and Tychinya Viruses, Incoo, Sindbis, Batai, Ukuniyemi, Tribec, diseases of Malaria, Tularemia, Dirofilariasis).

Among 13 arboviruses circulating in the Republic of Belarus, more than half are capable of causing disease in humans, 10 of arbovirus infections are isolated from bloodsucking mosquitoes [1].

Bloodsucking mosquitoes from the genus *Anopheles* on the territory of Belarus known as specific carriers of malarial plasmodium can also carry microfilariae, tularemia microbe and arboviruses. Malaria as a mass disease was eliminated in most areas of Belarus by 1956. To date, only imported cases are recorded [2].

Similarly, bloodsucking mosquitoes are carriers of diofilariasis. In the samples collected in August and September 2015 on the territory of the Minsk and Brest regions of the Republic of Belarus, mosquitoes infected with dirofilaria (*D. repens* and *D. immitis*) were recorded.

According to F.G. Rubanova in the conditions of Belarus the fact of spontaneous carrier of tularemia microbes by mosquitoes An. Claviger was revealed. Over the past 20 years, there have been 5 cases of tularemia in the republic, one of which is noted in the Brest region [3].

Mosquitoes are also carriers of arbovirus diseases. 131 out of 252 known arboviruses are transmitted by mosquitoes. The most common virus with mosquito transmission is the West Nile. On the territory of the Belorussian Polessyie, the studies were conducted on the detection of the West Nile virus antigen in bloodsucking mosquitoes. According to the results of the study, from 2002 to 2016, 19 cases were isolated from the biomaterial. As for the spread of the disease in the Belarussian Polessyie, it can be noted that the highest number of cases was recorded in Gomel region (11 cases – 58 %), and in Brest region – 8 cases (42 %).

It has been established that representatives of bloodsucking mosquitoes (Diptera, Culicidae) on the territory of Belarussian Polessyie can belong to several groups of vector species of epidemic significance.

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ANALYSIS OF MUTAGEN EFFECT OF FOOD COLORINGS BY ALLIUM TEST METHOD

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The analysis of mutagen effect of food colorings on living cells with use of the Allium Test method. Assessment of mutagen, toxic effects of dyes. Research objective is definition toxic and the genotoxic of effects of synthetic food dyes by Allium test method.

Keywords: Allium test, genotoxic effect, cytogenetic monitoring, mutagens.

In the food industry various dyes were widely adopted. They are used everywhere for improvement of appearance of food.

The used dyes: a flavin source – a turmeric (E-100), are roots of the plant of a turmeric growing in China on Sunda Islands etc. While studies have shown that food colorings with number E damage the brain of children, they lead to a significant reduction in IQ.

Materials and methods

Material of a research were food dyes. Food dyes: orange (Yellow "Sunset" – E110), yellow (Tartrazin – E102), green (Green S – E142), blue (Diamond Blue FCF – E133).

For studying of effect of food colorings Allium test which is recommended by experts of World Health Organization as the standard in cytogenetic monitoring of a surrounding medium was chosen.

Research object in this test is the meristem of sprouts of backs of an onion sowing - grade Allium cepa Shtutgarten-Rizen.

1. Seeds were germinated in appropriate dye solutions in 3 concentrations (0,25, 0,5, and 1 %). Once the roots reaches a length of 8–10 mm, they fixed (Carnoy's fixative).

2. Carried out a maceration of fabrics by solution of the hydrochloric acid.

3. Subsequently stained with acetaminomine and prepared temporary suppressed preparations.

4. Microscopy and counted the cells, took photographs.

As a result of the conducted studies it was shown that all the studied types of synthetic food colorants inhibit the growth of rootlets, which indicates the toxic activity of all the investigated dyes. When analyzing the cytotoxicity of the dyes, the following results were obtained: the lowest germination energy was observed during seed germination on a solution of dyes with high concentrations (1 % and 0,5 %). This indicates a toxic effect of these dyes. The highest levels of EP were detected using the dyes with the lowest concentrations.

When assessing the genotoxic of food dyes, aberrations such as chromosome lag, lead, bridge, and microkernel were identified. The frequency of AA in the sample of dyes with higher concentrations and statistically significantly higher than the control. In this connection, it is possible to assume the presence of mutagenesis factors in this solution, which affect the occurrence of aberrations of various types. The smallest statistically significant indicator of GE occurrence is observed in the sample with the lowest concentration of dye (0,25 %). It follows that the mutagenic effect directly depends on the concentration of the dye. Analysis of the obtained data indicated that:

1. All studied types of synthetic food colorants reduce MI, which demonstrates the mitotoxic activity of these dyes.

2. Level of observed effects increases at increase in concentration of dyes in solution – the effect depends on a dose.

3. Cause chromosomal mutations or have mutagen activity and, therefore, products with such additive can constitute health hazard of the person, and especially children.

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THE DEVELOPMENT OF AN ONLINE BOOKING SERVICE FOR TRADING PLACES IN THE MARKETS OF THE CITY OF MINSK

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The internet-service on booking of trading places in the markets of Minsk is developed.

Keywords: internet service, booking, trading places, markets, internet applications programming, Minsk.

The theme of the report is the development of an online booking service for trading places in the markets of Minsk, conducted as part of the work plan for the Information Technology Management Department of the Communal Unitary Enterprise "Center for Information Technologies of the Minsk City Executive Committee".

The need to develop the service arose in connection with the receipt of complaints from citizens coming to trade agricultural products from various regions of the country. Complaints were related to the problem of obtaining information on vacant places in the markets of Minsk. The development of the service makes it possible to provide an online opportunity for Belarusian producers of agricultural products from the regions of the country to reserve shopping places and parking spaces for trade in their products in the markets of Minsk.

To develop the web-service, the following set of software tools was used: programming languages PHP – to form the basic functional of the service, and JavaScipt – to provide interactivity of the pages, HTML and JQuery – to form the structure of the page and work with graphic elements, as well as database management system MySQL.

The service has several types of personal cabinets:

- for employees of the Main Directorate of Consumer Markets of the Minsk City Executive Committee;
- for the administrations of markets;
- for legal entities and individuals.

Each type of personal cabinet has its unique functionality and has certain access rights.

This service and services similar to it can become the basis for the development of Belarus, as an IT-country provide consumers with the opportunity to obtain the maximum number of online services throughout the territory of Belarus. This is precisely the task of territorial government in modern conditions. To solve this problem and reduce the number of civil servants online services are developed on the territory of the Republic of Belarus and legislation that take into account it.

Due to the small territory of the country, there is the possibility of its full Internet coverage, which will allow citizens to use numerous electronic services, regardless of their location, to speed up the information exchange between service consumers and authorities.

The report contains the results, obtained as a result, of developing an online shopping reservation service in the markets of Minsk for the seasonal trade in horticultural products of Belarusian producers located at http://www.gorod.gov.by/rinki/minsk.

IMPROVEMENT OF THE DATABASE OF THE RADIOTHERAPY EQUIPMENT IN THE REPUBLIC OF BELARUS

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Many of the issues associated with cancer diagnosis and its subsequent treatment nowadays are in the process of being revised in connection with introduction of modern technologies in all areas of medicine. This allowed employees, that are exercising control over the provision of medical care to oncology patients, to track the latest information on the main technical and dosimetric parameters, calibrations and operating conditions of radiotherapy equipment in the Republic of Belarus.

Keywords: radiation therapy, oncology dispensaries, radiotherapy equipment, database.

Many of the issues associated with cancer diagnosis and its subsequent treatment nowadays are in the process of being revised in connection with introduction of modern technologies in all areas of medicine, with the widespread use and availability of computer technology and the Internet. The actual processes of creating and improving radiotherapy equipment databases devoted to a region or a country or for the whole world are becoming more realistic using the capabilities of the personal computer with the accumulation and analysis of information.

Currently in Belarus there are 14 cancer institutions, national with regional and district subordination, where the irradiation with the use of medical linear electron accelerators, gamma-therapeutic and x-ray installations is provided to cancer patients.

In Alexandrov NCCB since the exit of the Republic of Belarus from the Soviet Union a radiotherapy equipment registration had been carried out. In particular, the specialists of Alexandrov NCCB have a list of devices for the medical exposure of the Republic of Belarus with their main technical and dosimetric parameters, calibrations dates and operating conditions for all oncological institutions of the country. It allowed medical professionals that are providing control over the provision of medical help to Oncology patients to track the latest information on this issue. It should be noted that, unfortunately, the database of devices for radiation therapy was not available for public use. In 1995, the IAEA had developed an online, accessible to any Internet user register of cancer centers and clinics that use radioactive isotopes and high-energy radiotherapy machines. The Alexandrov NCCB staff has created, and continuously kept up to date particular similar database for oncological medical institutions of the Republic of Belarus, which is included in the register of the IAEA.

This online register is continuously updated based on data from leading institutions experts and includes data not only on radiotherapy facilities, but also the sources of ionizing radiation and equipment for brachytherapy. The advantages of this database are: availability for the every interested person, ability to obtain the right information anywhere about any institution and the ability to communicate with physicians-radiation oncologists and medical physicists from oncological clinics. All data are correct, up to date and are provided directly by staff of each institution. New accounting system of the radiation therapy apparatus allows us to improve and/or replace obsolete equipment thus using the state money more efficient way.

COMPARATIVE ANALYSIS OF THE STATUS OF RADIATION THERAPY IN THE REPUBLIC OF BELARUS AND THE COUNTRIES OF THE FORMER USSR

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Today it is possible to conduct a comparative analysis of the status of radiation therapy in the Republic of Belarus and the countries of the former Soviet Union. The former USSR countries became competitors, both in quality of healthcare service and number of radiotherapy units. There were and are many disputes over the taking the leading role in the field of oncology in the post-Soviet territory.

Keywords: radiation therapy, comparative analysis, diagnostics, oncology dispensaries, radiotherapy equipment.

A radiation therapy is growing rapidly on the territory of the former USSR. The main reason for this situation is the accident at the Chernobyl nuclear power station, which led to a sharp increase in cases of cancerogenesis among the population of the Republic of Belarus. After the collapse of the Soviet Union, the overall Healthcare system had been divided into small parts. The former USSR countries became competitors, both in quality of healthcare service and number of radiotherapy units.

Today it is possible to conduct a comparative analysis of the status of radiation therapy in the Republic of Belarus and the countries of the former Soviet Union. Leading position in the number of cancer institutions is confident the Russian Federation and their number is 165.The Republic of Belarus has 14 oncology centers and clinics. The physicians that are working there provide diagnosis and treatment using gamma radiotherapy systems, medical electron accelerators, and x-ray machines, brachytherapy with radioactive sources (Ir-192).On the territory of Ukraine there are 58 institutions, providing diagnosis and treatment of cancer. Additionally, the Kazakhstan and its 22 cancer institutions are interesting for us, but only 20 are operational nowadays. Uzbekistan has 12 clinics with radiotherapy equipment which in recent years have been upgraded to the modern state.

The largest institutions are "N. Blokhin Cancer Center " (Moscow, 1951), "N. N. Alexandrov National Cancer Center of Belarus" (Minsk, 1960), clinic "LISOD" (Kiev). These centers had implemented the newest radiotherapy equipment from leading manufacturers (Varian; Skoda UJP; Nucletron; Elekta), technologies and devices in the medical-research process that allows quickly establishing the diagnosis in the most difficult cancer cases, and provide the highest-quality treatment.

DEVELOPMENT OF DATA DEPENDENT MS/MS ANALYSIS USING HIGH-RESOLUTION CHROMATOGRAPHY-MASS SPECTROMETRY

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In modern scientific disciplines of natural science, mass spectrometry plays an increasingly important role as an analytical method, and therefore the development of methods for determining compounds of different nature, as well as approaches to the development of these methods using compatible software. When writing the work, a chromatography-mass spectrometric analysis method was used to develop "data-dependent MS / MS analysis". Samples with different biological matrices containing anabolic steroids as the test compound were analyzed

Keywords: chromatography-mass spectrometry, data-dependent MS/MS analysis, high resolution mass spectrometry, steroids.

Anabolic steroids play an important role in the lives of modern people, regardless of origin. An important component in the approach of determining these compounds is the choice of an analytical system based on the characteristic properties of molecules, which make it possible to definitely pinpoint a given compound among the enormous number of connections of the matrix in which it is located. As a result, a promising method is a hybrid analytical method – chromatography-mass spectrometry.

In this study, the development of "data-dependent MS/MS analysis" of samples containing anabolic steroids was carried out. During the development, samples containing urine, which had been tested by dilute-and-shoot method, were analyzed. The development of the analysis, as well as data processing, was carried out with the help of Xcallibur software by Thermo Scientific. Samples containing human urine, as well as the culture medium, were used as blank samples. When processing the obtained data as a result of the analysis of blank samples, matrix ions were added to the list of exceptions to increase the signal-to-noise ratio when scanning with the mass-detector ions contained in the sample being analyzed.

After the analysis of the analytically significant compounds, the optimum width of the permissible m/z value of the ion included in the list of MC/MS-decay exclusions was established, as well as in the list of the temporary exclusion of the MS/MS decay. As a result of the analysis, a regularity was established. When setting a value other than the minimum, erroneous recording of analytically significant ions in these lists was observed, as a result of which they were not detected and were not subjected to MS/MS decay. During the processing of the obtained data, a minimum threshold for detecting ions with subsequent MS/MS decay was established, which in turn increased the efficiency of the analysis, in connection with the absence of additional scanning of low-intensity ions As a result of the development of this analysis, were achieved optimal parameters for detecting and fragmenting compounds contained in small quantities in biological media, which facilitates its use in screening assays in which the mass spectrometric method is combined with HPLC. Using this type of analysis with additional databases on fragment ionic compounds, it makes it indispensable in the study of metabolomics, proteomics and other related areas.

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THE TOXICITY OF THE MATERIALS IN RELATION TO MESENCHYMAL STEM CELLS

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The cytotoxicity of the biomaterials "Collapan", "Osteomatrix" and the collagen sponge "Liostipte" in relation to mesenchymal stem cells (MSC) of the bone marrow was studied; optimal variants of bone replacement matrices were determined to be used as a biotransplant for spondylosyndesis.

Keywords: mesenchymal stem cells of the human bone marrow, collapan, osteomatrix, lyosten, biocompatibility.

An alternative to bone grafting for the regeneration of non-healing defects are cell transplants, the use of osteogenic growth factors and cell-free substrates or the implantation of bone equivalents. Necessary conditions for bone regeneration are osteoinductive signals, the matrix, which delays signals and has an adhesive surface, and osteogenic cells that attach to the matrix and differentiate into osteoblasts in response to osteoinductive signals [1–3].

"Collapan" materials in the form of plates, granules and gel, "Osteomatrix" and collagen sponge "Liostipte" were tested for toxicity at the direct contact of the carrier matrix with MSCs. Supernatants obtained after the materials were held in a complete nutrient medium for 24 hours were tested in relation to MSCs as well. Cytotoxicity was evaluated in the MTT test. Biomaterials and supernatants were introduced into the sample wells of a 24-well plate with MSC culture. The toxic effect of materials on MSCs was evaluated after 24 hours and 7 days (Table 1).

Table 1

Toxic effect of supernatants from biomaterials in relation to MSC *in vitro*

	Samples	Toxicity, % of dead cells	
		After 24 hours	After 7 days
1	Collapan plates	30,1 ± 0,05	9,1 ± 0,17
2	Collapan granules	17,3 ± 0,26	10,9 ± 0,34
3	Collapan Gel	32,8 ± 0,074	8,3 ± 0,094
4	Osteomatrix	15,7 ±0,47	8,7 ± 0,16
5	Collagen sponge	0,0 ± 0,032	0,0 ± 0,07

Note: The experimental data id presented as the mean ± standard deviation

As can be seen from the results presented in the table, supernatants did not have high toxicity in relation to MSCs. When assessing acute toxicity after 24 hours of MSC culturing, the viability of the cells ranged from 67,2 to 100 %. The supernatants of the material "Osteomatrix" (15,7 %) and collagen sponge (0 %) turned out to be the least toxic. After 7 days the cytotoxicity of all materials significantly reduced.

Biomaterials also had a slight toxic effect in direct contact with cells (Table 2).

Table 2

Toxicity of biomaterials in relation to MSCs at direct contact *in vitro*

	Samples	Toxicity, %	
		After 24 hours	After 7 days
1	Collapan plates	28,1 ± 0,04	11,2 ± 0,079
2	Collapan granules	12,4 ± 0,32	6,6 ± 0,024
3	Collapan Gel	28,2 ± 0,04	13,0 ± 0,083
4	Osteomatrix	11 ± 0,01	7,6 ± 0,148
5	Collagen sponge	11,3 ± 0,01	3,4 ± 0,166

Note: The experimental data of three tests is presented as the mean value ± standard deviation

Thus, all five materials studied had the cytotoxicity, which caused the death of no more than 30 % of the cells. When MSC were cultured with "Osteomatrix", "Collapan granules" and "Lyostipte" the lowest toxicity of these materials in relation to the cells was revealed.

While increasing the cultivation period up to 7 days, cells adapted and started to proliferate under experimental conditions, both at culturing with supernatants and in the direct contact with materials.

Therefore, the studied biocomposite materials have an inconciderable toxicity in relation to human mesenchymal stromal cells in vitro and can be used as a bone replacement matrix in spondylosyndesis.

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CHARACTERIZATION OF BIOCHEMICAL PROPERTIES AND BIOLOGICAL ACTIVITY OF COMPOUNDS OF A CARBOHYDRATE NATURE OF SOME OF BAZIDIOMYCETES

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The study of physico-chemical and biological properties of polysaccharides of basidiomycetes is the basis for the development of new therapeutic and prophylactic preparations. Biological action of medicinal mushrooms is largely determined polysaccharides.

Keywords: fungoterapy, basidiomycetous fungi, macromycetes, polysaccharides, phagocytic activity.

Traditional use of mushrooms for medical purposes has developed into a new close to medicine branch called fungoterapy. In the composition of mushrooms contain biologically active polysaccharides lentinan, lanostane, hantaran, lanofil, grifolan, which affect the human body much softer than the synthetic means, it is better tolerated and usually do not possess cumulative properties. Preparations based on mushrooms are characterized by a wide spectrum of biological activity: immunostimulate, antitumor, antioxidant, hepatoprotective, antimicrobial, etc.

Many species of wood-destroying fungi of the class Basidiomycetes are enough to grow well in artificial culture methods. Of particular interest are the representatives of the genera Schizophyllum, Trametes and Hericium.

Melanistic ordinary (Schizophyllum commune) has antitumor, antimicrobial, anti-inflammatory and antiviral properties. Melanistic recently attracted the attention of specialists of the pharmaceutical industry.

The prickly hericium (Hericium erinaceus) has antitumor activity, helps in chronic gastritis, ulcer and cancer of stomach and esophagus, chronic bronchitis, used to treat Alzheimer's disease, because it has the ability to repair the nerve cells.

Coriolus multicolored (Trametes versicolor) contain antibiotic and anti-cancer substances, strengthens the immune system, has antiviral, antibacterial properties, antioxidant. This fungus is used in various chronic diseases.

We used the fungi belonging to the division Basidiomycota, class Basidiomycetes, genera Schizophyllum, Hericium, Trametes.

Deep mushroom mycelium was grown in Erlenmeyer flasks on rocking (180 rpm) on the following media: glucose-peptone, the beer wort (70 Balling), whey. As inoculum used culture daily 10–12 mushrooms, grown deep in the beer wort. After the cultivation, the mycelium was separated from culture liquid by filtration through a thick cloth, was washed with distilled water and used to carry out the relevant tests.

The content of total protein in S. commune, H. erinaceus и T. versicolor ranged from 15,0 to 22,4 %, respectively, of the polysaccharides from 11,8 to 22,0 %, lipids – from 3,1 to 4,4 %.

The study of the carbohydrate composition of polysaccharides showed that they all were heteroglycans. In most of the polysaccharides was dominated by glucose (75,3–91,1 %), was also attended by galactose (5,6–13,4 %) and mannose (4,5 to 17,8 percent).

To determine the ability of polysaccharides to stimulate the phagocytic activity of neutrophils was used "phagocytic test." As the test culture used in bacterial culture of Staphylococcus aureus.

It is established that in the experiment in vitro antipolysaccharide obtained from submerged mycelium of S. commune, actively stimulate the phagocytic activity of neutrophils against S. aureus at a concentration over 100 mcg/ml. Lower concentrations (1 and 10 μg/ml) also affect the intensity of phagocytosis, but differences from control were not statistically significant.

As well as antipolysaccharide, extracellular polysaccharides are synthesized by the fungus in a culture medium, have a stimulating effect on the intensity of phagocytosis. A statistically significant increase in phagocyte numbers compared to control was obtained for both fractions of exopolysaccharides also at a concentration of 100 μg/ml.

Thus, the studied mushroom polysaccharides in composition and physico-chemical properties similar to the polysaccharides known medicinal mushrooms, which will allow the development of powerful new functional products based on mycelium, medicinal mushroom extracts and their compositions.

ASSESMENT OF ANTIPROLIFERATIVE EFFECT OF BONE MARROW MONONUCLEAR CELLS

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Immunosuppressive and immunomodulatory effects of MSC allow us to consider these cells as a means for the therapy of autoimmune diseases, they are also used to ensure immune tolerance in organ transplantation and to overcome pathological inflammatory processes. However, the features of obtaining and culturing MSC limit the possibility of their use for the treatment of acute inflammatory conditions. An alternative to the MSCs are unfractionated bone marrow mononuclear cells (BMMCs). BMMCs are a heterogeneous cell population, including: hematopoietic stem cells, MSC, various types of progenitor cells. Preparation of BMMC for transplantation takes several hours and does not require precultivation. Transplanted BMMC are known to migrate to the lesion site, secrete cytokines and trophic factors such as vascular endothelial growth factor (VEGF), fibroblast growth factor (FGF), which are involved in the process of neovascularization of tissue and improve the oxygen supply of tissue.

Keywords: bone marrow mononuclear cells, cell therapy, acute ischemic nephropathy, mesenchymal stem cells.

21 laboratory rats of the Wistar line, female, body weight 260 (200–335) g and freshly isolated uncultivated BMMC and MSC cultures were chosen to be the materials for the research. The animals were divided into 2 groups: control (n=10) and experimental (n=11) with acute ischemic neuropathy. All cell suspensions at a concentration of 1×10^7 cells / ml were painted with 7 μM 5- (and-6) -carboxyfluorescein diacetate succinimidyl ester (CFSE, Fluka, Slovakia). Splenocytes were cultured at a concentration of 2×10^5 cells / well in medium with the 1 μg / ml concanavalin A (Con A, Sigma, Germany) in the presence of MSC or freshly isolated BMMC or in their absence for 4 days at 37 C in an atmosphere with 5 % content of CO_2. The results of cell proliferation were performed by flow cytometer FC 500 (Beckman Coulter, Germany). To characterize the inhibitory effect of MSC on the splenocytes proliferation the formula for calculating the coefficient suppression (CS) was proposed:

$$CS = \frac{P_{SP+MSC/BMMC} \cdot 100}{P_{SP}}$$

where $P_{SP + MCC / BMMC}$ – the number of proliferating splenocytes stimulated by mitogen, in the co-culture with MSC or BMMC, %; P_{SP} – the amount of proliferating splenocytes stimulated by mitogen, %. The comparison of two groups and the determination of the statistical significance of the differences were carried out using the non-parametric Wilcoxon test (in the case of dependent variables) and the Mann-Whitney test (in the case of independent variables). The differences were considered significant at $p < 0.05$. The results were presented in the form of a median (25^{th}–75th percentile) [1].

In the control group statistically significant differences in the number of proliferating cells in the presence of MSC and BMMC in the above cultures were absent. In the experimental group, the number of splenocytes proliferating in response to ConA were not statistically significantly different from the control group ($p > 0,05$), the medians in the groups were 57,1 % (35,4 ÷ 88,3) and 58,4 % (47,6 ÷ 77,1), respectively. A statistically significant decrease of splenocytes mitogen-induced proliferation in co-cultures with both MSC 28,8 % (9,9 ÷ 47,4) and BMMC 30,7 % (3,0 ÷ 52,8) was observed. So the suppression coefficients ranged from 8,7 to 94,2. In the control group CS of MSC-induced suppression was 64,9 % and BMMC-induced suppression was 42,5 % ($p > 0,05$). In the experimental group CS of splenocytes ConA-stimulated proliferation in the co-culture with BMMC was 60,3 % (17,1 ÷ 89,9) and did not statistically significantly differ from CS MSC-induced suppression of 55,2 % (44,5 ÷ 58,2).

To conclude, BMMC have an immunosuppressive effect comparable to the effect of mesenchymal stem cells. This suggests the possibility of using BMMC in the treatment of acute inflammatory conditions.

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THE HEALTH OF CHILDREN BORN AS A RESULT OF ASSISTED REPRODUCTIVE TECHNOLOGY

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A research has been made of the causes of infertility of couples and the health of their newborn children. It has been found that the use of Assisted Reproductive Technologies does not always favorably affect newborns.

Keywords: assisted reproductive technologies, in vitro fertilization, intracytoplasmic injection.

Real opportunities to manage the processes of human reproduction with the use of assisted reproductive technologies (ART), which are one of the variants of population reproduction, have appeared [1].

The success of ART methods largely depends not that much on the technical difficulties and thoroughness of performing microsurgical manipulations as on the health of the pregnant woman and the primary causes of infertility, as well as on the number of implanted embryos [2].

In the course of this research, IVF and ICSI programs, the health of couples with infertility, as well as the health of their newborn children have been studied.

It has been found that the risk factors for reproductive health disorders in women are: age, tubular peritoneal factor 20,5 %, endocrine infertility 11,7 %, endometriosis 26,4 %, PCOS 15,7 %.

Infertility factors in men are: oligospermia 20,0 %, asthenospermia 36,0 %, teratospermia 28,0 %, azoospermia 16,0 %.

When studying the state of newborns in the IVF group, it was found that 32,0 % of children had a delay in intrauterine development, 45,0 % had asphyxia, and 3,6 % had developmental abnormalities. The course of the neonatal period was complicated by a post-hypoxic condition of 29,1 % and infectious pathology in 12,0 %.

When studying the state of newborns of the ICSI group, it was found that 35,4 % of children had a delay in intrauterine development, 68,0 % had asphyxia, and 6,4 % had large developmental abnormalities. The course of the neonatal period was complicated by a posthypoxic condition of 22,5 % and infectious pathology in 25,8 %.

A comparative assessment of the state of newborn of ECO and ICSI has revealed that the number of newborn ICSI children with asphyxiation was higher than that of newborn ECO children (68,0 % and 45,4 %, respectively); ($X2 = 0,0323$, $p < 0,05$ Pirsan correlation analysis with Yates corrections).

The children of the ICSI group have more developmental anomalies than in the IVF group (6,4 % and 3,6 %, respectively); ($X2 = 0,0211$, $p < 0,05$ Pirsan correlation analysis with Yates correction). Infectious pathology in the neonatal period in children ICSI was diagnosed more often than in children with IVF (25,8 % and 12,0 %, respectively); ($X2 = 0,0222$, $p < 0,05$, the Pearson correlation analysis with the Yates correction).

Thus, children conceived with IVF and ICSI are at high risk, such as intrauterine growth retardation, asphyxia and neurologic changes. The ICSI children had a higher incidence of abnormal development compared to children of the IVF group and a more intense period of early adaptation due to posthypoxic complications and infectious pathology.

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CONGENITAL SPINAL HERNIAS (SPINA BIFIDA)

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The analysis of the data on the incidence of children's spina bifida in Belarus during 2008–2015 has been carried out. An average of 103,25 cases have been registered, with the population frequency of 0,91 ‰. The efficiency of prenatal diagnostics for the same period is on average 81,75 %.

The concerns of etiology, pathogenesis, diagnostics of spina bifida, as well as statistical documentation on children diagnosed with spina bifida in Belarus have been the object of research.

Keywords: spina bifida, congenital defects, prenatal diagnostics, teratogenic influence.

Spina bifida is a malformation of a spine column, also known as spinal hernia.It belongs to congenital defects of central nervous system. It results from nonclosure of vertebral archs and occasional direct split of corpus vertebrae. Patients diagnosed with spina bifida require surgical treatment almost without exception, therefore it is viewed as a serious congenital anomaly.

Ubiquitous expansion of hereditary pathology has direct influence on case rate indicators, disability and mortality indicators among the population. Specific registers containing studies of incidence and dynamics of congenital defect are created in many countries of the world.

The monitoring of congenital defect is carried out within the Belarusian register of congenital defects operating since 1979. The monitoring system of congenital defects is unique due to coverage breadth of territories under analysis and the number of analyzed births. Aggregation of information about congenital defect cases in Belarus is carried out in accordance with the Resolution of the Ministry of Health of the Republic of Belarus, "On the order of improvement of records of congenital defects (malformations) in children (fetus)" (No. 1172 from 01.11.2010). According to this order all cases of congenital defects registered in children under one year,still-born children, children who died at the age under one year, and at the fetuses aborted according to genetic indications, are subject to registration. Each case of congenital defect is recorded in the notice. The input of information into the computerized database is carried out by the regional principle.

We have carried out the analysis of monitoring data on congenital defects in Belarus from 2008 to 2015. This enabled the definition of incidence and dynamics of spina bifida within the period under study as well study of population incidence of this defect and efficiency of its prenatal diagnostics.

Year-to-year incidence of spina bifidafor the period under study has been determined. The comparative analysis of spina bifida incidence in Belarus from year to year for the period under study has been carried out.

826 cases of spina bifida in children during 2008–2015 have been analyzed. Spinal hernias in children averaged at 103,25 cases, thus the population incidence is 0,91 ‰.

The maximum population incidence of spina bifida (the live-born, mortinatus and aborted due to genetic indications cases) registered in 2012 was 1,1 ‰. The smallest spina bifida population rate was registered in 2015 and equals 0,72 ‰.

The efficiency of prenatal diagnostics by calculation of the pregnancies interrupted according to genetic indications from spina bifida made annually equaled 81,75 % which is a high spina bifida detectability rate during the prenatal period.

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ECOLOGICAL CHARACTERISTIC OF THE ORAL MICROBIOTA

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Microbiota of the oral cavity is important for the reactivity of the body, it plays a significant role in protecting our body from various diseases. The correct and in-depth study of the biological properties of the microflora of the oral cavity, the peculiarities and pathogenesis of the qualitative and quantitative composition of microorganisms, the characteristics of nonspecific and immune protective mechanisms confirms that the immunity of the oral mucosa has a significant effect on the formation of general immunity.

Keywords: mucosal immunity, oral microbiota, body reactivity.

One of the main factors protecting the internal environment of the body from the aggressive influence of the external environment is the normal microflora of the mucous membranes (oral cavity, nasopharynx, respiratory system, gastrointestinal tract, urogenital system) and skin. When the microbiocenosis of mucous membranes is disturbed and the bacterial population is unhindered, the reactivity of the organism is reduced, the cellular and humoral factors of mucosal protection are weakened, which ultimately leads to the development of pathological conditions. Moreover, the microbiological factor determines the development not only of infectious diseases, but also due to modulation of the immunological reactivity of the organism is the leading one in the development of autoimmune, allergic, oncological and other diseases [1; 2].

Human microbiota is still poorly understood. The in-depth study of the composition and properties of human microbiocenosis, as well as the identification of an association of microbiota with various diseases, is important. In this regard, the research is actively carried out, aimed at studying human microbiota, assessing the level of "microbiological load", determining the characteristics of the immune system response in the conditions of the influence of the factors of the external and internal environment.

The study aimed to determine the quantitative and qualitative composition of oral microflora of healthy donors.

The study included 30 students (donors) aged from 20 to 26 of the International Sakharov Environmental Institute of Belarusian State University, who gave written informed consent to the collection of biological material. To get the microbiota, smears were made by a standard procedure using a sterile cotton swab placed in a test tube.

The composition of microbiota of the oral cavity in healthy individuals is found to be characterized by a certain stability. At least 100 species of bacteria can be detected in the mouth, and their composition varies depending on local conditions. Approximately 30–60 % of the whole microflora of the oral cavity is facultative and obligatory anaerobic microorganisms, which include streptococci, lactobacilli, spirochetes, actinomycetes, etc. The following types of streptococci represent the largest group of oral bacteria: *Str. mutans*, *Str. mitis*, *Str. sanguis*, etc. In addition, the oral cavity contains strict or facultative anaerobes of the family *Lactobacillaceae*, which due to the fermentation of carbohydrates with the formation of lactic acid and lower pH create favorable conditions for the growth of normal microflora and prevent the development of pathogenic microorganisms.

Permanent microorganisms are often associated with two major diseases: caries and periodontal diseases. Apparently, these diseases occur after the imbalance among resident species in a given microbiocenosis under the influence of certain factors. In order to imagine the process leading to caries or periodontal diseases, and the contribution of microorganisms to the development of these diseases, it is necessary to know the ecology of the oral cavity, the mechanisms for the formation of normal microbiota, the factors regulating the homeostasis of the oral ecosystem. Special attention should be given to the state of oral microbiota after medical manipulations.

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ANALYSIS OF METHODS OF TREATMENT FOR CNS TUMORS USING MEDICAL LINEAR ACCELERATORS

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One of the methods of treatment of CNS tumors, which is used in combination with surgical treatment and chemotherapy, is external beam radiotherapy. Linear accelerators are the most useful radiotherapy equipment. They can provide precise dose delivery to the target volume being relatively easy to use, inexpensive and safe. Modern linear accelerators are multi-modal devices and give us an opportunity to choice among several methods of irradiation. Each of these methods have some advantages in treatment of a specific CNS tumor case. For this reason, it is important to make the right decision when choosing one of them. It must be suitable for the very specific case, taking into consideration all medical and physical aspects. The right analysis of these modern methods lets us provide treatment of a high quality.

Keywords: CNS tumor, medical linear accelerator, external beam radiotherapy, precision irradiation

Tumors of the central nervous system (CNS tumor) are a class of non-cancerous and cancerous growths localized in the brain and spinal cord. The important factors of choosing methods for treatment of these diseases are: the genesis of the tumor (primary or secondary), the grade of a tumor (high-grade tumor or low-grade tumor), the stage of the disease, etc.

One of the methods of treatment, which is used most often in combination with surgical treatment and chemotherapy, is external beam radiotherapy. The most useful radiotherapy equipment in the treatment of CNS tumors are linear accelerators (linac). Extremely important matter in the radiotherapy of CNS tumors is the fact that their location is always critical and requires a precise dose delivery to the target volume, in order not to damage adjacent tissues and organs, which can cause serious reducing of quality of life (blindness, deafness, inability to speak, etc.) or even death (for instance, during sessions of radiosurgery). Nowadays, linear accelerators can successfully solve this problem being relatively easy to use and inexpensive (for example, in comparison to proton accelerators), and it's safe and multimodal as well (if to compare with gamma-therapy apparatus). This is due to their wide range of optional features: the choice of radiation energy, varying dose rate, the use of beams with or without flattening filtration (FF-mode and FFF-mode), choice of treatment methods (static or with modulated intensity).

Since linacs were first used in medical practice, they have been evolved with well-engineered technologies and nowadays they can support the wide set of methods for treatment of CNS tumors: 3DCRT (3-dimensional conformal radiation therapy), IGRT (image guided radiation therapy), IMRT (intensity-modulated radiation therapy), SRT/SRS (stereotactic radiation therapy/stereotactic radiosurgery), RapidArc/VMAT (volumetric modulated arc therapy). Though the latest methods are very complex and have high functionality, at the same time, old ones are not completely replaced so far (for example, 3DCRT), which means that each of them still has some advantages in a specific cancer cases. For instance, 3DCRT methods are still actual for irradiation of the entire brain because of its simplicity and relatively quick realization, besides it saves time and money spending on the treatment without losing of medical care quality for the patient. More modern intensity-modulated methods, such as IMRT and VMAT, give us the possibility to provide high-dose precision irradiation while minimal dose on healthy tissues and organs, which cannot be achieved by using 3DCRT techniques. For example, due to the intensity-modulated methods only, it became possible to provide hypo fractionated SRT and boost methods.

Since modern linear accelerators are multi-modal devices and give us an opportunity to choice among several methods of irradiation, it is important to make the right decision when fixing on one of them. It must be suitable for the very specific case, taking into consideration all medical and physical aspects. The right analysis of these modern methods lets us provide treatment of a high quality.

FACTORS OF RADIATION RISK AT RADIODIAGNOSIS AND RADIATION THERAPY IN HEALTHCARE INSTITUTION

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Negative and positive impact of radiation exposure on health of the person is surveyed. The factors of radiation risk to which patients and personnel at radiation diagnosis and radiation therapy are exposed to, have been analyzed on the example of work of physics and technology radiological department of the Vitebsk Regional Clinical Oncology Dispensary. The sources of ionizing radiation used in diagnostic and medical practice have been described.

Keywords: radiation, source of ionizing radiation, radiation diagnosis, beam therapy, radiation protection.

The Republic of Belarus is the most affected republic as a result of the Chernobyl accident. The territory of the country was contaminated with about 70 % of all dose-forming radionuclides: isotopes of iodine-131, caesium-137, strontium-90 as well as transuranium elements. After the accident, a dramatic increase in the incidence of thyroid cancer was detected. Moreover, the number of other oncological diseases is growing every year in the Republic of Belarus.

However, ionizing radiation not only does harm to health, but also can treat a person. Medical exposure is the basis for the detection and treatment of cancer. It is used for radiation diagnosis and radiation therapy of malignant tumors. The nature of the effect of ionizing radiation on a person is determined by the type of radiation, the intensity of radiation and the individual characteristics of the organism.

The factors of radiation risk to which patients and personnel at radiation diagnosis and radiation therapy are exposed to, have been analyzed on the example of work of physics and technology radiological department of the Vitebsk Regional Clinical Oncology Dispensary. The department has a wide range of diagnostic and therapeutic options. For X-ray diagnostics, a modern 64-slice X-ray computer tomograph from TOSHIBA Aquilion One is used, open radionuclide sources are radopharmaceuticals labeled with Tc-99m, Ga-67, I-131. For pre-radial preparation, remote and contact radiotherapy, the department has modern equipment: X-ray computer tomography HiSpeed CT \ e GE Medical Systems; X-ray simulator Acuity IX; Linear electron accelerators CLINA-IX, equipped with the latest options, such as IMRT, RapidArc, IGRT; gamma therapeutic unit "TERAGAM"; brachytherapy apparatus VariSourse 200e; brachytherapy apparatus GammaMedplus IX; intracavitary gamma-therapeutic apparatus AGAT-VU. The following sources of ionizing radiation (IRI) are used in laboratory research and treatment:

Cobalt-60 type GK60T05, type of radiation is gamma, aggregate state is solid, metal, launch date is 10.09.2009, service life is15 years. Cobalt-60 type GK60T05 in terms of radiation hazard refers to category I.

Cobalt-60 type GK60T2, type of radiation is gamma, aggregate state is solid, metal, in the number of three pieces: activity 67,10 GBq, 67,12 GBq, 67,62 GBq, service life is not more than 5 years. This type of IRS in terms of radiation hazard refers to category II.

Iridium-192 type No. VS2000, activity is 0,465 TBq, type of radiation is gamma, aggregate state is solid, metal, service life is three months. The degree of radiation hazard refers to category II.

Iridium-192 type GM 12000680, activity is 0,555 TBq, type of radiation is gamma, aggregate state is solid, metal, service life is three months. This type of IRS in terms of radiation hazard refers to category II.

Hippuran-iodine -131, solution for injections in the vial, activity on the passport is 74 MBq, annual consumption is 2,072 GBq. Iodine-131 is a source of beta particles and gamma quanta, half-life is 8,1 days, shelf life is 21 days, delivery of the drug according to the order-application. Iodine-131 in terms of radiation hazard refers to category II.

Gallium citrate, Ga 67 is a chemical compound of sodium citrate with radionuclide Ga 67, solution for injections in vial, activity under passport is up to 420 MBq, annual consumption is up to 11,76 GBq. Ga 67 is a source of gamma quanta, half-life is 78,26 hours, shelf life is 11 days. The degree of radiation hazard refers to category II.

The radionuclide generator 99Mo / 99mTs. Tc99m-pertechnetate sodium (drug Polge-tech) is obtained by washing with 0,9 % NaCl solution of the column of the generator with the parent isotope of molybdenum-99. Activity on the passport is 5 GBq, annual consumption is 260 GBq. Tc99m decomposes, emitting gamma radiation, a half-life is 6,02 hours, and a shelf life is 14 days. The degree of radiation hazard refers to category II.

Radiation monitoring when working with ionizing radiation sources is carried out by the Radiation Safety Service, which has three dosimeters of the DKS-1121 type, two dosimeter-radiometers of the MKS-1117 type, dosimeters of the TLD type and 25 dosimeters DKG-FE2503A are available for individual dosimetric monitoring.

In the offices of megavoltage therapy, remote gamma therapy, intracavitary gamma therapy and contact radiation therapy, stationary dosimeters such as DKS-AT1119 and CPK-AE2327 are installed for constant monitoring.

IMPACT OF LASER IRRADIATION OF LOW INTENSITY ON HEMOGLOBIN

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Laser or optical quantum oscillator is a device that converts pump energy (light, electric, thermal, chemical, etc.) to the energy of a coherent, monochromatic, polarized and narrowly directed radiation flux.

The physical basis of the laser is the quantum mechanical phenomenon of stimulated (induced) radiation. The laser irradiation can be continuous, with a constant power, or pulsed, reaching extremely high peak powers.

Keywords: laser, hemoglobin, oxygenation.

According to its properties, laser irradiation refers to coherent monochromatic polarized electromagnetic radiation. The spectral characteristic of laser irradiation, or the length of its wave, is the most important indicator, which determines the biological effect on tissues and the body.

The main absorbing component in the irradiation of biological tissues by the laser is blood, which concentration of energy absorption is several times higher in the muscle tissue and tens of times in the physiological solution, and the acceptor factor of the laser irradiation is mainly in the hemoglobin of erythrocytes, which performs the most important function of the transport of oxygen to the tissues of the body.

The mechanism of action of low-level laser irradiation (LLLI) for homeostasis has been studied in terms of its activation by the oxygen-binding function of hemoglobin and the further transportation of oxygen to tissues, which will increase the compensatory functions of the organism both in the aspect of healing post-operative wounds, and ,possibly, in increasing the overall status of homeostasis .

Hemoglobin as the main source of the oxygen transport function of blood undergoes a number of changes under the influence of a helium-neon and semiconductor laser.

Oxygenation of hemoglobin is connected with the changes in the membrane of erythrocytes under the effect of the laser irradiation, which increases its permeability for the ions and the gases.

An increased degree of oxygenation of erythrocytes is associated with a complex mechanism of regulation of the fermentative and antioxidant complexes.

Low-energy laser irradiation has become widespread in various fields of biological sciences due to the fact that primary photobiological reactions cause various biochemical and physiological responses in the body.

As we know, one of the methods of laser therapy is laser hemotherapy, which includes Intravenous Laser Blood Irradiation (ILBI) and transcutaneous laser blood irradiation (TLBI).

The use of ILBI makes it possible to reduce the periods of treatment, to increase the time of remission, to stabilize the course of diseases, to reduce a quantity of postoperative complications, etc

However, the universality of the biological effect of LLLI, and of the ILBI method in particular, is due to the influence on the lower (subcellular and cellular) level of regulation and maintenance of homeostasis; the influence of LLLI also corrects the strategy of adaptation (physiological reactions) of a higher level of living organization as the disturbances of these mechanisms are the true cause of many diseases.

Laser technology is applicable for objects from a wide variety of materials located in various aggregate states, among which the most interesting and complex are the biological ones.

At the present time, there is an intensive introduction of laser irradiation in biological research and in practical medicine in most countries of the world. The unique properties of laser irradiation have revealed wide possibilities of its application in different fields of medicine: surgery, therapy and to diagnostics.

THE ANALYSIS OF INCIDENCE AMONG CHILDREN IN MINSK REGION DURING 2007–2015

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The retrospective analysis of incidence rates among children in Minsk region during 2007–2015 has been carried out, the dynamics has been analyzed and the main trends have been identified.

Keywords: incidence among children, social-hygienic factors, environmental factors, lifestyle, wellness, preventive activities.

The health status of children is an important indicator of the well-being of society. The incidence of children is a multifactorial problem; therefore, the analysis of children's health is very important in order to develop more effective preventive measures for health protection.

The research aims to analyze the incidence among the child and adolescent population of the Republic of Belarus in Minsk region during 2007–2015.

The subject of the study was the data of children incidence in the Minsk region in 2007–2015 obtained from the statistical compendium "Public Health in the Republic of Belarus" for 2007–2015.

The analysis of the incidence among children in Minsk region did not reveal a steady trend. It has shown that the incidence rates among children in Minsk region are similar to the average ones of the Republic of Belarus. The incidence and morbidity rates of child population is higher than the same indicators of adult population.

In the structure of morbidity both in 2007 and in 2015 respiratory diseases 73,32 % (the share in 2010 increased by 3,2 %) occupy the first ranked places; then go skin and subcutaneous tissue diseases 4,98 %, injuries, poisonings and some other consequences of external causes 3,86 %, followed by some infectious and parasitic diseases, as well as diseases of the digestive system, diseases of the eye and its adnexa,etc.

For the most frequently recorded pathologies, the analysis of long-term morbidity trends have been made. The analysis of the morbidity of children in Minsk region with respiratory diseases has not showed a clear trend. The incidence increased by 8 %, and morbidity by 7 %. The tendency to reduce skin and subcutaneous tissue incidence has been showed (both incidence and morbidity decreased by 10 %), as well as a reduction in injuries (incidence decreased by 23 %, morbidity fell by 21 %).

The results of the research show that in order to improve the health status of the children in the region, it is necessary to develop scientifically grounded recommendations and carry out measures for more effective prevention and timely modern diagnostics for all classes of diseases, with appropriate financial support, especially at the district level.

THE NECESSITY OF THE IMPROVEMENT OF BRAHITERAPY PROGRAM IN THE REPUBLIC OF BELARUS

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Brachytherapy is a part of radiotherapy when the ionizing source is delivered into the tumor or directly near the tumor. In the National Cancer Center brachytherapy treatment is performed by machines for the remote introduction of a radioactive source. Medical staff and extraneous persons cannot stay at the treatment room during treatment process because of high dose of radiation. Quality assurance program has been implemented in the clinical practice of the Center to achieve the high quality of medical care. It includes inspections of the compliance of technical and dosimetric characteristics of the equipment with the manufacturer's claimed requirements, as well as checking the source alignment and measuring the source strength.

Keywords: brachytherapy, quality control, medical equipment, afterloader.

The objectives of brachytherapy are to ensure an accurate and safe dose delivery to a target volume and avoid unnecessary dose to surrounding healthy tissue [1]. This is in contrast to external beam radiotherapy, where in

general a larger volume of healthy tissue receives a significant dose. Brachytherapy is usually performed with remote afterloading equipment, for the safe transport of sealed sources to and from the patient and for the protection of staff. Brachytherapy is performed in many radiotherapy institutions. Often brachytherapy is used for the application of a boost dose, in combination with or as an alternative to (a part of) the external beam therapy.

For a safe and accurate dose delivery using brachytherapy many aspects need to be carefully considered. Furthermore, the general safety aspects for the patient, the personnel, and the environment are important issues. In order to ensure the optimal treatment of patients much effort is required during the commissioning phase of new brachytherapy equipment, and afterwards during its clinical lifetime. The institution must therefore develop a proper QA program for sources and equipment [2].

Currently, quality control of brachytherapy procedures is carried out on the basis of instructions issued in 2007 by the Ministry of Health of the Republic of Belarus [3]. For more than 10 years since its publication, brachytherapy equipment has developed rapidly along with the introduction of new treatment and planning methods. The idea is to improve the quality control methods of this equipment.

The existing quality assurance protocol for brachytherapy afterloaders includes condition monitoring of brachytherapy afterloaders, as well as monitoring of these devices after installation, repair or radiation source replacement [4].

According to modern international requirements for cancer patients treatment, it is necessary to renew the existing protocol and supplement it with the following sections: quality control of the X-ray (IBU) unit used in obtaining X-ray images for planning, and quality control of CPS. The instructions need to take into account the requirements of current regulatory documents for the radiotherapy departments.

The development of a new quality control program of brachytherapy equipment will allow us to summarize the planned dose to the patient and thus increase the level of its radiation safety. Regular quality control of brachytherapy equipment and CPS is a necessary condition for providing high-quality medical care to oncological patients in the Republic of Belarus.

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ENGINEERING OF *ESCHERICHIA COLI* STRAINS – PRODUCERS OF GUANOSINE MONOPHOSPHATE – AND CYTIDINE MONOPHOSPHATE KINASES

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Escherichia coli pGMK and pCMK strains producing cytidine monophosphate kinase and guanosine monophosphate kinase, respectively were genetically engineered. The enzymes catalyze synthesis of nucleoside diphosphates from the corresponding nucleoside monophosphates. The productive capacity of strains *E. coli* pGMK and pCMK constitutes 3.3 and 4.2 thousand units of enzyme activity per 1 liter of cultural liquid, respectively.

Keywords: cytidine monophosphate kinase, guanosine monophosphate kinase, nucleoside triphosphates, *in vitro* transcription.

Transcription *in vitro* – is an artificial method of RNA synthesis in cell-free system using purified DNA molecule as a matrix. This method is used to investigate transcription mechanisms in pro- and eukaryotes, RNA recombination processes, to produce RNA-based aptamers, for mRNA transcription in systems envisaging cell-free protein synthesis. Transcription *in vitro* necessitates application of expensive nucleoside triphosphates (NTP),

DNA-dependent RNA polymerases and other reagents [1]. It appears that development of technology for producing components indispensable for implementation of transcription *in vitro* is likely to reduce the cost of reagent purchase.

NTPs act as precursors of RNA molecule. There are four kinds of NTP engaged in transcription *in vitro*: ATP, GTP, CTP and UTP. A large variety of chemical and enzymatic methods was proposed for NTP production [2; 3]. Enzyme-mediated NTP manufacturing scheme is presented as follows:

Nucleoside monophosphate (NMP) → Nucleoside diphosphate (NDP) → NTP.

NDP synthesis from NMP proceeds using nucleoside monophosphate kinases. Guanosine monophosphate kinase (GMP kinase) is involved in GDP synthesis from GMP, while cytidine monophosphate kinase (CMP kinase) catalyzes production of NDP from NMP of pyrimidine series. NTPs are derived from NDPs with the aid of non-specific enzyme nucleoside diphosphate kinase, promoting phosphorylation reaction for all four NDPs.

Taking into account the preamble, the present study was aimed at engineering of strains – sources of GMP kinase and CMP kinase.

The research resulted in novel recombinant *E. coli* strains pGMK and pCMK demonstrating heterologous expression of *Saccharomyces cerevisiae* enzymes GMP-kinase and CMP-kinase, respectively. The structure of the above-mentioned proteins contains complementary octahistidine oligopeptide at C-terminus, allowing to recover enzymes in a single stage using affinity chromatography on Ni-NTA resin. Following SDS gel electrophoresis the target proteins accounted for 20 % of total protein fraction. Enzyme-generating capacity of strains *E. coli* pGMK and pCMK equaled 3,3 and 4,2 thousand units per 1 liter of cultural liquid, respectively.

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INDICATORS OF GLYCATED HEMOGLOBIN AND BLOOD GLUCOSE IN TYPE 2 DIABETES MELLITUS IN PATIENTS OF SMORGON

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The study involved patients Smorgon district clinic. The study involved 20 volunteers. Patients were invited for control examinations once a month for 3 months. The study revealed a direct positive relationship between the level of blood glucose level and glycated hemoglobin: the higher the indicators for one criterion, the higher, and compare with it.

Keywords: diabetes mellitus, glycated hemoglobin, glucose.

Diabetes is a disease that is characterized by a chronic increase of sugar level (glucose) in the blood.

In the Republic of Belarus at the beginning of this year at the dispensary, there were about 288 thousand patients with diabetes, including the 2nd type – more than 268 thousand people.

The main causes of diabetes mellitus type 2 are: genetic predisposition; obesity, particularly Central or abdominal it type; age (the degree of disruption of glucose tolerance is constantly increasing with age), physical inactivity (loss of muscle leads to increased glucose levels in the body).

The purpose of the study is based on experimental data to study the performance of glycated hemoglobin and blood glucose and their relationship with diabetes 2 type patients the city of Smorgon.

Were investigated patients Smorgon district clinic. The study involved 20 volunteers. Patients were invited for control examinations once a month for 3 months. The study involved 12 people are female (60,0 %) and 8 males (40,0 %). The average age of patients was 53,5 years. Identified the diagnosis of diabetes mellitus of the 2nd type.

The study volunteers revealed that among patients with diabetes mellitus of the 2nd type, the level of glycated hemoglobin is between 7 to 8 % inclusive have 40,0 % of the patients of the clinic, from 8 to 9 % inclusive –

20,0 %, from 9 up to 10 % – 10,0 % of patients. The average value of the level of glycated hemoglobin in the study group after the first survey was 8,43±1,71 %, after the second and 7,60±0,87 %, after the third survey – of 7,53±0,64 %. The calculated student's t-test is less than table, then the differences of the compared values is statistically not significant.

Among patients with diabetes mellitus of the 2nd type, the level of glucose in blood is 6 to 8 mmol/l inclusive at 20,0 % of patients Smorgon regional clinics, from 8 to 10 mmol/l inclusive at 50,0 per cent, from 10 to 12 mmol/l, inclusive, from about 20,0 %, more than 12 mmol/l in patients of 10,0. The average value of blood glucose at study group Smorgon district clinic after the first inspection made of 10,66±2,86 mmol/l, after the second of 9,34±1,40 mmol/l, after the third survey – of 9,18±1,04 mmol/L. The calculated student's t-test is less than table, then the differences of the compared values is statistically not significant.

To establish the statistical significance of the obtained results, we used the method of mathematical statistics – rank correlation coefficient. Correlation coefficient coincided with the critical value for significance level of 1 %. The study revealed a direct positive relationship between the level of blood glucose level and glycated hemoglobin: the higher the indicators for one criterion, the higher, and compare with it.

DYNAMICS OF PREVALENCE OF TUBERCULOSIS RESISTANT TO DRUG THERAPY AMONG RESIDENTS OF MINSK CITY FOR 2011–2015

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Tuberculosis is a latent infection, which remains one of the biggest threats in the world. According to the World Health Organization in 2015 of 10,4 million people suffered from TB and 1.4 million people died. In this regard, the World Health Organization developed a global strategy «to put an end to tuberculosis» for the period after 2015. The main goal is to end the tuberculosis epidemic. However, a major obstacle to the successful implementation of this plan is the proliferation of drug-resistant tuberculosis forms. In 2015 multidrug-resistant tuberculosis (MDR-TB) was affected by 480,000 people, there were 100,000 cases of tuberculosis with resistance to rifampicin. In 2014 MDR-TB killed 190,000 people.

The purpose of the work is to characterize the features of the dynamics and structure of the primary incidence of tuberculosis, resistant to drug therapy among Minsk residents in 2011–2015.

Keywords: tuberculosis, multidrug-resistant tuberculosis.

The problem was studied on the basis of the data of the health care institution «2nd City TB Dispensary» in Minsk. The data were obtained from the electronic Republican register «Tuberculosis». Extensive indicators, intensive indicators, indicators of visibility have been calculated. The analysis of long-term dynamics of morbidity by the function of a parabola of the first order has been conducted [1; 2].

In Minsk and the Republic of Belarus, there is a similar tendency to reduce the primary incidence of MDR-TB, but at different rates. In Minsk, for example, the level of this disease declined by 13,51 % per year, while in the Republic of Belarus the annual loss was 1,33 %.

In the city of Minsk, men and women have become less likely to have tuberculosis that is resistant to treatment. In 2015, the primary incidence of women was 3,29 cases per 100 thousand people, men – 12,95 cases per 100 thousand people.

In comparison with Minsk, in the Republic of Belarus there is a tendency to increase the level of primary incidence of women by an average of 0,05 % per year.

In the city of Minsk, the primary incidence of people from 0 to 14 and from 15 years and older decreases with an average annual rate of 75,3 % and 13,1 % respectively.

In the Republic of Belarus for five years the primary incidence of the population from 0 to 14 years compared with Minsk, on the contrary, increased, the rate of growth was 9,1 % annually. The incidence of persons aged 15 and older decreased, but at a lower rate than in the city Minsk, on average by 1 % per year.

There are no differences in the types of drug resistance of mycobacterium tuberculosis in Minsk and the Republic of Belarus. The prevalence of multidrug-resistance (36 % and 34 % respectively). The proportion of forms with a wide drug resistance was much lower 21 % and 31 % respectively, monoresistance to rifampicin was observed only in 4 % and 5 % of cases respectively.

Thus, despite the generally positive dynamics of reducing the incidence of MDR-TB in Minsk and Belarus, it is necessary to pay attention to the trend toward increasing incidence of women and children in the age group 0-14 in Belarus and a lower rate of decline in nationwide morbidity compared to Minsk. Further improve measures for prevention, timely diagnosis and successful treatment of every patient with bacterial discharge that will prevent the spread of MDR-TB in the society.

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EVALUATION OF ENDOGENOUS INTOXICATION BY INDICATORS OF PERIPHERAL BLOOD IN PATIENTS WITH LYMPHOMA

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In the course of study, indices of cellular homeostasis were studied. It was noted that in patients with HL, calculation of indices of endogenous intoxication showed an increase in IRLM after treatment by 4 times. In patients with NHL, LII is reduced by 1.8 times, ISL by 1.6 times.

Keywords: Hodgkin's lymphoma, non-Hodgkin's lymphoma, endogenous intoxication.

Lymphoid tumors in general structure of malignant neoplasms occupy the fifth place. In recent years, the incidence of HL and NHL has increased steadily, in developed countries the incidence has almost doubled in the past 20 years. Heterogeneity of lymphomas, difficulties in diagnosis, severity of clinical symptoms, peculiarities of spread, the different nature of therapy, different prognosis and response to treatment make the problem of malignant lymphomas extremely urgent [1].

Systemic action of tumor on body is accompanied by the development of syndrome of endogenous intoxication. The syndrome of endogenous intoxication (SEI) is a syndrome based on the accumulation of toxic substances of various origin in the body, in concentrations that exceed the functional capabilities of detoxification systems, resulting in damage to organs and body systems [2].

In terms of the degree of severity of SEI, one can judge the severity of the disease and predict its course.

1. Leukocyte index of intoxication is calculated by the formula of Kalf-Kalifa. It characterizes the degree of endogenous intoxication and the severity of inflammation.

2. Index of leukocyte shift is the ratio of sum of eosinophils, basophils and neutrophils to the sum of monocytes and lymphocytes. Leukocyte formula shift to the left indicates the course of various kinds of inflammatory processes and infectious diseases, acidosis, and pre-coma [2].

Materials and methods. The work is based on clinical data of 20 patients with lymphomas aged 22–86 years who were on treatment at "Pinsk inter-district oncology dispensary" Healthcare Facility.

In the course of study, the peripheral blood parameters of patients were analyzed, in which the relative number of leukocytes, lymphocytes, neutrophils, monocytes, and ESR was determined. Quantitative study of hematologic indices was performed with hematology analyzer Hemacomp 10 (Italy). According to the formulas, the following indices of endogenous intoxication were calculated: leukocyte intoxication index (LII), leukocyte shift index (ISL), leukocyte and ESR ratio index (IRESR), lymphocyte and monocyte ratio index (IRLM), neutrophil and lymphocyte ratio index (IRNL).

Results. Calculation of integral hematological parameters in patients with Hodgkin's lymphoma showed a decrease in LII from 1,62 rel. units up to 1,3 rel. units, ISL also decreases from 2,95 rel. units up to 2,3 rel. units, which indicates a violation of the reactivity of the organism. IRNL decreases slightly from 3,02 rel. units up to 2,98 rel. units IRESR indicators has changed from 1,04 rel. units up to 1,2 rel. units. As a result of the data analysis, IRLM significantly increased after treatment (from 5,5 rel. units to 22,4 rel. units) 4-fold, which indicates a high sensitivity of monocytes, and also shows the effectiveness of the therapy.

In patients with non-Hodgkin's lymphoma, LII decreases from 1,4 rel. units up to 0,78 rel. units, ISL with 3,1 rel. units by 2 rel. units, IRESR slightly increases from 1,4 rel. units to 1,5 rel. units, IRNL decreases from 3,7 rel. units of 2,6 rel. units and IRLM is also slightly reduced from 9,8 rel. units to 9,77 rel. units.

Thus, in patients with lymphoma, an increase in level of endogenous intoxication resulting from carcinogenesis the tumor has an adverse effect on the immune system and is displayed by inflammatory process during the therapy.

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EPIDEMIOLOGICAL FEATURES OF THE PREVALENCE OF OVERWEIGHT AND OBESITY IN BELARUS

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The problems of overweight and obesity attracts everyone’s attention. Every day we see people who suffer from obesity in many places: in public transport, streets, in shops, hospitals, educational institutions. This disease became widespread long ago, and the number of victims is growing every year. That is why we can't ignore this problem.

Keywords: overweight, obesity, weight gain, weight disorders.

The obesity is medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, as a result weight gain due to excess of adipose tissue. The main sign of the disease is overweight. In later stages, which occur during long-term overeating, certain complications can be observed, such as: the presence of stretch marks on the skin, the violation of the functions of various organs, including sexual function, increase in blood pressure and etc.

In Belarus, among both the urban and rural population, an increase in the frequency of obesity is observed. In modern society, the struggle for normal body weight is not only a medical problem, but also a social one. In this regard, every person who is suffering from overweight is obliged to take timely measures to normalize their physical condition, prevent or even stop further weight gain. After all, even without any medical help, it's possible and feasible for every person caring for their health and well-being. During our research for the last 5 years we have noticed that there is a visible increase of the population with weight disorders in the Republic of Belarus, but at the same time, the growth rates are slowing down. To identify territorial differences, a comparative analysis of the body mass index of the population was carried out in the regions of Belarus in 2011–2016. The most unfavorable situation develops in Minsk and Vitebsk regions. Morbidity rates in Minsk city, Gomel and Mogilev oblasts are lower than the national indices.

Considering growing rates of obesity in Republic here are some recommendations for improving the health of the population:

• It's necessary to take measures on an individual scale, people personally have to normalize their physical condition, stop and prevent weight increase.

• It is necessary to create a free sports infrastructure on a national scale, develop inexpensive rental of inventory and equipment. According to research, individuals with low incomes have fewer opportunities for sports activities (lack of funds to purchase necessary equipment, clothes, equipment), the availability of accessible infrastructure at work or school is positively related to the chances of individual exercising. Also, it's worth to promote active leisure and give more opportunities for active lifestyles, for example adapting cities for bicycle type of transportation – more bicycle tracks, considering every year the number of vehicles in Belarusian cities only increases, traffic lanes for bicyclists to make it most preferable type of transport.

HYGIENIC EVALUATION OF NUTRITION OF CHILDREN VISITING KINDERGARTEN NO. 195 IN MINSK

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The complex hygienic assessment of the status of nutrition of preschool children is given, the excessive and scarce nature of actual nutrition is revealed. The diets of nutrition of the organized children of the kindergarten № 195 in Minsk are depleted of vitamins A, B1, RR. The content of proteins, fats and carbohydrates is normal. There was a shortage of calcium, an excessive supply of magnesium, iron and phosphorus.

Keywords: nutrition, chemical composition, vitamins, minerals, calorie content.

With the purpose to analyze the availability of the organism of preschool children with the main macro- and micronutrients the diets according to the menu-layouts of the kindergarten No. 195 in Minsk were evaluated. The results were compared with the recommended physiological requirements for energy and nutrients for children aged 3 to 7 years.

We analyzed the data from January 2016 to December 2016 through a study of the menu layouts and cumulative statements. Also the structure of food products as a part of the 10-day menu, was analyzed. The mean values and standard errors of the mean for the main macro- and micronutrients were calculated, as well as the ratio of the obtained data to the normative intervals. The analysis of caloric distribution of the diet for individual meals was carried out.

It was shown that the actual nutrition of pre-school children is not balanced and has both a scarce and an excessive character due to the characteristic irrational structure of food sets, with a shortage of beans, confectionery, milk, meat, vegetables, poultry, fish, juice, cheese and eggs , with excessive consumption of potatoes, cereals, cottage cheese in a preschool institution. Assessment of nutrient intake in comparison with the recommendations adopted in the Republic of Belarus and WHO, indicates the norm of proteins, fats and carbohydrates.

A significant deficit in preschoolers consumption of vitamin A (by 10 %), B1 (by 22 %), PP (by 28 %), and the excess of the physiological requirement of vitamin B2 (by 20 %) and carotene (by 40 %) was revealed.

The consumption of mineral substances is characterized by a pronounced imbalance. Against the backdrop of insufficient intake of calcium (by 14,5 %) there is an excess intake of magnesium (by 12,85 %), iron (by 8 %) and phosphorus (by 28,5 %). The content of potassium in the diet of children is within normal limits.

While assessing the distribution of the caloric content of the diet for individual meals, it was found that there is a discrepancy with the requirements and principles of children's diet, but the distribution of the calorific value of the entire diet was 100 % due to the transition of kcal to other meals.

PSYCHOLOGICAL STATE OF WOMEN WITH NEURO-CIRCULATORY DYSTONIA

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This research contains the an analysis of the presence of anxiety in patients with cardiovascular disease. Women with neuro-circulatory dystonia have high levels of trait anxiety, low levels of general condition, activity and mood. Therefore, they need psychological rehabilitation.

Keywords: neuro-circulatory dystonia, cardiovascular dysfunctions, anxiety.

Neuro-circulatory dystonia is a complex of cardiovascular dysfunctions. It develops as the result of violation of neuroendocrine regulation. Cardiovascular dysfunctions can be caused and intensified by acute or chronic stress. Neuro-circulatory dystonia may develop on the background of physical and chemical factors influence, intoxications, physical overload or hypodinamy, wrong feeding, acute and chronic infections etc.

The purpose of the research was to analyze the psychological state in patients with neuro-circulatory dystonia.

Psychological state of 19 women (aged 27–50) with neuro-circulatory dystonia has been analyzed in comparison with 19 healthy women.

The trait and reactive anxiety had been examined with Spilberger Trait Anxiety Inventory and psychological test GAM (general condition, activity, mood).

It was revealed that the levels of trait anxiety in women with neuro-circulatory dystonia have been significantly higher in comparison with healthy women (53,0±1,6 and 40,6±1,5, $p < 0,001$). The levels of trait anxiety in women with neuro-circulatory dystonia had been appraised as high.

The reactive anxiety in women with neuro-circulatory dystonia had average level and tendency of its increase towards the control group (41,9±4,9 and 38,9±1,6).

The levels of general condition and mood in women with neuro-circulatory were above normal indices.

The levels of activity in women with neuro-circulatory dystonia were significantly lower in comparison with healthy women $p < 0,001$).

The data of psychological examination indicate that women with neuro-circulatory dystonia have high levels of trait anxiety, low levels of general condition, activity and mood. Therefore, they need psychological rehabilitation.

SPECIFIC FEATURES OF PSYCHOLOGICAL STATUS OF PATIENTS WITH DIABETES MELLITUS

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The object of the research is the archival data of the Rehabilitation and Health Laboratory of the NIKI RM and E.The research has been conducted. It has been revealed that low levels of activity is considerably observed in cases of the DM sick more often, and low levels of health are observed among the control group. Gender distinctions of the studied indicators have been revealed.

Keywords: Diabetes mellitus, insulin-dependent, self-suffering, depression, asthenium, activity, mood

The morbidity of diabetes mellitus raises in Belarus steadily as well as in the whole world. According to the latest researches, not only environment and somatic factors but also psychological state plays an important role in the development of diabetes mellitus. From the other side, disorders in psychological state lead to the progress of the disease and to the development of its complications.

The purpose of our research is to analyze the levels of general condition, activity and mood of patients with diabetes mellitus.

Psychological state of 60 persons has been examined with psychological test GAM (general condition, activity and mood): 38 patients with diabetes mellitus and 22 healthy people.

The middle levels of general condition of patients with diabetes mellitus and healthy people were the same. In fact, we can see the low levels of general condition among women with diabetes mellitus more rarely then among the healthy ones (37,5 % and 55,5 %). Moreover, the low levels of general condition in the group of healthy women can be found 2,1 times more frequent than in the group of healthy men (23,08 %). It can be connected with the condition of psychological testing: patients with diabetes mellitus were tested in a rehabilitation center while healthy people were questioned during the working week. In real life, most of the women have more duties than men. The low levels of general condition in the group with diabetes mellitus can be found more frequent among women than among men(37,5 % and 28,6 %).

The middle levels of activity of patients with diabetes mellitus and healthy people have not any significant difference. Nevertheless, the low levels of activity of patients with diabetes were discovered more often in comparison with the group of healthy people (50 % and 30,8 % among men, 45,8 % and 33,3 % among women).

The middle levels of mood of patients with diabetes mellitus and healthy people were the same. However, the low levels were discovered more frequently in the group of patients. This difference was more significant among men (35,71 % and 15,38 % among men; 37,5 % and 22,2 % among women).

In conclusion, we would like to say that patients with diabetes mellitus have certain differences in the levels of general condition, activity, mood in comparison with healthy people and these differences are connected with gender.

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DISEASES OF THE DIGESTIVE SYSTEM AS A MEDICAL AND SOCIAL PROBLEM IN THE REBUBLIC OF BELARUS

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The indicators of morbidity and mortality of the population of the Republic of Belarus with diseases of the digestive system in 2008–2015years were analyzed. A retrospective analysis of the morbidity rates of the population of the Republic of Belarus with diseases of the digestive organs, analyzed the dynamics and identified the main trends in their distribution among different age groups of the population of our country is performed.

Keywords: diseases of the digestive system, risk factors, morbidity, mortality, trend.

For now, the diseases of gastrointestinal tract are one of the important and difficult problems to solve in modern medicine. The frequency and prevalence of this pathology determine the relevance of this problem. This is due to malnutrition, adverse environmental conditions, constant stress, and modern rhythm of the people's lives. An important argument that determines the medico-social significance of diseases of the digestive system is that all age groups of the population (people of working age, elderly, old people, children and adolescents) suffer from this pathology [1].

The objective of this study is to analyze the morbidity and mortality of the population of the Republic of Belarus with diseases of the digestive system.

In the structure of the morbidity of the population of the Republic of Belarus in 2008 diseases of the digestive system occupy the fourth place (6,3 %).Initial positions are occupied with respiratory diseases (30,2 %), diseases of the circulatory system (16,0 %), and diseases of the osseous – muscular and connective system (6,4 %) [2]. It should be noted that in 2015, the specific gravity of morbidity due to diseases of the digestive system decreased to 5,6 % [3], which is possibly associated with annual preventive and curative measures in our country. For 2008–2015, there was a downward trend ($R^2 = 0,66$) of the incidence of diseases of the digestive system among the total population of the Republic of Belarus. The number of cases at the beginning of the period was 8 946,4 per 100 000 population, in 2015 this index decreased to 8657 $^0/_{0000}$.The average annual incidence rate is A0 = 8792 $^0/_{0000}$.

For revelation of the territorial differences, we analyzed the dynamics of the incidence of diseases of the digestive organs of the population of the Republic of Belarus by regions in 2008 and 2015. In 2008, the most unfavorable situation observed in Gomel region (11199,7 $^0/_{0000}$) and in the city of Minsk (10008,4 $^0/_{0000}$), where the incidence rates exceed the average national level (8946,4 $^0/_{0000}$). In 2015, the situation in the regions was persistant, except the indicator in Grodno region (9647,1 $^0/_{0000}$), it is higher in comparison with an average republican indicator of 8657 $^0/_{0000}$.

The indicator that reflects character of the epidemiological trends of morbidity is the mortality rate. The mortality of the population of the Republic of Belarus from diseases of the digestive system is characterized by a downward trend($R^2 = 0,5$). In 2008 and 2015, mortality indicators are 47,5 % and 38 % respectively. At the same time, the greatest value was observed in 2011 (58,5 %).

The largest share in this pathology is attributed to a population older than the able-bodied (61,26 % in 2015). At the same time there is a decrease in mortality from this pathology among the able-bodied population (7,7 %). The infant mortality rates remain approximately at the same level throughout the study period.

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DETERMINATION OF EXPRESSION OF COX-2 AND MMP-7 GENES AMOUNG PATIENTS WITH GASTRIC CANCER

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In this research, we have studied the expression of genes COX-2 and MMP-7 in tumor and abdominal tissues of patients suffering GC to determine the course of the disease.

Keywords: gastric cancer, expression, matrilysin, cyclooxygenase, molecular genetic studies, polymerase chain reaction.

Today, gastric cancer (GC) is the fourth largest oncological pathology in the world, after lung cancer, breast cancer and colon cancer. GC annually affects about 1 million people [1].

MMP-7 (matrilysin) is the matrix of metalloproteinase. It initiates epithelial-mesenchymal transfer, which leads to distant metastases. Feature of MMP-7 is that it is presented in the form of tumor cells and involved in cancer development, from its early stages [2].

COX-2 (cyclooxygenase) activated under certain circumstances, for example, with inflammation. It is introduced by macrophages, fibroblasts, smooth vascular musculature, and endothelial cells [3].

The research is based on data research from 79 patients with gastric cancer, treated at the Belarussian research center of N.N. Alexandrova during the course of 2013–2016. The study of the genes expression of MMP-7 and COX-2 was performed by using a polymerase chain reaction (PCR) in real time, using the amplifier Bio-Rad iQ5 (USA), using a set of reagents "Maxima Hot Start DNA polymerase kit" (Fermentas, Lithuania). DNA extraction was performed by reverse transcription, using a set of reagents "miRNease Mini Kit" manufactured by Qiagen (Germany).

In the course of this study,the analysis of the COX-2 in the abdominal tissue and the tumor tissue among patients suffering from gastric cancer was carried out. The baseline is the gene expression of COX-2 is set to (0,049–20,17 relative units) identified from normal tissue. As a result of molecular-genetic studies of abdominal tissue among patients with gastric cancer, it was discovered that in 27 (34,2 %) cases, the expression level of the COX-2 gene exceeded the baseline level. it has been noticed that 16 (20,2 %) patients had the level of expression below the baseline. 36 (45,6 %) patients had the expression of this gene within the baseline value. In the study group, 10 (12,6 %) patients has COX-2 gene expression level in tumor tissue was above baseline, in 9 (11,4 %) cases below the baseline level, and 60 (76 %) patients with detected stomach cancer the expression value of the COX-2 gene within the baseline.

Patients suffering from gastric cancer had an analysis of the expression of the MMP-7 gene in abdominal tissue and tumor tissue. When analyzing the obtained data in the expression of this gene in the baseline level in abdominal tissue and tumor tissue the value (0,04 to 24,6 relative units), was detected for normal tissue. In the abdominal tissue it was discovered that 25 (31,6 %) patients had the level of gene expression exceeded the base value of MMP-7 gene expression, 4 (5,1 %) cases had the expression below the baseline, 50 (63,3 %) patients' level depending on the baseline value. In a tumor tissue 10 (12,6 %) patients had the level of gene expression exceeded to the baseline level, 8 (10,1 %) patients had the expression below the baseline, 61 (77,3 %) patients with detected gastric cancer had the expression within the baseline level.

Thus, according to this data analysis, the gene expression of COX-2 and MMP-7 in abdominal tissue and tumor tissues found that the expression of the gene COX-2, is detected 2,3 times more often, and gene MMP-7 – 1,6 times in the abdominal tissue than the tumor tissue, that may indicate a high proliferative activity of tissues among patients with GC, the prevalence of the tumor process and the bad prognosis of the disease.

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SPECTRAL MICROTOMOGRAPHY USING THE MARS-CT

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The aims of this work are visualization of unknown object and material identification using spectral computed tomography. It is very important to study this processes, as it may lead to the development of new innovative approaches in the biomedical research (example, for tissue identification) and in the geophysical studies (example, ore composition).

Keywords: MARS-CT, CT, X-ray, Timepix detector, 3D visualize, atomic number, pixel.

Many of us heard about computed tomography (or simple CT) as an indispensable imaging method in clinical routine. CT produces a volume of data to demonstrate various bodily structures based on their ability to absorb the X-ray beam. As you know, X-ray radiation is of electromagnetic nature. And CT operates by using an X-ray tube that rotates around the object. As a result, we get a picture. But for the other purpose, such as material testing and analysis it's more useful a miniaturized design of the cone beam CT, which called Micro-CTs. The X-rayed measuring field, usually as small as $2cm^3$ in volume, is so small that medical applications might seem to be ruled out. But we can use it in human medicine, example, for analysis of trabecular structures in bones. Micro-CTs are also ideal scanners for radiological examinations of small animals.

In our work we use MARS-CT scanner. The abbreviation MARS means *Medipix All Resolution System.* The key feature of the MARS-CT is the ability to measure quantitative information about the elemental, molecular information of tissues and contrast materials on the basis of their attenuation properties. For this purpose, in our MARS-CT was installed gallium arsenide-based 1 mm-thick Timepix detector + Fitpix readout interface with more than 65 thousand pixels, 1 energy threshold per pixel, microfocus X-ray tube. The gantry is surrounded by the lead shield. The scan procedure is fully automatic. The sample stays motionless. The size of a sample may be up to the diameter of 10 cm and up to the length of 30 cm. The bias voltages for the sensor were 700 V and 500 V.

The MARS-CT scanner and image processing are used to obtain practical skills of making scans. And we were working on two different tasks. The first one was to identify an unknown object. So, we scanned the object by the MARS CT scanner, and then we got shadow projections. Then, we processed the obtained projections using an imaging processing software to reconstruct and 3D visualize an image. The second task of our project was to study the ability of MARS scanner and to identify different materials with different concentrations and atomic number. In this regard, we used a phantom of 9 falcon tubes which have the materials under study. We studied this under two different applied bias voltages to the sensor (500 V & 700 V). Using the same steps in the previous slide, we were able to calculate the linear attenuation coefficients which is related to the energy. The result are following:

1. The multi-energy spectral CT system has the ability to discriminate nine materials from each other. The addition of a color spectrum to the spatial resolution provided by MARS-CT scanner gives significantly more information.

2. The highest voltage that the detector can withstand is 700 V, and this may result in producing a good quality image. On the other hand, as we decrease the voltage to 500 V, it gives lower quality.

3. In the terms of field size, it doesn't make any difference for the results.

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SCIENTIFIC COMPUTING IN PYTHON

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Python is used in many ways. There are libraries for scientific calculations that make life easier for scientists. This language is fond of physics and mathematics for its easy to use.

Keywords: Python, MATLAB, NumPy, SciPy, Scikitlearn.

The Python programming language quite rapidly. Its scope is quite extensive, it is used in Web development, system administration, software and games, as well as in scientific research. Python is used and distributed free of charge, you can download it from official sites www.python.org. It is used in such campaigns as Google, Facebook, Dropbox, NASA, Fermilab, JPL. Using Python you can implement machine learning, an example is the prediction of the financial market. Intel, Cisco, and IBM use Python for hardware testing. The ease of this language, his love of mathematics and physics. MATLAB was originally written for scientific computing, unlike Python. But Python has many libraries that make life easier for scientists. An example of such libraries are SciPy is the library of scientific tools. It has modules to integrate and allows to solve the differential equation, signal processing, and helps in various problems that are solved in science and engineering. On top of it implemented a variety of modules for different fields of science. One of them Scikitlearn. These modules can be compared to MATLAB Toolbox. NumPy package allows you to conveniently work with vectors and matrices, the realization of all operations with them are carefully optimized. NumPy can be compared with the "core" of the MATLAB language. In the vast majority of research projects are written in Python using NumPy. Were also developed the Anaconda distribution, containing 720 packages, libraries for scientific and engineering computing.

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THE STATE OF CALCIUM METABOLISM IN RAT PLATELETS IN THE NEAREST AND LONG TERM AFTER IRRADIATION

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The investigation of the status of calcium metabolism in platelets of rats in the early and late periods after irradiation.Under the action of γ-radiation on platelets of rats revealed a change in indices of calcium metabolism in the early and late periods after irradiation (3rd, 10th and 30th day).

Keywords: calcium metabolism, platelets, irradiation.

Under ionizing radiation on the body one of the most sensory systems is the blood system. Among the cell elements, platelets play a crucial role in changing hemodynamic properties.One of the factors triggering platelet aggregation is Ca^{2+}. The calcium metabolism in rat platelets was analyzedin the experiment. Studies were carried out on mature white male rats (3 to 6 months age). Two groups of animals were studied. One group, the control group, was kept in the usual conditions of the vivarium. The animals of the second group were irradiated with

γ-radiation in a dose of 1Gy and the state of calcium metabolism in platelets was studied on the 3rd, 10th and 30th days after irradiation.

Methods. The fluorescent pathfinder Fura-2/AMwas usedfor the quantitation of calcium concentration in platelets. The concentration of $Ca^{2+}$is calculated based on the measurement of fluorescence upon excitation of these two wavelengths according to the formula:

$$\left[Ca^{2+}\right] = K_d \frac{R_{\max 380}}{R_{\min 380}} \frac{F - F_{\min}}{F_{\max} - F}, \quad (1)$$

where is the dissociation constant of the complex Fura-2/AM , $F = \frac{R_{340}}{R_{380}}$ – calcium – current ratio of fluorescent signals, $F_{\min}$ – the same ratio in the solution with low concentration of Ca^{2+}, $F_{\max}$ – the same ratio in a solution with a high concentration of Ca^{2+} (max and min when adding Triton (10 %) and EGTA (100 mmol/l), respectively). K_d = 224 nmol/l.

An increase of the basal level of calcium ions (85,9±5,2 nmol/l) in calcium-free environment(100 mM EGTA) in platelets of rats wasrecordedafter irradiation on 3rd day. There is a decrease in the basal level on the 10th day after exposure to calcium-free environment.

There is a greater than normal (111,4±5,8 nmol/l) increase (289,5±11,7 nmol/l) in the concentration of calcium ions in the platelets of irradiated rats on the 3rd and 10th day in response to the action of physiological inducers of platelet aggregation – ADP (20 mcrM) in the presence of 1 mM $CaCl_2$,

The content of cytoplasmic calcium by the action of thrombin (0,2 IU/ml)was increased only on day 3th (561,9±12,1 nmol/l) and on 10th (374,4±15,66 nmol/l) day did not differ from the norm (383,2±15,2 nmol/l).

The concentration of calcium ions in the cytoplasm of platelets suspended in calcium-free and calcium-containing (1 mmol) in platelets of irradiated rats 30 days (49,6±3,2 nmol/l and 79,1±4,0 nmol/l) after irradiation was not substantially different from the values in the control group (44,8±3,6 nmol/l and 67,6±7,1 nmol/l).

Conclusion. The change in indices of calcium metabolism was revealed in the early and late periods after irradiation under the action of γ-radiation on platelets of rats: on the 3rd day after irradiation, an increase in the basal level of calcium ions in the platelets of irradiated rats in calcium-free and calcium-containing medium, and at 10-th and 30-th day its normalization. An increase in the intracellular concentration of Ca^{2+} ions under the action of ADP and thrombinis presented on 3rd and 10-th day, and did not differ from the norm on 30-th day.

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MULTIPLE CONFORMATION STATES OF HUMAN HEMOGLOBIN

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Hemoglobin (Hb) is one of the vital biomolecules in nature that plays a central role in binding, transporting and offloading oxygen from the lungs to the tissues to respiring cells, and represents the most well-defined and intensely studied allosteric protein. Hb exists in equilibrium between unliganded or deoxygenated Hb possessing low oxygen affinity, and the liganded or oxygenated Hb, which has a high oxygen affinity. Monod et al. assigned the deoxygenated Hb to the T (tense) and oxygenated Hb to the R (relaxed) states.

Our purpose is to study a number of intense and relaxed states of hemoglobin, which determine the degree of affinity of this protein to oxygen.

Keywords: hemoglobin (Hb), allosteric protein, deoxygenated Hb, oxygenated Hb, allostery, hemoglobin's affinity, conformation, ligand.

The presence of two allosteric states: R (relaxed) and T (tense) is postulated for hemoglobin. The state of R is high and T is low affinity for oxygen (molecular oxygen is more strongly bound and molecular oxygen is more weakly bound).

Quaternary structures of the T and R forms were used to substantiate the model of two states of the mechanism of functioning of allosteric proteins, which suggests that, upon ligand binding the T-form passes into the R-form without intermediate states.

At present, the obtained functional, thermodynamic, spectroscopic and structural studies suggest the existence of individual varieties of the T-state and / or discrete multiple states that are in the path of the T → R transition. The relaxed state of hemoglobin is not a single-valued classical R-state, but it is a set of completely liganded states, each of which has an individual quaternary structure. The most well-known examples are R2-, RR2- and R3-states [1]. The transition T → R2 was initially assumed to lay on the transition path T → R with the R-conformation as the final state. However, further studies have shown that the R2-state is not intermediate, but rather a finite structure in the T → R2 transition series, passing first through the T → R-state, and then through the R → RR2 transition. The RR3 structure exhibits some intermediate structural features between the R and R3 states. The researchers found that R-, R2- and RR2-conformations are involved in the transport of the ligand to the gem, while the R3 and RR3 conformations can be involved in the liberation of the ligand. The transition states have a greater affinity than the states R and T [2].

Multiple conformational states contribute either to the high affinity of hemoglobin to oxygen or, conversely, to a decrease in affinity for oxygen. These states are determining the binding strength, which is necessary for the performance of hemoglobin functions.

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ANALYSIS OF GENITOURINARY INFECTION PREVALENCE IN DIFFERENT AGE AND SOCIAL GROUPS

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Statistical analysis of genitourinary infection prevalence in different age and social groups in the town of Drogichin and Drogichin district in 2011–2016, based on the data collected by the Drogichin Central District Hospital, demonstrated decline in incidence of all reviewed genitourinary infections: genitourinary trichomoniasis by 58 %, genitourinary chlamidiosis by 58 %, genitourinary candidosis by 15 %.

Keywords: genitourinary infections, sexually-transmitted diseases, trichomoniasis, chlamidiosis, candidosis.

Infectious inflammatory diseases hold a special position in the world total disease incidence. Inflammatory conditions rank first among gynecological disorders. Genitourinary infections are the trigger of inflammation in 80 % cases. Reportedly, about 90 % of world population suffer from genitourinary infections or carry them. Infectious inflammatory genitourinary tract diseases are among main reasons of degradation of the quality of life and fertility.

The required data for analysis of genitourinary infection prevalence in different age and social groups were collected from documents of the dermatovenerologic service of the Drogichin Central District Hospital. I use information from Reports on Registered Sexually-Transmitted Diseases as well as The Structure of Control Group in 2011–2016. The Control Group includes residents of Drogichin and Drogichin district, men and women, age groups 0–14, 15–17, 18–19, 25–29, 30–39, 40–49, over 50.

Based on the analysis, we may say that in 2011–2016, the prevailing infection among the population of Drogichin district was candidosis (18–27 cases per 10 000 people), the trichomoniasis infection rate was 8–20 cases per 10 000 people, the chlamidiosis rate – 4–10 cases per 10 000 people. In Drogichin and Drogchin district the highest trichomoniasis sick rate is observed in the age group 30–40, the highest chlamidiosis sick rate is registered

in the age group 20–30, the highest candidosis sick rate – in the age group 25–40. Meanwhile, 93–100 % of patients are female. If analysed per 10000 people, the trichomoniasis sick rate of rural population is by 40 % higher than with urban population, the chlamidiosis sick rate of rural population is by 50 % higher than with urban population, and the candidosis sick rate of rural population is by17 % lower than with urban population.

THE ANALYSIS OF EPIDEMIOLOGICAL ASPECTS OF EYE DISODERS MORBIDITY OF THE CHILD POPULATION OF NOVOGRUDOK CITY

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There is a steady tendency towards an increase in the incidence rate of the eye and its adnexa in both adults and children in the Republic of Belarus. Ophthalmic pathology has one of the leading positions in the structure of morbidity.

Keywords: analysis, child population, morbidity, eye.

Additional health risk factors associated with the use of modern devices was formed in recent years, which is directly related to the growth of ophthalmic pathology. Therefore, the analysis of the incidence rate of the eye and its adnexa using quantitative methods of evaluation has both relevant and prognostic interest.

The purpose of the study is to carry out a quantitative analysis of the eye disorders morbidity in the child population of Novogrudok.

The object of the study was the data from the State statistical reporting on the number of cases of diseases of the child population of Novogrudok, received in the healthcare institution "Novogrudok Child City Hospital" and the data on child population, obtained from the Demographic Yearbooks of the Republic of Belarus for the period studied. The following methods were used in the study: the calculation of extensive coefficients, the analysis of statistical series by the method of the first-order parabolic curve graduation, the calculation of the annual average morbidity rate, the calculation of the dynamics of the average annual morbidity.

The results of the research showed that the diseases of the eye and its adnexa in the last four years occupied the second rank place, in 2011–2013 – the third rank place, in 2008–2010 the third rank place in the structure of the eye disorders morbidity of child population of Novogrudok for the entire study period (2008–2016). The analysis of the statistical series of general morbidity revealed an unstable growth of the index ($R2 = 0,60$). Significant difference upwards the incidence of general morbidity in 2016 ($464,2 \pm 16,5$) $^0/_{000}$ compared to 2008 ($364,6 \pm 19,4$) $^0/_{000}$ ($t = 4,1$, $p < 0,001$) was indicated. The analysis of the statistical series of primary incidence rate was carried out by the method of the moving average graduation. An unstable increase in the index ($R2 = 0,52$) was revealed. The comparative analysis of the indices at the end of the study period compared with the beginning did not reveal significant differences ($t = 1,7$, $p > 0,05$). The calculation of the ratio of the total and primary eye disorders morbidity of the child population of Novogrudok was carried out. It was revealed that the coefficient ranged from 2 to 4,4 in the last four years of study.

The diseases of the eye and its adnexa were distinguished into a separate class of diseases in 2004. Until 2004, this class of diseases was a part of the class of diseases of the nervous system and sensory organs and occupied the first rank place in the structure of this class of diseases. The increase in the ratio of the total and primary disease incidence of the eye and its adnexa from year to year may indicate an increase in the chronicity of pathology among the child population of Novogrudok.

MOLECULAR AND CYTOGENETIC DIAGNOSTICS OF LYMPHOMA

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In the course of the study, the expression levels of the Bcl-2 and Bcl-6 genes responsible for proliferative activity were determined in patients suffering from lymphoma.

Keywords: Hodgkin's lymphoma, non-Hodgkin's lymphoma, immunohistochemical analysis, expression, molecular-cytogenetic diagnostics.

Lymphoproliferative diseases belong to the blood cancer group and occupy the fifth place among all oncological diseases. Lymphoma is a common disease, which is a heterogeneous group of malignant tumors [1].

For early diagnosis of lymphoma, it is necessary to know the molecular-cytogenetic characteristic of the disease. When analyzing the expression value, it was established that precisely during the identification of the Bcl-2 and Bcl-6 genes the patients had an extremely unfavorable prognosis. The prognosis of the disease depends on the overall level of activity and the mechanisms that lead to an increase in the expression of each of these genes and the production of the corresponding proteins.

The Bcl-2 gene protects cancer cells from apoptosis. This can lead to the continuation of the division of mutated cell lines and then to cancer. Moreover, overexpression of Bcl-2 can affect metastasis [2]. The Bcl-6 gene makes the cells less sensitive to DNA damage, protects them from apoptosis, and leads to the development of resistance to drugs [3].

The study was based on clinical data of 35 patients, aged from 24 to 76 years, with the disease of groups of non-Hodgkin's lymphoma and Hodgkin's disease, treated on the basis of the State Institution "RNPTS OMP named after N.N. Alexandrov "from 2015 to 2016.

When analyzing the extent of the tumor process in patients with lymphomas, it was found that stage I was diagnosed in 6 % of cases, 9 % of patients had Stage II, 11 % had III, and 60 % had Stage IV disease.

The level of expression of the proliferative antigens Bcl-2 and Bcl-6 was determined by immunohistochemistry using the DAKO kit (manufactured in Denmark) with the imaging system EnVision +.

When analyzing the morphotype of lymphomas, it was found that in most cases, malignant neoplasms belong to such categories as diffuse B-large-cell non-Hodgkin's lymphoma (29 %), Hodgkin's lymphoma (14 %), diffuse B-small-cell non-Hodgkin's lymphoma (14 %), mantle cell non-Hodgkin's lymphoma (3 %), B-cell lymphoma of Burkitt (3 %), B-cell lymphoblastic non-Hodgkin's lymphoma.

As a result of the analysis of the obtained data, it was found that 16 % of patients suffering from lymphoma, had a high level of expression of the Bcl-2 gene. A moderate level of expression occurs in 63 % of patients, low expression level – in 16 % of cases, absence of expression was detected in 5 % of patients. The Bcl-6 gene was detected: a high level of expression in 46 % of cases, with a moderate – 27 %, with a low gene expression frequency of 9 %, absence of expression level was detected in 18 % of cases.

Based on the obtained data, it can be concluded, that the expression of the Bcl-2 gene is most characteristic in the following morphotypes: diffuse B-large cell lymphoma, B-small cell lymphoma.

High level of expression of the Bcl-6 gene is detected more often with the following morphotypes: Burkitt's lymphoma, diffuse B-large-cell non-Hodgkin's lymphoma, Hodgkin's lymphoma, which may indicate a high proliferative tumor and unfavorable course of the disease.

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THE INFLUENCE OF PATHOLOGY OF THE THYROID GLAND ON REPRODUCTIVE HEALTH OF WOMEN

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Extent of influence of pathology of a thyroid gland on the course of pregnancy is studied. It is established that the most expressed violations of reproductive function are shown at women with a hypothyrosis.

Keywords: pathology of a thyroid gland, reproductive health, pregnancy.

The problem of maintaining of women health of reproductive age is relevant now and in many respects defines demographic safety of our country. One of the priority directions of health care is the question of prediction and prophylaxis of individual risks of development of those pathological states which can adversely influence a state and development of reproductive health of each woman. [1]

The reproductive system is most subjected to the influence of various factors, it is undergone serious changes in response to the environmental aggression. Therefore, the increase in thyroid pathology affects health of reproductive system of women and causes special alarm.

Frequency of cases of a thyroid gland disease during pregnancy increases, negatively affects the course of pregnancy and considerably increases risk of not incubation and also development of pathologies in a fetus. [2]

The great value is gained by researches on studying of a becoming of reproductive function against the background of various diseases of a thyroid gland: an autoimmune thyroiditis (AIT), a hypothyrosis and a thyrotoxicosis, since the early pubertal period up to realization by the woman of genital function. [3]

When studying communication of pathology of a thyroid gland with reproductive health of women it is established that the main reason for an adverse course of pregnancy – hormonal failures against the background of pathology of a thyroid gland.

The thyroid pathology is one of the heavy dysfunctions of reproductive system of the woman determining by the reason. The diseases of a thyroid gland at approach of pregnancy can lead to the formation of a placentary failure and consequently, prematurity and incidence of newborns.

The pregnancy can worsen considerably the course of any disease of a thyroid gland and lead to the considerable problems of reproductive function.

The highest frequency of problems with incubation, complications at the pregnant woman and a fetus, prematurity, the considerable weighting of a current of a childbed, mainly adverse forecast of childbirth is observed at a hypothyrosis.

The hypothyrosis at most of patients developed against the background of AIT, and the hyperthyroidism developed owing to presence of a diffuse toxic craw at pregnant women. Women with lungs and averages on weight thyrotoxicosis forms well transfer pregnancy. [4]

The combination of several pathologies gives the highest frequency of an adverse course of pregnancy and pathological childbirth. For improvement of result of childbirth patients with pathology of a thyroid gland need the maximal extent of correction of a disease, prophylaxis and treatment of pathology of pregnancy, antepartum diagnostics and correction of pathological conditions of a fetus.

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IMMUNOPHENOTYPE OF PERIPHERAL BLOOD AND CEREBROSPINAL FLUID OF PATIENTS WITH PARKINSON'S DISEASE

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In the early stages of Parkinson's disease development shifts in lymphocytes subsets are observed in the peripheral blood as well as cerebrospinal fluid of patients. Therefore lymphocytes immunophenotyping has an important diagnostic significance. This thesis describes a characteristic of lymphocytes subpopulation composition in patients with different course of Parkinson's disease.

Keywords: Parkinson's disease, cerebrospinal fluid, immunophenotype.

Introduction. Parkinson's disease (PD) is one of the most common chronic neurodegenerative diseases, caused by the progressive destruction and death of dopaminergic neurons of black substance and other parts. Despite various trigger events, during the development of the disease chronic immune activation, in particular microglia, of resident macrophages of the central nervous system is observed. It leads to neuronal damage by affecting the blood-brain barrier, which attracts cells of the adaptive immune system that exacerbate the pathogenesis of the disease. In this regard, the study of the immunophenotype of peripheral blood and cerebrospinal fluid is an important diagnostic value.

Aim. To assess the subpopulation subsets of peripheral blood lymphocytes and cerebrospinal fluid cells in patients with PD (n=2).

Materials and methods. The material for the study was the whole blood and cerebrospinal fluid of PD patients (n=2). Subpopulation of lymphocytes was determined by flow cytometry using monoclonal antibodies.

Results. Cytofluorimetric analysis of peripheral blood lymphocytes in PD patients showed normal values of the total number of lymphocytes in both patients: $2{,}2*10^9/l$ and $1{,}3*10^9/l$, respectively, compared to normal rate of $1{,}2–2{,}5*10^9/l$. However, a detailed analysis of the lymphocytes subsets revealed a reduction of all T-cell subpopulations in the first patient with aggressive course of PD: total number of CD3+ T cells amounted $352*10^6/l$, at the normal rate of $652–1500*10^6/l$, number of CD3+CD4+ T cells was $121*10^6/l$, at the normal rate of $350–1290*10^6/l$, number of CD3+CD8+ T cells amounted $148*10^6/l$, at the normal rate of $190–1120 *10^6/l$. All the T-lymphocytes of the second patient with usual course of PD were within the normal range. Meanwhile it was established an increased content of NK cells in the first patient ($634*10^6/l$ at the normal rate of $108–475*10^6/l$). The number of B cells vary within the normal range: $162*10^6/l$ – in the first patient and $179 *10^6/l$ in the second, at the rate of 100–600 ($*10^6/l$).

The investigation of cerebrospinal fluid has revealed a significant excess of all the subpopulations of lymphocytes in the PD patients. The total number of lymphocytes of the second patient was $127*10^6/l$, at the normal rate of 0,66 [0,16–1,88] $*10^6/l$, which is 192 times higher than the normal parameter; while in the first patient these indicators are 3494 times higher than the norm and counted $2306*10^6/l$. Herewith the values of CD3+ T cells, CD3+CD8+ T cells, CD19+ B cells and CD56+ cells were hundreds of times higher than normal findings – in PD with usual typical course, and exceeded the normal rate by a thousand times – in patients with aggressive course. In both patients the number of CD3+CD4+ T cells practically did not differ and amounted $79*10^6/l$ in the first patient and $75*10^6/l$ in the second, at the normal rate of 0,44 [0,08–1,43] $*10^6/l$, that is more than 150 times higher than the normal values.

Conclusion. The obtained data confirm the exceeded content of the adaptive immune cells in cerebrospinal fluid in patients with PD. The data of the two patients were differed and pointed to the aggressive course of the disease in the first patient and the unfavorable prognosis. Thus it is important to estimate the lymphocytes subsets numbers not only in peripheral blood but also in cerebrospinal fluid for the diagnosis and prognosis of neurodegenerative diseases, in particular PD.

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THYROID CANCER MORBIDITY IN PINSK REGION IN 2009-2016

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Statistical data on the incidence of thyroid cancer in the population of Pinsk and Pinsk district of the Brest region and Belarus for 2009–2016 years. In the period 2009–2016, there is a tendency to increase the incidence of thyroid cancer in the population of Pinsk and Pinsk districts. For 2012–2016 was 22 cases of thyroid cancer. children of Pinsk and Pinsk district.

Keywords: thyroid cancer, endocrine system, malignant tumor, iodine deficiency, the incidence of.

Thyroid cancer (TC) is one of the most spread malignant tumors of endocrine system. It may develop in any age. The significant growth of TC morbidity occurred during the period after the accident on Chernobyl NPP,

especially in Gomel and Brest region. It was connected with so called "iodine blow" on the background of iodine deficiency in environment.

The aim of this work was to study the levels of incidence of thyroid cancer in the town of Pinsk and Pinsk district and compare them with levels in Brest region and Belarus.

Comparative evaluation of statistical data of the incidence of thyroid cancer in the population of Pinsk and Pinsk district, Brest region and the Republic of Belarus in the period 2009–2016 has been done.

During analyzing period, we can see tendency for growth of the incidence of thyroid cancer in the population of Pinsk and Pinsk district (236 per 100 thousand in 2009 and 390 per 100 thousand in 2016). The difference between 2009 and 2016 years was not significant.

22 cases of TC were registered during 2012–2016 years. in children of Pinsk and Pinsk district. We didn't reveal significant difference in the incidence of TC in children during this period (0,13 per thousand in 2012 and 2013; 0,2 per thousand in 2014; 0,03 per thousand in 2015 and 0,1 per thousand in 2016).

We revealed steady significant growth of TC morbidity during 2009–2016 years in Brest region (244 per 100 thousand in 2009 and 399 per 100 thousand in 2016).

The incidence of TC in the population of Pinsk and Pinsk district was significantly lower, than in Brest region in 2006 ($p < 0,05$), in, in 2014 and 2016 ($p < 0,01$) and in 2013 ($p < 0,001$). The incidence of TC in the population of Pinsk and Pinsk district in 2010–2011 was significantly higher ($p < 0,05$).

During analyzing period the incidence of TC in the population of Pinsk and Pinsk was significantly lower than in Republic of Belarus in 2009 ($p < 0,05$ in 2010; $p < 0,01$ in 2010, 2012 and 2014; $p < 0,001$ in 2013 and 2016).

Almost the same situation was noticed with morbidity during 2009-2016 years in Brest region in comparison with Republic of Belarus.

DYNAMICS OF BACTERIAL AND VIRAL INFECTIONS OF RESPIRATORY TRACT IN SLUTSK REGION

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In this paper the results of health status monitoring of the population of Slutsk and Slutsk district for the period 2011–2015 on the main incidence of morbidity of respiratory tract infections are represented. The comparative analysis of the morbidity of bacterial and viral respiratory tract infections has been implemented, the structure of nosologies, the age composition of the diseased and the annual dynamics of the incidence of respiratory infections in the district has been examined.

Keywords: respiratory tract, morbidity of infection, contagiosity, epidemic situation, vaccination, dynamics.

The present stage of epidemiology and infectology is characterized by the recognition that infectious diseases occupy leading positions in human pathology. Respiratory infections take the first place in the structure of infectious pathology and appear the most common and uncontrolled diseases causing significant damage to the health of population and the economies of countries around the world.

The aim of this work is to monitor the health status of residents of Slutsk and Slutsk district with the study of the dynamics of the incidence of bacterial and viral respiratory tract infections.

To realize this aim, the annual bulletins of Slutsk Zonal Hygiene and Epidemiology Center were analysed on the main incidence of morbidity and health of the inhabitants of Slutsk district, data of the National Statistical Committee of the Republic of Belarus.

The study found out that in Slutsk district for the period of 2011–2015 the greatest contribution in the structure of the morbidity of bacterial infections of the airways is made by tuberculosis (70,89 %) and scarlet fever (27,48 %).

The analysis of long-term dynamics of active tuberculosis morbidity of the population of Minsk region and Slutsk district demonstrates a moderate downward trend, however, there is a tendency to increase the proportion of patients with multidrug-resistant (MDR), which in 2015 was recorded at the level of 22,22 % of newly diagnosed patients with active tuberculosis. The major part of the sick accounts for the asocial layers of the population (2015 – 48,52 %) and the age from 45 to 64 years. Among patients, 66,67 % with bacilli (BK +). In 2015 6 cases of death from tuberculosis infection (MDR 80 %) were registered. The peak of morbidity was registered in 2011.

The highest morbidity of scarlet fever in the last 5 years was recorded in 2012. It was found out that the incidence of scarlet fever in the urban population (2015 – 7,91 cases per 100,000 population) is higher than the level of the incidence of the rural population (5,97 cases per 100,000 population). In the age structure of the diseased, children of 3–8 years old predominate (86,36 %).

There is a stable epidemic situation for meningococcal infection: the last time cases of meningococcal disease were registered in 2013 – 8,11 % of all bacterial infections of the respiratory tract (3 cases, or 3,22 per 100,000 population). In the region, cases of infectious mononucleosis are also recorded: In 2015 15 cases were registered, or 16,14 cases per 100 thousand people, this is 1,31 times higher than the regional indicator. There were no cases of diphtheria, pertussis, paracottus, and there are also no so-called "managed" viral infections: measles, mumps and rubella.

Since the end of 2010 a high morbidity of chicken pox is marked. The mordibility rate is cyclical and and is determined by ups and downs. For the analyzed period, the peak incidence occurred in 2013 (703 cases, or 754,32 per 100,000 of the population), while the mordibility of urban population was by 4,85 times higher than the incidence of rural population. The bulk of the cases falls on the group of children from 0 to 17 years (99,24 %).

Acute respiratory infection (ARI) occupies a major share in the structure of viral airborne infections. During the analyzed period, there are slight fluctuations in the incidence of ARI. In 2015, the incidence of this group of infections was by 1,1 times higher than the regional morbidity rate. In the structure of the affected 62,59 % falls on children under 17 years. The mordibility of all ARIs among the population is by 1,12 times higher than the incidence of the population's population due to the adult contingent. The mordibility of urban children is by 1,21 higher than the mordibility of rural children. These figures indicate a high degree of contagiousness of these diseases and the lack of effectiveness of preventive measures.

Medical science has developed powerful tools to combat infectious diseases; every year, medical practice enriches new effective methods of prevention and treatment. However, despite the improvement of preventive and curative methods und the appearance in the arsenal of doctors of new highly effective drugs, respiratory infections continue to be a major problem in modern medicine.

CARDIAC SURGERY INTERVENTIONS BY HEART RHYTHM AND CONDUCTANCE DISTURBANCES IN THE ORGANIZATIONS OF THE MINISTRY OF HEALTH OF THE REPUBLIC OF BELARUS

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The Analysis of statistical data of National statistical Committee of the Republic of Belarus and Sector methodology and medical statistics of the Ministry of health of Belarus on the state of health and the health of the population of the Republic of Belarus of violation of rhythm and conductivity showed that from 2005–2015 the number of operations increased in 3,5 times, including almost 3 times increase of the number of implanted pacemakers.

Keywords: heart rhythm disturbance, conduction disorder of the heart, implantation of pacemakers.

Rapid or irregular heartbeat is called arrhythmia. There are many different types of arrhythmias from usually harmless atrial extrasystoles to life-threatening paroxysms of rapid ventricular tachycardia. Arrhythmia is routinely encountered in medical practice. Cardiac arrhythmias are frequent and significant complications of various diseases and, in turn, can cause severe complications, which often determine the prognosis for work and life of patients.

To assess the amount of cardiac surgery interventions for arrhythmias and conductance disturbances in the organizations of the Ministry of health of the Republic of Belarus it was analyzed statistical data of National statistical Committee of the Republic of Belarus and Sector methodology and medical statistics of the Ministry of health of Belarus on the state of public health and the health of the population of the Republic of Belarus for the period from 2005 to 2015.

In the organizations of the Ministry of health of Belarus from 2005 to 2015, the number of cardiac interventions has increased from 3,6 thousand to 17,1 thousand, i.e. 4,7 times. The number of operations by violations of heart rhythm and conductivity increased from 1,3 thousand to 4,5 thousand, i. e. 3,5, including almost 3 times increase in the number of implanted pacemakers.

In children, age 0–17 number of heart operations increased 1,5 times. The volume of surgery for cardiac rhythm disorders and conductivity increased from 22 to 72, i. e. by 3,3 times. The number of implanted pacemakers in these patients has not practically changed.

Postoperative mortality in surgery for arrhythmias is lower than the average for all cardiac surgery by an average of 80 %.

MAIN INDICATORS OF OBSTETRIC SERVICES IN SOLIGORSK AND SOLIGORSK DISTRICT

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The object of the work are some indicators of obstetric services of Soligorsk Central Regional Hospital from 2009 to 2016 and official statistical data of Ministry of Health of Republic of Belarus.

The aim of the work is to analyze main indicators of obstetric services of Soligorsk Central Regional Hospital in order to identify trends and to evaluate the efficiency of obstetric services in Soligorsk district.

For the period from 2009 to 2016 there has been a positive growth rate in Soligorsk district. The number of childbirth shows trend to grow as long as stillbirth rate remains low. High coverage by preventive examinations among the women allows to assess obstetric services in Soligorsk region with a positive score.

Keywords: growth rate, women of reproductive age, number of childbirths, preterm births, perinatal mortality, stillbirth rate, preventive examinations.

According to WHO, infant mortality in Belarus is at a low level – 4 per 1,000 births. This indicator shows the dynamics of decline. Despite the favorable situation, according to the Health Development Strategy of the Republic of Belarus until 2020, the stabilization of infant and maternal mortality indicators should become one of the main results of the work for the indicated period. In this regard, special attention should be given to gynecology and obstetrics.

The retrospective analysis of the main indicators of the obstetrics service of Soligorsk Central Regional Hospital for the period 2009–2016 was conducted.

According to the results of work, the following conclusions were made:

1. It was found that in 2016 the female population of Soligorsk district was 71162 people, which is 52,9 % of the total population of the region. Since 2009, there has been a trend towards a decrease in the number of women over 18 due to the decrease in elderly women. In 2016, the number of women of working age was 49,48 % (35215 people) of the total female population of Soligorsk district. Girls and girls under the age of 16 in 2016 accounted for 16,6 % (11,819 people) of the total female population of the district. In the structure of the female population over the age of 18, the share of women of childbearing age was 64,3 %. There has been a slight upward trend in the proportion of women of childbearing age.

2. It was shown an increase in the birth rate. Since 2011 there has been a steady trend towards an increase in the number of births in the Soligorsk district. It is shown that almost all births take place in a hospital (99,89 %). The index of premature births is kept within 4 % of the total number of births with small fluctuations throughout the study period. In 2016, no case of stillbirth was recorded in the Soligorsk Central Regional Hospital. Perinatal mortality for the period 2009–2016. decreased from 3,2 in 2009 to 1,1 in 2016. However, there is no stable trend towards a decrease in this indicator.

3. During the study period in the city of Soligorsk and Soligorsk district, the indicator of women covered by clinical examinations with cytological research ranged from 90,2 %. There is a high percentage of early registration (up to 12 weeks of pregnancy) of pregnant women, an average of 96,2 % over the study period. In 2016 this indicator was 97,0 %. A certain percentage of women are observed in private medical centers, considering the service there is better and more convenient.

An increase in the number of births and a high percentage of their admission in a hospital, a high level of coverage of preventive measures for women and early registration of pregnant women, positive population growth observed during the period under study allow the work of the delivery service of the Soligorsk Central Regional Hospital to be positively evaluated.

DETERMINATION OF GENE EXPRESSION OF TS AND TP FOR THE ASSESSMENT OF DRUG SENSITIVITY IN COLORECTAL CANCER

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This work is about the role of gene expression of TS and TP.

Keywords: colorectal cancer, gene expression, gene TS, gene TP.

In the last decade there has been a steady increase in the incidence of colorectal cancer, which occupies the 2nd place among all cancer sites. The risk of developing cancer after age 50 increases twice during each subsequent decade, and reaches a peak by age 75. There has been a sharp increase in the incidence and mortality from colorectal cancer in the age groups up to 34 years and 45 to 49 years, especially in Europe, USA and Canada.

The incidence of cancer, the blind and the colon is in 11,6 cases per 100 thousand populations among men and 9,2 per 100 thousand among women with rectal cancer – 11 cases per 100 thousand in males and 7,1 per 100 thousand among women. It is important to note that the incidence of colorectal cancer (CRC) is much higher in the industrialized countries of Europe and North America than in the developing countries of Africa, Asia and South America.

An important role in the diagnosis and treatment of colorectal cancer is determining the level of gene expression of TP and TS. Analysis of gene expression of TP and TS allows you to determine the effectiveness and feasibility of the prescribed treatment of chemotherapy.

The purpose of the study is to determine the gene expression of TS and TP for the assessment of drug sensitivity in patients with colorectal cancer.

Materials and methods. The object of the study was tumor and morphologically normal tissue of the intestine patients I-III stages of colorectal cancer. Determination of gene expression of TS and TP was carried out by PCR in real time using the thermocycler Bio-Rad.

Patients were included in the study with mandatory morphological confirmation of the diagnosis.

The age of patients (n=31) included in the study ranged from 45 to 83 years. The average age amounted to 66,0±of 9,18 years.

In the analyzed group of patients, the gender distribution was as follows: 17 (54,8 %) men and 14 (45,2 %) women.

A study of the extent of the tumor process in the analyzed group of patients the CRE revealed a high prevalence (58,1 per cent) stage II cancer. The number of patients with I stage is made up of 12,90 %, III grade – 29,0 %.

Depending on the histological type of the adenocarcinoma, patients were distributed as follows: adenocarcinoma was verified in 23 (74,1 %) cases, tubulo-papillary and mucinous adenocarcinoma in 2 (6,5 %) cases, respectively, adenocarcinoma with sliseobrazutee – 4 (12,9 %).

Moderately differentiated (G2) adenocarcinoma predominated (67,9 %) in the analyzed group of patients. The number of patients with a high degree of tumor differentiation (G1) was 25 %, with a low degree of differentiation (G3) to 7,15 %.

Results. The results of the carried out molecular genetic studies established that the gene expression levels of TS in patients with CRC (n=27), ranged from 0,03 to 8,23 Rel. units: average expression level for stage I made up 1,82 Rel. units (0,08–5,09), with stage II – 1,54 Rel. units (0,03–4,03), at III stage 2,01 Rel. units (0,03–8,29).

The study detected that the group of patients with recurrent disease (n=6) was dominated by overexpression of the TS gene (n=5, 83,4 %), and in the group of patients without relapse (n=21) moderate expression (47–6 per cent).

Analysis of gene expression of TP in patients with CRC showed changes in the expression of the gene in the range from 0,02 to 16,56 Rel. units: average expression level for stage I made up 6,90 Rel. units (0,09–16,56), with stage II-2,1 Rel. units (0,03 – of 14,07), with stage III – 0,94 Rel. units

It was found that both groups of patients the most characterized reasonable TP gene expression (n=4, 66,8 % – with recurrent disease, n=10, 47,6 per cent without relapse of the disease).

Thus obtained data allow to assess the effectiveness of therapy based on determining the level of gene expression of TS and TP, the nature of sensitivity to drugs ftorpirimidinov series.

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PROGNOSTIC SIGNIFICANCE OF ASSESSMENT OF HORMONAL STATUS IN BREAST CANCER

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The hormonal status of patients with breast cancer for predicting the course of the disease has been studied. It was found that 26 patients with breast cancer with overexpression of estrogen receptors showed a high level of progesterone receptor hyper expression – this indicates a high sensitivity to endocrine therapy and a favorable course of the disease.

Keywords: breast cancer, hormones, endocrine therapy, overexpression, immunohistochemical method.

The steady growth of malignant diseases can be associated with the worsening of ecological situation in RB. Breast cancer (BR) is the most widespread oncological disease of women. Breast cancer is a serious problem of health care around the world. About one million new cases are being identified annually throughout the world [1].

Expression of steroid hormone receptors in breast cancer indicates a relatively favorable prognosis and the potential sensitivity of the tumor to endocrine therapy.

It is known that hormone-dependent mammary tumors containing both or at least one of the steroid hormone receptors have a more favorable course and postoperative prognosis [2].

Materials and methods. The material for the study was clinical data and tumor tissue of 72 patients with breast cancer, aged 33 to 79 years, who were on treatment at the Republican Scientific and Practical Center of Oncology and Medical Radiology. N. N. Alexandrov "from 2015 to 2017 years.

Determination of the level of expression of estrogen and progesterone receptors in women with breast cancer was performed by immunehistochemical method using DAKO reagents (Denmark) and visualization systems (En-Vision +).

During the analysis of the obtained data, it was found that 25 % of the patients showed a high level of estrogen receptor expression (85–100 % positively stained cells) and 31,9 % had a moderate level of estrogen receptor expression (40–85 % positively stained cells). Low expression (from 0–1 % of immunocomplexed cells) was observed in 29,2 % of the patients studied.

When the level of expression of progesterone receptors was determined in women with breast cancer, tumors with overexpression of these receptors (85–100 % positively stained cells) were detected in 11,1 % of cases and a moderate level of expression of progesterone receptors (40–85 % positively stained cells) was detected as well. The absence of expression (0–1 % of immunocorrected cells) was observed in 54,2 % of the patients studied.

Thus, in 26 patients with breast cancer, with overexpression of estrogen receptors, a high level of progesterone receptor hyperexpressionis was revealed, which indicates a high sensitivity to endocrine therapy and a favorable course of the disease.

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IMMUNE INDICES AND REACTIONS OF ADAPTATION

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Violation of immune mechanisms at the level of the organism significantly reduces its adaptability to a particular process, increases the likelihood of serious damage, and affects population processes. Therefore, the purpose of this study was to understand the mechanisms of adaptation and the impact of stressful situations, which allow us to re-evaluate the mechanisms of the appearance of various diseases of the immune system.

Keywords: adaptation, immune system, central nervous system, adaptation types, stress, activation reaction, training react.

The influence of different internal and environmental factors leads to development of reactions of adaptation in whole organism and in all organism's systems.

Organism's resistance, as well as immune one, depend on the type of the reaction of adaptation. According to L. Garkaviet (1990), there are several types of reaction of adaptation. Extreme factors lead to the development of stress reaction or reaction op hyper activation, influence of small intensity leads to training reaction development, influence of middle intensity leads to activation reactions development (quite or high).

The types of adaptation reaction are determining mainly by the rate of lymphocytes in blood. This rate depends on person's age. There is the special table ro identify a type of adaptation reaction. Rates of other cells allow defining the level of reactivity.

The aim of this research is to analyze immune indices indifferent types of reaction of adaptation.

Heamograms of 60 healthy children (7–16 years old) have been analyzed to determine the type of the reaction of adaptation. The levels of several immune indices have been analyzed in different types of reaction of adaptation. We analyzed the levels of lysozyme (unspecific immune humoral factor), IgA, IgMandIgG.

We revealed the highest lysozyme level in reaction of quite activation (8,59$\pm$0,48 in comparison with 7,56$\pm$0,29 in stress reaction, 8,27$\pm$0,28 in training reaction and 5,59$\pm$0,72 in high activation).We could see that lowest level was in high activation reaction.

The highest IgA level was determined in reaction of quite activation as well – 2,58+0,56 (1,62$\pm$0,52 in stress reaction, 1,08$\pm$0,14 in training reaction and 1,53$\pm$0,15 in high activation). The lowest IgA level was in training reaction.

We could see no distinct difference in the levels of IgG (9,85$\pm$1,68 in stress reaction, 10,98$\pm$0,70 in training reaction and 8,85+1,03 in high activation).

Our investigation showed, that reaction of quite activation accompanied with the highest levels of all analyzed immune indices (lysozyme, IgA, IgMandIgG) in comparison with other types of reactions of adaptation (stress reaction, training reaction and high activation).

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EXAMINATION OF THE EXTENT OF THE DRUG USE AMONG THE YOUTH

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Analysis of statistical data of health-care agency "Mogilev regional drug abuse dispensary" shows that from 2002 to 2005, the decline was observed in the number of drug addicts, but since 2006, it can be noted an annual increase of drug users who are registered in the regional drug abuse dispensary.

Keywords: drugs, psychoactive substances, drug use, abuse, addiction, drug addiction.

Today the issue of abuse of narcotic drugs and psychotropic substances is very serious. According to the World Health Organization, drugs ranked first among the culprits of premature death and already ahead of cardiovascular disease and malignant tumors. The scale and pace of the spread of drug addiction in the country are putting a question about the physical and moral health of young people, the future of a significant part of it, the social stability of our society already in the near future.

According to the Ministry of health of the Republic of Belarus the majority of drug users – persons under the age of 35 years (84,5 %). Of them under 15 years is 2,9 %, 15–19 years is 10,3 %, 20–24 years – 22,4 % 25–34 – 48,9 per cent. The proportion of secondary school students and University students in the population of all consumers of surfactants is of 14,0 %, and among drug (toxic) maniac is 6,7 %.

The analysis of statistical data of health-care agency "Mogilev regional drug abuse dispensary" shows that from 2002 to 2005, there had been a decline in the number of drug addicts consisting on the account in a regional narcological dispensary (2002 – 368; 2003 – 340; 2004 – 312; 2005 – 291 people). Since 2006, it can be noted an annual increase of drug users, registered in a dispensary in 2006 – 301 people, 2007 – 378, 2008 – 394, 2009 – 417 people, 2010 – 503 people, 2011 – 549 people, 2012 – 601 people, 2013 – 682 people, in 2014 – 718. 01.01.2015 total number of registered drug addicts, substance abusers and consumers of psychoactive substances – 978.

In the Republic drug situation is deteriorated significantly in recent years. The spread of drug abuse occurs at an alarming rate and has a tendency to flare: increased the consumption of narcotic drugs and psychoactive substances, the steadily growing volume of drug trafficking and the number of crimes committed on the ground of drugs and drug addiction, drug abuse is rapidly getting younger, increasing the number of minors purchasing the "experience" consumption of narcotic and psychotropic drugs, increases in the number of female drug users, a new dangerous phenomenon is the appearance of "family drug addiction", involvement in the drug abuse of young children by their parents, has increased dramatically the incidence of HIV infection, increased mortality from drug use, especially among children.

MOLECULAR GENETIC PROLIFERATION OF METASTATIC MELANOMA

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In the course of the research the relationship between the expression level of mir-214 and sex, age of the patient, stage, localization, morphotype and intensity of pigmentation of melanoma was studied.

Keywords: melanoma, microRNA, gene expression, melanocyte nevus

An actual problem of clinical oncology is the increasing incidence of melanoma and the relatively poor prognosis of the disease in the common forms. Melanoma is responsible for 80 % of deaths from malignant skin neoplasms, although in the structure of morbidity is not more than 10 % of the diseases in this group [1].

Polymorphisms in the genes BRAF, NRAS, c-kit and signaling pathways RAS / RAF / MEK / ERK are associated with the occurrence and progression of melanoma [2].

In recent years, it became known that a non-coding RNA plays a special role in the development of malignant tumors. MicroRNAs constitute a recently discovered class of non-coding RNAS that play a key role in the regulation of gene expression. It is considered that a violation of miRNA expression leads to carcinogenesis. It is known that at a melanoma of the skin, the expression of certain microRNAs that act as an oncogene or a suppressor gene is increased or decreased [3].

The purpose of the research isto study aberrant expression of miRNAs in patients with melanoma for assessing the prognosis of the disease.

Materials and methods of a research

In a research examined the level of microRNA expression by PCR in the tissues of melanoma and melanocyte nevi. 32 samples of skin melanoma I (40,6 %), II (59,4 %) stages and 10 samples of melanocytic nevi were used. For amplification in real-time fragments of cDNA of the genes of miRNAs used a set of "miScript SYBR Green PCR Kit" (Qiagen, Germany).

Results

The study found that the expression level of mir-214 in melanoma samples decreased (30,9 rel. units [25,3, 35,3]) compared with melanocytic nevi (33,4 rel. [31,4; 34,9]).

Men have the level of expression of this microRNA (31,0 relative units [29,0; 33,6]) slightly higher than in women (30,7 rel. units [25,3; 35,3]).

The reduced level of expression of the studied genes of miRNAs was observed in patients aged 41–50 years – 30,2 rel. units [27,9; 34,1], increased is characteristic for persons in the age category 61–70 years – 31,7 rel. units [25,3; 34,4].

The level of expression of mir-214 in patients with I stage of disease was slightly lower 30,4 rel. units [25,3; 34,4] than in patients with II stage – 31,1 rel. units [26,8; 35,3].

Depending on the morphological structure of the tumor, there was a tendency to decrease the expression of the gene with lentigo melanoma – 29,4 rel. units [26,2; 31,3], increased expression is associated with the nodal form of tumor growth – 31,6 rel. units [29,1; 35,3].

The highest level of expression of mir-214 is diagnosed with poorly pigmented melanoma 32,8 rel. units [30,0; 35,3], and the smallest in the pigment – 30,6 Rel. units [29,1; 32,6].

The increasing the level of expression of mir-214 was detected in melanoma in the region of the upper limbs 31,8 rel. units [27,9; 35,3], while the decreasing level wasfound in the lower extremities – 29,8 rel. units [25,3; 33,5] depending on the localization of the primary tumor

Thus, the previously obtained data showed that the aberrant expression of microRNA is associated with clinical and morphological characteristics – sex, age of the patient, stage, localization, morphotype and intensity of pigmentation of melanoma, which in the future will allow an individualized prognosis of the disease to be assessed.

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DETECTION OF MOLECULAR-GENETIC AND IMMUNOLOGICAL MARKERS OF HERPES VIRUSES IN PATIENTS WITH A PRIMARY BRAIN TUMOR

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The incidence of malignant neoplasms of different localization is steadily increasing throughout the world and in particular in the Republic of Belarus. Over the past decade, there has been a tendency to increase the number of newly diagnosed cases of brain tumors and the central nervous system.If this indicator in 2006 was 470, then in 2015 621 cases were identified. As a consequence, rough intensive morbidity has been steadily increasing. If in 2006 it was 4,8 per 100,000 population, by it 2015 had increased to 6,5 per 100,000 population.

Keywords: herpesviruses, herpes simplex virus 1, 2 types, Epstein-Barr virus, cytomegalovirus, human herpes virus 6 type.

One of the reasons for the development of cerebral oncopathology is the presence of viral agents belonging to the *Herpesviridae* family: herpes simplex virus type 1, 2 types (HSV1,2), cytomegalovirus (CMV), Epstein-Barr virus (EBV) and human herpes virus 6 type (HHV 6).Viruses belonging to this family are able to induce and modulate oncotransformation of healthy cells causing the development of a tumor process. The detection of viral agents in patients with diagnosed oncopathology of the brain and central nervous system is possible using laboratory diagnostic methods, i. e. polymerase chain reaction (PCR) and enzyme immunoassay (ELISA) in various biological material: blood, serum, plasma, liquor, tumor tissue and others.

The aim of the study was to establish the presence of molecular-genetic and immunological markers of herpes viruses in the blood of patients with primary detected brain tumors.

Materials and methods. Whole venous blood for PCR and serum for ELISA were used as biological material for study in group of patients with a primary brain tumor. Enzyme immunoassay was performed using a semi-automated analyzer Tecan «Sunrise».The PCR method was performed with a hybridization-fluorescent detection in real time mode using BioRad CFX96 (USA) and Rotor-Gene 3000 (CorbettResearch, Australia).

Results. In the course of the study, in a group of patients with a primary brain tumor (n=50), the polymerase chain reaction method revealed that in 38 % of the cases EBV DNAwas detected, and in 4 % CMV DNAwas found.HSV DNA 1, 2 typeswas not detected.The following data were obtained during the enzyme immunoassay.When examining 50 patients for antibodies to herpes simplex virus 1, 2 types, immunoglobulin G (IgG) was detected in 86 % of cases, immunoglobulin M (Ig M) in 6 %. Twentynine patients were diagnosed with Ig M and Ig G to the immediate protein (IEA) of the cytomegalovirus, in 6,9 % of casesIg M to IEA CMVwas found, in 17,24 % Ig G to IEA CMV. Ig G was detected in 45,5 % of casesof the 33 people who were tested for herpesvirus6type,.Twentyone patients underwent examination for detection of Ig G to the cytomegalovirus, which was detected in 95,94 % of cases.

The conclusion. As a result of the study,EBV DNA(38 %) and CMV DNA(4 %) weredetectedby PCR method.Immunoenzyme analysis showed the presence of immunoglobulin G to HSV 1, 2 types (86 %), IEA CMV (17,24 %), CMV (95,94 %) and HHV6 type (45,5 %); also immunoglobulins M to IEA CMV (6,9 %), HSV 1, 2 types (6 %) in the group of patients with primary brain tumor.

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THE INFLUENCE OF VARIED LEVEL OF PHYSICAL ACTIVITY ON THE BIOLOGICAL AGE OF YOUNG PEOPLE

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This article is devoted to the state of young people, as well as the influence of different levels of physical activity on biological age. The results of the study indicate a high degree of aging of the studied people compared with the mean values. The dependence between biological age and the level of motor activity was identified. In general, the findings show the need to alter the way of life of students, to encourage physical education and sports.

Keywords: biological age, premature aging, physical activity, students.

One of the main problems of our time is the problem of improving and maintaining the health of students. According to the results of numerous studies, recent years revealed the reduction in the standard of health and lack of motor activity among young people. This is largely due to the large learning load, the inability to organize the working day properly, the predominance of a passive lifestyle, etc. In such conditions, it is important to perform the primary diagnosis of individual health risk factors. The assessment of biological age copes with this aim rather well. It serves quite an accurate indicator and characterizes the health status and the effectiveness of adaptation to unusual ecological and occupational conditions. A significant advance or retardation in the biological age of the organism in relation to the actual age can be interpreted as a sign of a decline in the level of health and its functional reserve.

The purpose of the study is to determine the biological age of students with different levels of motor activity.

The study involved 24 young men and 36 girls aged 18 to 21 years. The researched students formed two groups: the control group, which included the students who had the usual learning load (4 hours of physical training per week according to the timetable), and the experimental group, which included young men and women who attended various sports clubs more than 4 hours per week in addition to general curriculum. In order to collect the necessary information a questionnaire was used. It included questions about bad health habits, the length of physical activity and the type of activity. The biological age of the students of both groups was determined according to the method of V. Voitenko.

In the course of the study, it was revealed that young men from the control group had the highest level of premature aging. Thus, at an average actual age of 19,5 ± 0,4 years, their biological age reached 31,1 ± 1,5 years, while in young men from the experimental group with an average age of 19,5 ± 0,5 years, the biological age was

25, 9 ± 1,9 years. Compared with boys, girls of both groups had a slower aging rate: in the control group at an average actual age of 19,5 ± 0,4 years, their biological age reached 28,6 ± 1,6 years. At the same time, in girls from the experimental group at an average age of 19,5 ± 0,5 years, the biological age was 24,0 ± 1,3 years (P <0,05).

The evaluation of the aging rate of students showed that in neither of the groups there were students with a distinct slow aging rate (the difference is from –15 to –10), whereas only boys and girls from the experimental group – 9 % and 16 %, respectively, had a slow aging rate (the difference is from –8,9 to –3). 53 % of the experimental group members have their approximate biological age, which is two times more than in the control group. Needless to say that the main part of the students of the control group (61 % of boys and 47 % girls) show a distinctively rapid aging rate, while in the experimental group this is observed in 36% of young men and 21 % of girls.

Thus, the study showed signs of premature aging in all studied groups of students. At the same time, the indicators of the biological age of students depend on the level of regular weekly physical activity.

PROGNOSTIC SIGNIFICANCE OF MOLECULAR PROFILING OF COLORECTAL CANCER

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In the course of the study there were determined the levels of expression of TP and TS genes, characterizing tumor sensitivity to drug treatment in patients with colorectal cancer.

Keywords: colorectal cancer, level of expression, tumor sensitivity, disease prognosis.

The issue of the day of modern oncology and proctology is a colorectal cancer (CRC), the increase of morbidity of which is related to a great extent with worsening of ecological situation in the Republic of Belarus.One of the modern approaches to choosing an individual program for treating patients with malignant neoplasms and predicting the course of the disease is the study of molecular-biological markers in tumor tissue. The determination of these markers in the tumor can provide additional information about the biological behavior of the tumor: its rate of growth, the ability to invade and metastasize, and resistance to chemotherapy drugs [1].

Thymidylphosphorylase (TP) is an angiogenesis factor − increased expression of this enzyme is associated with an unfavorable prognosis of the course of the disease [2]. Elevated levels of thymidylatesynthetase (TS) of colorectal cancer are associated with worse prognosis and resistance to chemotherapy [3].

Materials and methods. The material for the study was the data on 50 patients suffering from colorectal cancer who received treatment at the "Republican Scientific and Practical Center of Oncology and Medical Radiology. N. N. Alexandrov "from 2014 to 2016 years.

In the course of the work performed, patients with colorectal cancer were assessed for expression levels of TP and TS genes by real-time PCR using the Bio-Rad iQ5 (USA) amplifier.

In the course of the study, the overexpression of the TP gene was 6.90 r.u, the hypoexpression was 0,94 r. u. As a result of the studies, the elevated level of expression of the TS gene was 2,01 r. u., the low level of expression was 1,54 r. u.

Hyperexpression of the TP gene was observed in 40 % of patients, a low level of expression was found in 54 % of patients. In the group of patients with recurrent disease, moderate expression was observed in 66,8 % of cases, without recurrence – in 33,2 % of cases.

The high level of expression of the TP gene characterizes the sensitivity of the tumor to the preparations of the fluoropyrimidine series and indicates a favorable prognosis of the course of the disease.

Hyperexpression of the TS gene was detected in 56 % of patients, a low level of expression was observed in 38 % of patients. In the group of patients with recurrent disease, overexpression was observed in 83,4 %, without recurrence – in 26,6 % of cases.

High levels of TS gene expression in 83,4 % of patients indicate tumor resistance to drug therapy using 5-fluorouracil and tomudex and a high risk of recurrence of the disease.

Thus, high levels of TP gene expression in 40 % of patients and low levels of TS gene expression in 38 % of patients indicate the sensitivity of the tumor to ongoing drug therapy and favorable course of the disease.

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GLUCOSE LEVEL CHANGES IN PATIENTS WITH DIABETES MELLITUS AND IN HEALTHY INDIVIDUALS UNDER THE INFLUENCE OF LOW-LEVEL LASER THERAPY

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This research is devoted to the study of changes in glucose levels in patients with diabetes mellitus and in healthy individuals under the influence of low-level laser therapy (LLLT). It is shown that LLLT is an important component of therapy in the treatment of type 2 diabetes, since it favorably affects the biochemical parameters of blood and increases the resistance of the organism to unfavorable factors.

Keywords: diabetes mellitus, hyperglycemia, low-level laser therapy.

Type 2 diabetes mellitus (DM) is a chronic metabolic disorder in which prevalence has been increasing steadily all over the world. Diabetes is characterized by a chronic hyperglycemic condition resulting from insufficient action of insulin[1].The main complications of this disease are damage to kidney, blood vessels and eyesight, nervous system disturbance. Abovementionedcomplications may lead to disability, therefore the search for new ways of treatment and reduction of complications threat level are relevant objectives at the moment. In this regard the top-priority is the choice of treatment which has a many-sided effect on the human body. One of these methods isthe low-level laser therapy (LLLT).

Low intensity laser therapy is referred toelectromagnetic radiationof optical range.The helium-neon laser radiation has a low radiant power – up to 20 mW with a wavelength equal to 630 nm capable of affectingtrigger mechanismsof cellular regulation, changingcell membrane conditionby the increase of cellsfunctional activity, changing ofmetabolic processes, stimulating of microcirculation and oxidation-reduction processes, as well as increasingthe human body tolerance. At the same timelaser radiation has not so many contraindications, which include eideosyncrasy, febricity, presence of benign or malignant tumors.

Currently there is noconsensus on laser impact on the human body, itsseparate systemsandabnormal focus. It is assumed thatthe variabilityand systematic natureof secondarybiochemicalandphysiological effects ofLLLTon bloodis explained by the variety ofphotoacceptorsandprimaryphotobiological reactionsimplemented on different-levels. Laser interaction with a biological object includes the following stages: light quantumabsorption andintramolecularenergy redistribution (photophysical processes), an intermolecular energy transferand primary photochemical reactions, biochemical processesinvolvingphotoproducts, secondary photobiological reactionsand the body's general physiologicalresponse tothe effect of light [2].

To study the effect of LLLT on blood glucose values, 32 patients were included in this study. Group I included the patients who didn't have type 2 diabetes – 16 people (50 %) of the average ageof 50,18 ± 8,4 years. The second group consisted of patients with type 2 diabetes of the average age of 56,87 ± 6,83 years. Serum samples of venous blood were analyzed before and after the effects of LLLT in healthy individuals and in patients with type 2 diabetes.

Statistical analysis was performed using the R programming language and Microsoft Exel table processor. Varying quantitative indicators of the results of the studies were subjected to statistical treatment, with an assessment of the reliability of the effects using Student's t-test. The difference was considered to be reliable for $p \leq 0,05$ [3].

In patients with type 2 diabetes after LLLT use, the blood glucose level was reliably reduced ($p = 0,028$), the baseline level was 7,715 ± 2,23, the post-procedure glucose level was 6,78 ± 1,39. Accordingly, in healthy patients patients such differences in the level of glucose before and after the effects of LLLT was not observed and corresponded to the value ($p = 0,76$). Thus, one can draw a conclusion about the favorable effect of the procedure on the body of patients with type 2 diabetes.

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THE STATE OF HEALTH OF PREGNANT WOMEN AND THE PECULIARITIES OF PREGNANCY AND BIRTH

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The analysis of the statistical data of the health institution “Mogilev polyclinic №11” on state of health of pregnant women in 2016 showed that most frequent case of pregnancy complications is the threat of pregnancy termination which forms 20,2 %, less frequent are the cases of infectious and parasitic diseases – 17,4 % and infections of the urogenital system – 15,8 %.

Keywords: reproductive health, caesarean section, teenage pregnancy, premature birth.

The main tasks of modern perinatal obstetrics are the creation of the best possible conditions for the woman performing the functions of motherhood, the maintenance of her health and ensuring the birth of healthy children. High somatic incidence among pregnant women, an increase in the age of women, the expansion of the criteria for childbearing and burdened reproductive history increase the probability of complications during pregnancy, pathological births and a complicated post-natal period. A high incidence among pregnant women also determines a higher level of pregnancy complications that requires obstetric in-patient treatment.

Early medical check-up in antenatal clinic, consultations from all specialists make it possible to diagnose all existing diseases and to conduct timely diagnostic and treatment activities.

In this study, data on pregnant women’s state of health was obtained in the antenatal clinic of the health institution “Mogilev polyclinic №11”. The analysis of statistical reports, as well as of pregnant women’s and postpartum women’s medical records for 2012–2016 was carried out.

Based on the analysis being carried out, it was found that the births on time constituted 90,1 % in 2015 and 92,0 % in 2016. In 2016, the number of undeveloped pregnancies decreased by 2,2 % and that of late spontaneous abortions – by 0,5 %. The ratio of preterm birth to urgent for 2015 and 2016 was 1/30,0 and 1/16,7, respectively. It is shown that from 2012 to 2016 the number of premature births and cesarean sections increased. Teenage pregnancy constituted 1,2 % in 2016, and all teenage pregnancies ended in childbirth.

Compared with 2012–2015, the number of teen pregnancies declined in 2016. When comparing the data on the Republic of Belarus and the health institution “Mogilev polyclinic №11” for 2015, it was found that among the diseases complicating the course of pregnancy, the most frequent were the urinary tract infections with the corresponding rate of 26,2 % and 10,4 %, less frequent - pregnancy anemia – 22,4 % and 9,2 %, respectively.

SPECIFIC FEATURES OF THE PSYCHOLOGICAL STATE OF CHILDREN LIVING IN THE REGIONS CONTAMINATED WITH RADIONUCLIDES

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The analysis of the archival data of the Scientific and Research Clinical Institute of Radiation Medicine and Endocrinology on the psychological status of children living on radionuclide contaminated territories showed that

the low levels of general condition were more frequently registered among the children living in the regions contaminated with radionuclides then in the control group (14,5 % and 0,1 %).

Keywords: Chernobyl disaster, contaminated territories, psychological characteristics of children, radiation.

In the result of the accident on Chernobyl NPP 23 % of the territory of the Republic of Belarus were contaminated with radionuclides. The contamination of the territories with radionuclides caused indirect influence on the lifestyle of people. Chernobyl disaster caused significant changes in many families: changes in the lifestyle, in parents' professions, in the social and financial status. All these factors influenced psychological state of the population living on the contaminated territories.

The aim of the research is to analyze the levels of general condition, activity and mood of the children living in the regions contaminated with radionuclides in comparison with the children from a conditionally clean territory.

The psychological state of 78 children of 8–15 years old were examined with the help of WAM psychological test (wellbeing, activity, mood): 55 children (29 boys and 26 girls) living in the regions contaminated with radionuclides (Vetka district, Gomel region) and 23 children (10 boys and 13 girls) living on a conditionally clean territory (Smilovichi district, Minsk region).

The analysis showed that the low levels of general condition were more frequently registered among the children living in the regions contaminated with radionuclides then in the control group (14,5 % and 0,1 %).

The low levels of activity were revealed twice more often among the boys living in the regions contaminated with radionuclides then among the boys from the control group (41,4 % and 20 %).

Girls living on the contaminated with radionuclides territories had the low levels of mood in 11, 5 % of cases and none of the girls from a conditionally clean territory had the low level of mood.

Gender differences were revealed: the low levels of activity were registered more often among the boys living in the regions contaminated with radionuclides then among the girls (41,4 % and 23,1 %). Whereas on the conditionally clean territory the situation was the opposite: the low levels of activity have been registered more often among the girls (38,5 %), then among the boys (20 %). No differences in frequency of the low levels of mood between the boys and the girls from the contaminated areas were revealed (13,8 % of the boys and 11,5 % of the girls). 20 % of boys and none of the girls from the conditionally clean territory had the low levels of mood.

In conclusion it should be mentioned that the children living in the regions contaminated with radionuclides have the lower levels of general condition, activity and mood in comparison with the children from the conditionally clean territories. Several gender peculiarities in their psychological state were found.

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ART AT WOMEN WITH ENDOCRINE PATHOLOGY

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Extent of influence of endocrine diseases on the course of pregnancy, condition of a fetus and the newborn is studied. It is established that pregnancy in women of the IVF program against the background of endocrine pathology proceeds with the expressed complications that has negative effect on the result of pregnancy.

Keywords: endocrine diseases, assisted reproductive technologies, pregnancy, diabetes, hypothyrosis.

The endocrine system plays an important regulatory role in the human body. The problem of the interrelation between reproductive disorders and endocrine pathology has become increasingly discussed in recent years. Its relevance is due, on the one hand, to the fact that the prevalence of infertility in the marriage remains at a consistently high level (13–15 %), despite modern technologies and achievements in the field of reproductive health [1].

During pregnancy endocrine diseases proceed differently, both pregnancy and childbirth have specific complications. Often, endocrine diseases lead to the development of pathology in the reproductive system of women in the form of disorders of the menstrual cycle and infertility [3].

Despite a large number of studies in this field, there are still no dynamic prolonged studies on the development of reproductive function against the background of the endocrine pathology of women with infertility [2].

During this study, the course of pregnancy and childbirth in women with IVF programs with endocrine pathology was studied, as well as the condition of the fetus and newborns from these mothers.

It was found that most women with endocrine pathology had a pregnancy against a background of infectious diseases (80 % of DM and 75 % of thyroid gland). In 47 % of women with diabetes and 36 % of women with thyroid gland pathology, pregnancy was complicated by gestosis and chronic fetal hypoxia. In most women with endocrine pathology (67 %), the delivery was by caesarean section, which was associated with a complicated course of pregnancy and fetal hypoxia.

In 47 % of women in the IVF group with diabetes mellitus and in 30% of women with thyroid abnormality, intrauterine fetal hypoxia was noted.

In 33 % of children from the mothers of the IVF group with diabetes and 13 % of children from mothers with thyroid pathology the condition at birth was severe and of moderate severity, which was associated with intrauterine hypoxia of the fetus. 26 % of children from the mothers of the IVF program with diabetes mellitus had intrauterine hypotrophy were detected.

Thus, it is established that endocrine pathology negatively affects the course of pregnancy and childbirth, the condition of the fetus and the newborn. Complications during pregnancy in women with IVF programs with diabetes are more common than in women with thyroid gland pathology.

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THE EVALUATION OF THE INFLUENCE OF VIRUS AND BACTERIAL INFECTIONS ON THE DEVELOPMENT OF PAPILLOMAVIRUS INFECTION

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The clinical features of the clinical manifestations of papillomavirus infection in patients were studied in the course of the study. HPV infection in the examined persons is accompanied by the presence of the sign of the persistence of other agents. It was justified to conduct a simultaneous testing for both HPV and on the presence immunological markers of other viral and bacterial infections.

Keywords: papillomavirus infection, immunological markers of infections, immunosuppressive effect.

Human papillomavirus belongs to highly contagious and dermatotropic viruses [1]. The socio-economic significance of the HPV is due not only to its wide spread, but also to the possibility of development of oncological pathology. Papillomavirus infection is extremely difficult for laboratory diagnostics. Along with manifestations of the infection, there is also a latent form. No morphological changes are observed in it despite the presence of viruses [2]. This practically eliminates the possibility of the detection of HPV using the immunologic investigative

methods. Only the decrease in immunity the virus can manifest itself. The consequences of undiagnosed and unattended papillomavirus infection cause the society not only demographic, but also economic damage [3].

The aim of this work is to investigate the association of papillomavirus infection with other infections.

The subject of the study are 30 patients with clinical signs of papillomavirus infection of the skin at the aged 16–58 years.

Biopsy material from papillomatous formations was used as the test material. To determine the immunological markers of additional infections blood serum was used. It was prepared from venous blood according by a standard protocol [4]. The main methods of laboratory research were the real-time PCR for identifying and quantifying the DNA of HPV and ELISA for identifying immunological markers of other viral and bacterial infections.

When studying the presence of papillomaviruses in the examined individuals, the results of the study showed that the examined individuals had different serotypes of human papillomavirus, the representation of which is approximately the same. HPV type 1 (6; 20 %), HPV type 2 (5; 16,7 %), HPV type 3 (5; 16,7 %), HPV type 4 (4; 13,3 %), HPV type 6 (1; 3,3 %), HPV type 8 (2; 6,7 %), HPV type 10 (1; 3,3 %), HPV type 12 (3; 10 %), HPV type 16 (2; 6,7 %), HPV type 30 (1, 3,3 %). It was possible to establish that the examined women did not have serotypes 4, 10, 12, 30, and the examined men did not have serotype 3.

The results of the study of the age and sex peculiarities of patients with papillomavirus infection showed that the patients had no sex differences in the representation of HPV of different serotypes. According to the received data, HPV was registered in both men and women at the age of up to 25 years, 25–35 years and after 35 years with the same frequency.

A correlation coefficient was determined between the frequency of occurrence of different serotypes in men and women. Pearson's correlation coefficient for men was $r = –0,63$ ($p>0,05$); for women $r = –0,53$ ($p>0,05$). Correlation relationship is absent.

Taking into account the frequency of the associations of HPV with other infections, the test for the presence of immunological markers of viral and bacterial infections was conducted simultaneously with the HPV examination as these infections are capable of exerting an immunosuppressive effect on the body, and thus contribute to the development of papillomavirus infection.

Antibodies to the herpes simplex virus, cytomegalovirus infection, the Epstein – Barr virus and chlamydia were identified in the results of the study. Attention is drawn to the fact that the examined persons detected the presence of not only one infection, but of several infections.

The relationship between certain serotypes and the presence of antibodies to herpes simplex viruses, CMV, EBV, chlamydia in men and women was determined, but the connection was not revealed. Spearman's correlation coefficient for men was $r = –0,52$ ($p>0,05$); for women $r = –0,21$ ($p>0,05$).

Thus it is established that the HPV infection in the examined individuals is accompanied by the presence of a sign of the persistence of other agents (herpes simplex virus, cytomegalovirus infection, Epstein – Barr virus, chlamydia), which characterizes the immune status with deficiency.

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TRAUMATISM AS A CAUSE OF PREMATURE MORTALITY OF THE POPULATION OF THE REPUBLIC OF BELARUS

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The mortality rates of the population of the Republic of Belarus from external causes for the period 2005–2015 were analyzed. The main causes of traumatism were considered, the formed tendencies in dynamics of death rate of the population from various reasons were revealed. The prevalence of traumas among different age groups of the population of the Republic of Belarus was studied. Issues of trauma prevention were considered.

Keywords: traumatism, external causes, mortality, long-term dynamics, tendency

Currently, traumas are one of the most urgent medical and social problems. The urgency of the problem of traumas is determined by their consequences (disability and mortality), which have social and economic significance. Every year in the Republic of Belarus more than 750 thousand people get traumas, 150 thousand or 20 % of them are children under the age of 18 years. Traumas form the most serious epidemic of our time, being the leading factor in premature and preventable causes of death [1].

The objective of the study was to investigate and analyze the current tendencies in the death rate of the population of the Republic of Belarus from traumas, poisonings and some other consequences of external causes.

Mortality is one of the indicators of the medical and demographic well-being of the population, and the death rate from injuries and other external causes, often premature (about 72 % of deaths are people of working age) and in many cases preventable is a socially significant indicator [2]. During the last two decades injuries, poisonings and other accidents as the cause of death were second after diseases of the circulatory system (DCS) and malignant neoplasms. Since 2007 external causes took the 4th place (10,8 %) after DCS (52,9 %), neoplasms (13,7 %), symptoms and other inaccurately indicated conditions (11,7 %) [3]. Despite a decrease in the proportion by 7,5 % in 2015 traumas continue to be one of the leading causes of sudden premature mortality.

In the period from 2005 to 2015 there is a steady decline ($R^2 = 0,91$) of the death rate of the republic's population from external causes from 172,5 cases per 100,000 to 92,5 % or 1,8 times. The average annual indicator for the period under study was $A_0 = 135,9\ \%_{000}$. The most unfavorable situation regarding the mortality of the population from external causes was found in Vitebsk, Minsk and Mogilev regions. The analysis of mortality caused by injuries of urban and rural populations showed that the mortality rate of rural population is twice higher than in urban areas: the average annual values of indicators (A_0) were 227,1 % and 105,2 %, respectively. In the structure of the death rate of the population from external causes the largest proportion was alcohol poisoning (an average of 17 %), traffic injuries (11 %), intentional self-harm (12 %), drowning (5 %). Accidents, poisoning and other external influences are the causes of death of children, the able-bodied population and the population of over working age. The average annual rate of deaths of children from external causes for the period under study was 16,9 % of the population, the able-bodied population is 159,1 %, and the population of over working age 162,3 %. The reduction in traumas and deaths from external causes is the result of targeted activity of state structures at the interdepartmental level, directly depends on the quality and timeliness of the provision of specialized medical assistance, the activities conducted to create a healthy and safe way of life among the population.

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INFLUENCE OF INCREASED GLUCOSE CONCENTRATIONS ON OXYGEN-INDEPENDENT METABOLISM OF NEUTROPHILS

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Influence of simulated conditions of hyperglycemia (6,5 mM, 8,0 mM, 11,0 mM) on spontaneous and induced myeloperoxidase activity of azurophilic granules of polymorphonuclear leukocytes has been researched. It was established that the spontaneous and receptor-induced activity of myeloperoxidase of azurophilic granules of neutrophils in hyperglycemia condition increases with the increase in the amount of glucose in the pre-incubation environment.

Keywords: hyperglycemia, myeloperoxidase, neutrophils, atherosclerosis, oxidative stress, Staphylococcus aureus, azurophilic granules, glucose.

It has been figured out recently that MPO is an important factor in the initiation and development of a variety of diseases associated with the related to a chronic or acute inflammatory process. In clinical practice, the activity of neutrophil myeloperoxidase serves as a marker for the intensity of inflammatory processes, and is also a promising diagnostic and prognostic indicator for a number of diseases and pathological conditions. The biological effect of MPO is largely determined by the balance between the effectiveness of the secretion of this enzyme in the extracellular space at the stage of neutrophil degranulation, on the one hand, and its inactivation and utilization in tissues, as well as degradation of oxidants formed in reactions involving MPO, on the other hand. In the secretory degranulation or death of neutrophils, the pathological action of the enzyme may be manifested.

Elevated systemic level of MPO is associated with the presence of coronary arterial diseases and may provoke the risk of developing adverse cardiological events (myocardial infarction, sudden death, etc.) among patients with chest pain and acute coronary syndrome. In addition, elevated levels of MPO can play a decisive role in atherosclerosis, oncological, neurodegenerative diseases, impaired lung respiratory function, kidney disease, systemic vasculitis, rheumatoid arthritis, etc.

Increased glucose content is able to reduce the immune response, lead to suppression of phagocytic activity of neutrophils, metabolic changes occur including glycosylation of proteins, metabolism of polyol (converts glucose to sorbitol), activation of protein kinase C (increased activity of this enzyme in hyperglycemia is accompanied by activation of lipid peroxidation processes), the formation of free radicals of oxygen, nitrogen oxide, cyclic guanosine-3'-5 'monophosphate, the reaction of glycolysis. In this case, the strong oxidants that result from the functioning of MPO initiate lipid peroxidation, the modification of proteins and nucleic acids (including halogenation, nitration, oxidation and cross-linking), thereby damaging the own tissues in the inflammation points.

In the experiments physiologically recorded glucose concentrations of 6,5 mm, 8,0 mm, 11,0 mm. have been used. To induce myeloperoxidase degranulation the daily culture of *St. aureus* have been used. With mild hyperglycemia (6,5 mM), the increase in spontaneous myeloperoxidase activity was increased at 1,2 times. In hyperglycemia of moderate degree (8,5 and 11,0 mm), the increase in spontaneous myeloperoxidase was observed at 1,6 and 2 times, respectively, and the induced activity was increased at 1,2 and 1,6 times in relation to intact cells.

It is obvious that glucose in concentrations of 6,5, 8,0 and 11,0 mm stimulates the processes of glycolysis and Krebs cycle, leading to the increase in the synthesis of ATP molecules and to the hyperactivation of neutrophils. Spontaneous and induced release of myeloperoxidase triggers the formation of free forms of oxygen and oxidative radicals, but in this case, it promotes the development of oxidative stress and leads to an increase in the bioaggressive potential of neutrophils.

Thus, the incubation of neutrophils under simulated hyperglycemia results in a nonspecific increase in the activity of myeloperoxidase cells, which promotes the generation of active oxygen species and the development of oxidative stress.

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RELATIVE BIOLOGICAL EFFECTIVNESS (RBE) VALUES FOR PROTON BEAM THERAPY

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Analysis of the radiation-induced cytogenetic effects of the action of γ rays and protons from a therapeutic fascicle beam at the entrance; and protons in the modified Bragg peak region on human peripheral blood lymphocytes *in vitro*. The calculated RBE of the protons of the original 150-MeV beam was 0,9 in the range of 0,5–5 Gy. Under the action of protons in the region of the Bragg peak, the RBE was about 1,1.

Keywords: proton therapy; relative biological effectiveness; chromosome aberrations; CABAS

Currently, there is a rapidly growing use of ionizing radiation in medicine for the diagnosis and therapy of cancer, and in various fields of science, industry and agriculture. As a result, there is an increasing unregulated natural background radiation on Earth, caused by radioactive pollution of the biosphere. Therefore, special importance has been placed on the study of the biological action of various types of radiation. In particular, knowledge of radiation induced cytogenetic damages is necessary for effective planning of radiation therapy, solutions to the radiation safety problems faced by nuclear power workers and long-term mission astronauts.[1]

Research of radiation-induced biological effects and their correlation with radiation dose is the main task of biological dosimetry. The most common, proven and valid biological markers of exposure used in dosimetry are specific radiation-induced cytogenetic damages - stable and unstable chromosomal aberrations.

The main aim of the work was to study the cytogenetic effects of the protons from a therapeutic fascicle beam, belonging to the Joint Institute for Nuclear Research, in particular the protons at the entrance and protons in the region of the modified Bragg peak on human peripheral blood lymphocytes *in vitro*.

Whole blood samples obtained from healthy donors were irradiated *in vitro*, with the ^{60}Co γ-ray installation ROKUS-M, in a dose range from 0,5 to 5 Gy (dose rate 0,82 Gy/min), and with the synchrocyclotron therapeutic proton beam (Dzhelepov Laboratory of Nuclear Problems, JINR). Whole blood samples in the tubes were exposed to an unmodified proton beam entering the object with an energy of 150 MeV, the energy normally prepared for radiotherapy for patients. The average LET value and dose rate at the target volume totaled 0,57 keV/μm and 0,7 Gy/min, respectively. The second set of samples were irradiated in the modified Bragg peak, which by means of a comb filter has been further modified to form a plateau extended to 10 mm. The proton energy at this site varied from 0 to 30 MeV, LET from 0,7 to 3,0 keV/μm with a maximum contribution at a value of 1,4 keV/μm. The dose rate was 1,3 Gy/min. In all experiments, cells were irradiated in a dose range from 0,5 to 5 Gy.

Culturing and fixation of human peripheral blood lymphocytes was performed according to standard protocol recommended by the IAEA.[2] The spectrum and the frequency of radiation-induced chromosomal aberrations of an unstable type was evaluated in the first post radiation mitosis (48 hours after the start of cultivation). On the basis of these results, the dose dependence of cells with chromosomal aberration formation and the total number of chromosomal aberrations in peripheral blood lymphocytes under the influence of radiation *in vitro* has been found. Evaluation of the RBE of the therapeutic proton beam was conducted using the ratio of doses of proton and γ-radiation effects, at equal levels, and showed that the magnitude of the RBE of the initial beam of protons with an energy of 150 MeV is close to 0,9 in the dose range 0,5 – 5 Gy, compared to the action of the protons in the region of the Bragg peak RBE which was 1,1.

The curves of the frequency of unstable CA have also been built using the CABAS software, which obtained curves that can be used as calibration curves for assessing dose in irradiated patients.

The quantitative and qualitative differences in cytogenetic indices in the human peripheral blood lymphocytes under the influence of γ-ray and proton beam therapy, at the entrance and in the region of the modified Bragg peak were identified. It was shown that protons in the region of the Bragg Peak are more efficient in their damaging effects, while the effect of protons at the entrance is almost equivalent to the action of γ-rays.

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INFLUENCE OF SEVERAL FACTORS ON THYROID CANCER DEVELOPMENT

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One of the main factors in the development of thyroid cancer is radiation exposure. The accident at the Chernobyl nuclear power plant led to a significant increase of this disease. In Belarus, the most affected were southern areas.

In this work, we have studied a number of factors influencing the development of thyroid cancer: age of the test at the time of the Chernobyl accident, gender, belonging by blood.

In the result, there had been some pattern of development of the disease: children 2–5 years old at the time of the Chernobyl accident, women and people with A (II) blood group have higher risk of developing arranged compared to other population groups.

Keywords: тhyroid cancer, radiation, radiation exposure, Chernobyl, blood group.

Thyroid cancer (TC) is one of the most spread malignant tumors of endocrine system. It may develop in any age. Frequency of its revelation has steady growth. Prognosis exists that number of newly revealed TC will be greater. Several factors of TC development exists. Nevertheless, radiation influence is considered as main reason of TC development. The role of radiation factor in the TC development in children and teen-agers after accident on Chernobyl NPP is taken for granted.

Disaster on Chernobyl NPP lead to significant growth of patients with TC. In Belarus, this pathology is met more frequently in southern regions.

The aim of investigation was to study several factors of TC development.

Archive data of RCI of radiation medicine and endocrinology about 300 children and teen-agers with TC have been used. The report of outpatient department and department of medical rehabilitation (period 01.01.2015 – 03.04. 2017) of RSPC of radiation medicine and human ecology was analyzed. Histories of disease of 30 patients with TC were analyzed.

We revealed that number of children and adolescents with TC have increased after 5–6 years after accident on Chernobyl NPP. The number of girls teen-agers was 10 % more, then boys.

The age of children during peak of TC revealing (1993–1996) was 7–15 years. Therefore, there were persons who have been 2–5 years old at the moment of the accident on Chernobyl NPP.

According to the report of outpatient department and department of medical rehabilitation (period 01.01.2015–03.04. 2017) of RSPC of radiation medicine and human ecology, we can see that Gomel region during last years TC was diagnosed more often in persons of middle age. It concerns women from 40 years and older. At the moment of the accident on Chernobyl NPP they were 11 years and older.

Data about blood groups from histories of disease of patients with TG were analyzed. Distribution of blood groups was following: 26,7 % of patients with TG had O (I) blood group, 53, 3% – A (II) blood group, 6,7 % – B (III) blood group and 13,3 AB (IV) blood group.

Received results were compared with data about common distribution of blood groups among the population of Republic of Belarus. In Belarus prevalence of blood groups is following: O (I) blood group near 35–40 %, blood group A (II) – 35–37 %, blood group B (III) – 15–20 %, blood group AB (IV) – 5–10 %.

The comparison of these data shows that greatest risk of TC development have persons with blood group A (II) and minimal – with blood group B (III).

In the result of this investigation we can conclude that children who were 2–5 years old at the moment of the accident on Chernobyl NPP, women and people with blood group A (II) have higher risk of TC development in comparison with other population.

MODERN METHODS OF DIAGNOSTICS OF VIRAL HEPATITIS C

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Diagnostics of HCV infection is one of the significant problems of modern medicine. The main target of the hepatitis C virus (HCV) is hepatocytes. Hepatitis C, as a rule, is asymptomatic and remains occult. HCV is of the greatest variability among all pathogens of viral hepatitis. At present, there are 6 main genotypes of the virus. Due to high mutational activity, HCV is able to avoid the effects of the protective mechanisms of the immune system. The dynamics of a special HCV marker (total HCV antibodies, as well as specific antibodies IgG and IgM) at different stages of the infectious process is different. In the blood, HCV is detected only in the acute phase of infection. To accurately analyze the dynamics of the process of HCV infection, comprehensive diagnostics is needed using modern methods.

Keywords: HCV, EIA, Ab, PCR.

The causative agent of HCV is the RNA genomic virus included in the genus Flaviviridae. Vyrions of a spherical shape are surrounded by a super-capsid. The HCV genome encodes structural proteins – C, E1, E2 / NS1 and non-structural proteins – NS2, NS3, NS4, NS5. The variability of protein ratios determines the presence of multiple serotypes. To each of these proteins, antibodies circulating in the blood are produced, which do not have virus neutralizing properties. The essential condition for the HCV infection development is the virus penetration into hepatocytes, where it replicates. Direct cytopathic effect of the virus on hepatocytes is observed only with the primary infection. The main lesions of organs and tissues in HCV are caused by immunological reactions. There is no rapid elimination of the pathogen from the hepatocytes. This is due to its weak immunogenicity. The main mechanism for "escaping" the virus from under the immune control is the high variability of the pathogen. The resulting specific anti-bodies directed at the dominant genotype lead to the destruction of the variant of the virus. But its place is occupied by one of the many minor quasispecies, immunity turns out to be inconsistent. As a result, hypervariable strains are maintained and support active replication. The rate of mutations exceeds the rate of replication, which forms the inherent HCV perennial persistence of infection.

In the laboratory diagnostics of hepatitis C, the main role belongs to serological methods based on the detection the general and specific antibodies to HCV (anti-HCV antibodies) in the blood serum and molecular biological methods based on the detection the RNA of the virus. Serological methods include ELISA. With the help of ELISA, IgM and IgG to HCV are detected in serum and plasma. The specificity of modern test systems for ELISA anti-HCV antibodies exceeds 99 %. The very fact of the presence of antibodies shows not only that a person is infected with hepatitis C, but also allows clarifying whether it is the consequences of an earlier infection, a chronic form of the disease or its acute course. At the same time during the development of the disease there is a so-called "seronegative window" – that is, antibodies appear in the blood of a sick person not earlier than 2–3 weeks after the onset of infection. Negative results of ELISA test are more likely to exclude hepatitis C. Among the sera, there are samples containing anti-HCV in amounts that are close to the norm of the detecting limits, which may be due to the early stage of infection. In case of the detection of anti-HCV IgM and IgG, additional polymerase chain reaction (PCR) testing is needed to detect HCV RNA. Qualitative detection of RNA indicates the presence of the virus, and quantification in real time gives an idea of the viral load. It is also necessary to carry out genotyping of the virus for the detection of genotypes of HCV by PCR.

Thus, to obtain complete information about the presence of HCV in the human body and the dynamics of the disease development, a comprehensive examination of the patient, including both serological (ELISA for the determination of total HCV antibodies as well as specific IgM and IgG), and a molecular biological study (PCR for HCV detection and the definition of its genotype) is required.

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ANALYSIS OF SPECTROSCOPIC METHODS OF DETECTION OF STRUCTURAL AND FUNCTIONAL STATES OF HEMOGLOBIN IN RBCS

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Spectroscopic methods of detection of structural and functional states of hemoglobin in RBCs are considered. It should be noted that in recent years the SERS method has been actively developing. Using this method, can detect various forms of Hb including in single live erythrocytes; selective detection of Hb bound to erythrocyte membranes.

Keywords: erythrocytes, hemoglobin, methods of detection of structural and functional states.

Red blood cells (RBCs), also known as erythrocytes, are normally biconcave disks of diameter 7–9 μm. An erythrocyte is the thickest (1,7–2,4 μm) at the edges and the thinnest (0,9–1,2 μm) at the center. RBCs are able to aggregate, stick to each other by the surface of the disks, thus, forming a rouleau. The number of RBCs in the aggregate can vary from a few to hundreds of pieces. The change of the degree of aggregation, size and shape of RBCs can indicate blood disorders. Structure and functional state of RBCs and quantity of various forms of hemoglobin (Hb) in them are the most important indicators reflecting the state of the body. The main function of RBCs is the transport oxygen (O_2). This function depends on the functional state (conformation) of Hb, i.e. affinity of Hb for O_2. The concentration of hydroxy-Hb, deoxy-Hb, carboxy-Hb and meth-Hb is determined in the blood. Methods of microscopy, optical, microwave, and Mossbauer spectroscopy are widely used to solve the mentioned and other specific analytical problems.

The purpose of this work was a comparative study of the unique analytical capabilities of various methods for the detection of structural and functional states of RBCs and various forms of Hb in them. The results of the studies are tabulated. It should be noted that in recent years the SERS method has been actively developped.

Method name	Physical principle	Analytical capabilities
Optical microscopy	The phenomena of refraction and reflection of light at the interface between media are used.	Measurement of the shape and size of erythrocytes.
Optical spectrophotometry	Resonance absorption of light due to electronic transitions in molecules.	Determination of the concentration of various forms of Hb in the concentration range $>10^{-6}$ M
Raman scattering (RS)	Displacement of frequency of light scattered by molecules as a result of the interaction of laser radiation with intramolecular vibrations.	Determination of the concentration of various forms of Hb in the concentration range $>10^{-3}$ M
Surface enhanced Raman scattering (SERS)	Enhance of Raman scattering as a result electromagnetic and chemical interaction of molecules with a nanostructured surface of noble metals.	Detection of various forms of Hb including in single live erythrocytes; selective detection of Hb bound to erythrocyte membranes.
Nuclear magnetic resonance (NMR)	Resonant absorption of electromagnetic radiation by atomic nuclei in magnetic fields.	Study and integral control of the structure of erythrocyte membranes.
Mossbauer Spectroscopy	Resonant absorption of the gamma radiation of a moving source by atomic nuclei of the sample.	Determination of the concentration of various forms of Hb on the basis of the determination of the quantum state of the iron ion.

POLYMORPHISM *ACE* AND GLUTATHION-S- TRANSPHERASE OF GENES IN KIDNEY CANCER

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The purpose of the research is to study the prevalence rate of I / D polymorphism of the ACE gene in case of kidney cancer among male population of the Republic of Belarus. The analysis was carried out using single nucleotide polymorphism in the ACE gene (rs4646994), as well as detection of frequency of polymorphic variants of genes of the biotransformation system of xenobiotics, as factors predisposing to kidney cancer.

Keywords: ACE gene, kidney cancer, biotransformation genes of xenobiotics, PCR.

The *ACE* gene encodes the amino acid sequence of the angiotensin converting enzyme, which is the key enzyme of the renin-angiotensin system, involved in the regulation of blood pressure, the number of red blood cells and electrolyte blood balance. Polymorphism *rs 4646994, Ins / Del I-> D*, the *ACE* gene has two variants, differing in insertion, I or absence of deletion, of the *D* sequence in the intron of the ACE gene. Polymorphism is associated with the degree of expression of the *ACE* gene. Option *D* is characterized by a more active expression of *ACE* [1]. It has also been demonstrated that the *ACE* gene, in addition to the synthesis of angiotensin II, is an inactivator of bradykinin. Angiogenesis, cell invasion and growth of cancer cells are the targets of new strategies for the treatment of malignant tumors in recent years [2]. It can be assumed that the allele *D* may be associated with increased activity of the renin-angiotensin system: the risk of developing hypertension, diabetic nephropathy, severe hypoglycemia in patients with diabetes, obesity and poor prognosis in kidney transplantation [3].

The genes of glutathione-S-transferases: *GSTT1, GSTM1, GSTP1*, encode the enzymes of the xenobiotics detoxification system. This system performs enzymatic cleavage of xenobiotics and is a large family of genes, many of which have polymorphic variants that reduce or block the expression of genes. There are indications in the literature that in some studies there was no correlation between *GSTT1 (0), GSTM1 (0)* with an increasing risk of kidney cancer [4], with the exception of *GSTT1* in the Asian population [5]. However, most studies show that some combinations of individual polymorphisms increase the risk of developing kidney cancer, this also applies to combinations of the genotypes *GSTM1 (0), GSTT1 (0*) [6,7].

The determination of the polymorphic variant of the ACE gene was carried out by PCR. The presence of polymorphism *(rs4646994)* in the *ACE* gene was analyzed in 26 patients without a history of kidney cancer and in 42 patients with a clinically verified diagnosis of kidney cancer. Based on the calculation of the odds ratio, it can be stated that the genotype *D / D* prevails in the main group – 61,9 %, in the comparison group it is 34,6 %, and the frequency of heterozygotes *I / D*-9,5 % is sharply reduced, against 26,9 %. Research in this direction will be continued.

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EVALUATION OF THE RESULTS OF PROSTATE CANCER SCREENING IN MEN

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The object of research is the issue of timely diagnosis of prostate cancer at the age of 50–65 years in the Republic of Belarus. The aim of study is find out as far as effectively and realization of population screening of prostate cancer is expedient for men in age 50–65 during the pilot project of Screening of prostate cancer in Republic of Belarus.

Introduction in everyday urology practice of determination of level of prostatic specific antigen in the whey of blood resulted in the exposure of plenty of forms without symptoms of prostate gland.

The analysis of prostatic specific antigen in the whey of blood became one of fundamental in screening and monitoring of patients the cancer of prostate gland, in his differential diagnostics with the adenoma of prostate gland, quite often largely determining the dynamics of efficiency and prospect of his treatment.

Keywords: cancer of the prostate gland, prostatic specific antigen, echography, magnetic resonance imaging.

The incidence of prostate cancer (PCA) in the Republic of Belarus is growing rapidly. According to the Belarusian Chancery Registry, the number of cases of prostate cancer reported annually in the Republic increased from 932 in 1996 to 3,122 in 2011 (3,5 times). The growth rate of PCA takes the 1st place among all malignancies in the country. At present, there is an exponential increase in the incidence of PCA. Mortality rates also remain high. Over the past 20 years, the mortality from prostate cancer has almost tripled.

Modern methods of diagnosis of prostate cancer are based on the definition of prostate-specific antigen (PSA) followed by systematic biopsy of the prostate under the control of trans rectal ultrasound (TRUS). This allows you to identify the disease in the early stages, which, in turn, significantly improves the results of treatment. [2].

At the same time, during the screening, there is a problem of detecting latent, or "histological" forms of cancer that do not appear clinically, which leads to over diagnosis and excessive treatment.

In the Republic of Belarus, a program of a "pilot" screening project for PCA was developed, approved by the order of the Minister of Health and successfully conducted in selected districts of the republic with a total population of 500 thousand people. The obtained data made it possible to analyze the effectiveness of the Program under the following criteria: the number of patients surveyed, the number of detected cases of cancer during screening, the distribution by stages of newly diagnosed cases in the region, the distribution by type of treatment of all newly diagnosed cases in the region, and stratification of cancer risk in patients before treatment. In addition, the impact of screening on the main epidemiological indicators for PCA in the respective region was assessed.

In connection with the foregoing, the purpose of this work was to evaluate the effectiveness and feasibility of conducting a population screening for prostate cancer in men aged 50 to 65 years during a "pilot" screening project in the Republic of Belarus.

During the screening, the dependence of IV stage of prostate cancer on age was analyzed. The study showed that the older a man is, the more often patients are in old age visit doctors, therefore, better and earlier diagnosed possible violations. In two years of screening, the indicator for prostate cancer of Stage IV in men aged 50–54 years in Belarus as a whole decreased from 52 % to 22 %.

The screening also showed that although the incidence of prostate cancer of the fourth stage in all ages began to decline, among men aged 45–49 years, the neglect of the disease is still high (30 %), because this age does not enter the screening program.

Prostate cancer causes death in 3 % of men over 50 years of age. This is a relatively slow progression of the disease. If a patient under 65 years of age remains untreated, the probability of his death from PCA is 75 %.

The development and implementation of a pilot screening project for prostate cancer has significantly improved the detection of localized forms of the disease. In the screening group of the 1–11 stage, 68,6 % were compared with 42,6 % in the republic average.

USE OF GAMMA KNIFE IN RADIOSURGERY IN THE TREATMENT OF EPILEPSY

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Epilepsy is a group of neurological disorders: structural, biochemical or electrical anomalies of nerve cells characterized by epileptic seizures. These seizures are caused by abnormal activity of neurons of the brain, which can lead to disruption of cognitive and motor functions, neurodegeneration of brain tissue and even death without proper treatment.

According to the World Health Organization (WHO), as for 2017, around 50 million people suffer from epilepsy throughout the world. In this regard, epilepsy is one of the most spread neurological diseases on a global scale.

Keywords: epilepsy, pharmacoresistance, radiosurgery, Gamma Knife, ionizing radiation.

There are many ways to treat epilepsy: antiepileptic drugs (Phenobarbital, lamotrigine, perampanel, etc.), dietary treatment (ketogenic diet), surgical treatment, neurostimulation and neuromodulation (electrical stimulation of the vagus nerve), radiosurgery.

Every third case of epilepsy is drug resistant (pharmacoresistant), which presents a complex choice of treatment methods. In connection with it, patients has to resort to surgical intervention: removal of the epileptic region of the brain without any subsequent significant disorders of consciousness and motor functions. In some cases, simple surgery cannot solve the problem due to the difficult location of the abnormal site or close contact with the cortical area, whose removal will result in loss of sensory processing, linguistic capacity or paralysis.

Radiosurgery is an alternative to surgical treatment in complex cases of benign and malignant tumors, arteriovenous malformations, metastases, meningiomas, trigeminal neuralgia, as well as epileptogenic brain damage in patients with a pharmaco-resistant form of epilepsy. In radiosurgery, innovative devices are used where focused converging narrow ionizing beams are used to induce the desired biological effect at a predetermined target through intact skull and brain tissue. A sharp drop in the dose outside the target ensures optimal preservation of surrounding tissues.

Gamma Knife is the most famous device in radiosurgery among other devices. It was invented in the 1950s, and widely used in the 1970s in oncology. Thanks to the development of computer technology and diagnostic methods (MRI, CT, PET), the Gamma Knife is still used, even despite the development of other promising radiosurgical systems, such as the cybernetic robotic radiotherapy system based on linear accelerators.

The advantage of the Gamma Knife, as well as of all radiosurgery, is the avoidance of damage to the outer covers or craniotomy, and there is also no damage to neighboring healthy cells located next to the abnormal area. Gamma Knife treatment is based on the ability to focus ionizing radiation of cobalt-60 in doses of 10–50 Gy (depending on the nature of the lesion) on small clearly defined areas of tissues of deep or hard-to-reach areas of the brain.

The development of radiation diagnostics, radiosurgery and radiotherapy makes it possible to detect and treat difficult operable tumors and epileptic structures of the brain difficult for ordinary surgery. Still there are many nuances associated with the uniqueness of each case, the selection of appropriate technical parameters (dose, volume goal, etc.) and the development of highly functional computers that should be studied and overcome in this promising method of treatment. However, the important role of radiosurgical methods in the treatment of oncological diseases and epilepsy is already clear.

APPLICATION OF LASERS IN VISION CORRECTION

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The paper considers the main methods of vision correction used in ophthalmology, compares the mechanisms of vision correction and their possible side effects, studies the prospects of this direction of medicine.

Keywords: laser radiation, correction of vision, choriodea, miopia, hypermetropy, sculter.

The laser is a source of monochromatic coherent light with a high directionality of the light beam. The laser beam has hemostatic properties, produces a bloodless incision while simultaneously destroying the pathogenic microflora and tumor cells in the operating wound.

There are 2 main pathologies of vision-myopia and hypermetropia, the correction of which is carried out using different lasers. Treatment can be as conservative: glasses, gymnastics, nutrition, lighting mode, metered eye strain, etc., and surgical with the use of various laser devices, which in turn are divided into excimer laser units (Lasik method) and femtosecond lasers (PRK method).

LASIK is a unique combination of microsurgical and excimer laser technologies. This is the most "sparing" and effective method that preserves the anatomy of the corneal layers.

PRK-dosed removal of the corneal tissue by evaporation using an excimer laser, is a non-contact action of the excimer laser on the surface layers of the cornea, without affecting other structures of the eye. At the same time, the laser, working in the scanning mode, "smoothes out" and "simulates" its surface, with the advent of "microerosion".

If we compare these two methods, then in the case of hyperopia, LASIK is uniquely the best method. The thin cornea in some cases does not allow correction by LASIK, so the only option is PRK. In the case when the microkeratome can not be used for one reason or another, PRK is again the only option. In all other cases, LASIK is the preferred option.

Every year, several million laser sight correction operations are performed worldwide, and numerous private clinics convince patients of the absolute effectiveness and safety of this procedure, but is it so?

Here are a number of side effects of these operations: dry eye syndrome, the appearance of asterisks and luminous circles before the eyes, the disturbance of night vision, a decrease in contrast sensitivity, a decrease in the ability to distinguish between the outlines of objects and the color range is one of the most important functions of vision. It should be understood that the operation thins the corneal layer and reduces its resistance to external influences.

There is also the risk of appearance and operational complications, which are most often associated with the technical maintenance of the operation: loss of vacuum or its failure during shear, blade defects, incorrectly selected parameters of vacuum rings and stoppers, and postoperative complications, which include a large number of conditions: from inflammatory reactions to subjective dissatisfaction of the patient with the result of the operation.

If you summarize all the complications, deviations from the normal course and side effects of LASIK, you will get 18,61 %. Quite often they are combined in one patient. For example, the uneven slice of a microkeratome with an epithelial defect during surgery can lead to the growth of epithelium in the postoperative period, which in turn can lead to the occurrence of induced or incorrect astigmatism, and, consequently, reduced visual acuity. Complications that affect the visual result in the long-term postoperative period, after reoperations (the total of reoperations – 12,8 %), was 0,67 %.

Every year, several million laser sight correction operations are performed worldwide, and numerous private clinics convince patients of the absolute effectiveness and safety of this procedure, but is it so?

PROSPECTS OF USING CPG-DNA AND CYCLIC DINUCLEOTIDES AS VACCINE ADJUVANTS

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Owing to insufficient immunogenicity of modern vaccines they need to be complemented with adjuvants. The canonical adjuvants induce a humoral, rather than cellular immune response essential for control of viruses and tumors. It is known that nucleic acid compounds, such as CpG-DNA and cyclic dinucleotides (cyclic diGMP, cyclic diAMP, etc.) are the agents capable to stimulate both humoral and cellular immune response to pathogens and own transformed cells. The prospects of using the above mentioned nucleic acid compounds for treatment of cancer are of particular importance.

Keywords: adjuvants, CpG-DNA, cyclic dinucleotides, *in situ* vaccination

Elaboration of most efficient strategies of disease therapy has always been one of top priority trends in medicine. Growing risk of contracting bacterial and viral pathologies contributes to the relevance of this challenge.

Conventional vaccines incorporate viable attenuated and inactivated microorganisms plus components of microbial cells or viruses. Many live and even inactivated vaccines are not safe. New generation formulas (e. g. DNA and peptide vaccines) are more harmless but less immunogenic, necessitating concerted addition of immunity-enhancing agents – adjuvants to raise their efficiency.

The available adjuvants induce potent humoral and weak cellular immune response, urging the vital need to seek novel more effective substances.

In recent years research interest has been focused on nucleic acid compounds, particularly on prokaryotic DNA enriched with CpG-motifs and on cyclic dinucleotides (cyclic diGMP, cyclic diAMP, etc). They are capable to imitate pathogen attack and activate both humoral and cellular protection systems [1; 2]. The above-mentioned natural substances are relatively labile in blood stream and may be readily degraded by the enzymes. It was suggested to promote their stability by immobilization on nanoparticles composed of Mg, Al-layered double hydroxides [3].

Development of nano-size adjuvants based on nucleic acid compounds may provide the solution of numerous problems in contemporary medicine, like side-effects of many existing vaccines and inadequate immunogenicity of adjuvants toward T-cell immunity.

One of promising therapeutic strategies in oncology is the so-called vaccination *in situ* which consists of a combination of minor-dose irradiation (or chemotherapy) with the intratumoral introduction of CpG-DNA [4]. This procedure causes the release from the dead cancer cells of a full range of tumor-associated antigens. In turn, CpG-DNA conveys the alarm signal to the innate immunity system, resulting in activation of antigen-presenting cells. As a consequence, vaccination *in situ* eliminates the need to seek potential therapeutic antigen or antigen set for individual patient.

In our view, adjuvant system comprising constituents with different mechanism of action represented by plasmid CpG-DNA and cyclic dinucleotide (i. e. cyclic diGMP or cyclic diAMP) has demonstrated realistic, scientifically substantiated claim to be applied in formula of the vaccine capable upon intratumoral injection to induce a personalized therapeutic *in situ* «autovaccination» against individual tumor antigens of the patient.

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THE ANALYSIS OF INCIDENCE OF PREGNANT WOMEN ON THE EXAMPLE OF FRUNZENSKY DISTRICT OF THE CITY OF MINSK

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Long time, influencing the nature, humanity has created environmental problems which have gained global character that has affected the state of health of all mankind. In particular, it became one of factors of incidence of pregnant women. It is known that the adverse state of environment in the different cities causes 20-30 % of complications during pregnancy.

Keywords: pregnant women, health, diseases, dynamics, analysis.

In the conditions of an adverse demographic situation in Republic of Belarus, and the introduction in reproductive age of girls from the small generations born in the 90s problems of a condition of reproductive health and reproduction of the population acquire special relevance and the medico-social importance [1; 2].

The high incidence of pregnant women predetermines the high incidence of newborns remaining in recent years, and as a result, is the adverse forecast for health of the nation. The reasons, the worsening health of women have medico-social, ecological and economic character [4].

The complication of pregnancy is given as chronic diseases of women which can become aggravated during incubation of a fetus, and arisen for the first time during pregnancy [5].

Diseases acquired during pregnancy are one of the frequent reasons of the pre-natal pathology leading to developing of malformations of a fetus and its death [3].

Purpose of work: analyze and follow the dynamics of the morbidity of pregnant women in the conditions of the Frunze district of Minsk for the period from 2014 to 2015.

For realization of a goal annual reports of antenatal clinic of "the 20th city policlinic" of Minsk from 2014 for 2015 have been analysed.

It is established that in this temporary period overall picture of the end of pregnancies has improved.

The increase in number of urgent childbirth is noted (from 93,52 % to 95,72 %). The number of premature birth (from 3,45 % to 2,59 %), and abortions has decreased (from 3,03 % to 1,69 %).

It is defined that 2015 is characterized by the big level of birth rate (the number of live-born children has increased on 51), however at the same time the occurrence of congenital malformations of a fetus increases (from 0,5 % up to 0,9 %) that is connected both with endogenous, and with exogenous factors.

It has been revealed that main reason of pregnancy complication is development of anemia (2014 – 21,54 %, 2015 – 22,53 %), infectious and parasitic diseases (2014 – 17,4 %, 2015 – 18,22 %), infections of urinogenital ways is the leading reasons of a complication of pregnancy (2014 – 14,41 %, 2015 – 12,63 %).

In dynamics of a research at zero level there are such indicators as prenatal bleedings (0–0,14 %), a diabetes mellitus (0–0,29 %), illnesses of the blood circulatory system (0,57–0,57 %).

Health protection of women and children has important medico-social value, both for the present stage of development of society, and for the future of the country. Therefore protection of motherhood and the childhood becomes one of the main objectives of state policy, an important component of health care.

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IMMUNOPHENOTYPIC CHARACTERISTICS OF B-CELL NON-HODGKIN'S LYMPHOMAS

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As a result of the research, the immunophenotypic characteristic was determined for diffuse large B-cell lymphoma and follicular B-cell lymphoma.

Keywords: non-Hodgkin's B-cell lymphomas, B-lymphocyte, immunophenotyping, clusters of differentiation, flow cytometry.

Nowadays the molecular-biological researches in the field of non-Hodgkin B-cellular lymphomas are developing at a rapid pace.

The appearance of lymphomas of this type is often associated with changes in ecological status, because the workers in different spheres of production contacting pesticides, fertilizers, and solvents are considered to have them more often [1].

The research of immunophenotypic features of the non-Hodgkin's B-cell lymphomas is relevant, so making a diagnosis correctly and in time allows you to predict the flow of the disease and individualize the tactics of the treatment.

The Non-Hodgkin's lymphomas are a group of histologically and biologically heterogeneous cancerous neoplasms of the lymphoid system. The B-cell lymphoproliferative tumor is characterized by uncontrolled production of B-lymphocyte cellular structures [2].

Immunophenotyping is carried out on the analysis of specific protein markers basis that are located on the surface or inside the cells of lymphocytes – clusters of differentiation and denoted by the CD index with the addition of a conditional number .

The aim of the study was to increase the effectiveness of differential diagnosis of non-Hodgkin's lymphomas on the basis of an evaluation of the immunophenotypic characteristics [3].

Material and methods.

Immunophenotyping of the bone marrow, peripheral blood and lymph nodes were carried out by flow cytometry on Beckman Coulter Navios flow cytofluorimeter (USA). The material of the research was samples of bone marrow, peripheral blood and lymph nodes of patients treated on the basis of the Republican Scientific and Practical Center of Oncology and Medical Radiology named after. N.N. Alexandrov.

Immunophenotype of tumor cells of bone marrow and peripheral blood of 37 patients with various morphotypes of lymphomas were researched.

The prevalence of the group of patients with diffuse large B-cell lymphoma in 37,8 % of cases was established.

This morphotype is characterized by high cell aggressiveness and dynamic growth. In the absence of a highly effective intensive treatment, the metastatic lesion of the body leads to a lethal outcome [4].

In the research of this type of lymphoma, the following immunophenotype was established: high level of expression of HLA-DR markers, CD79b, CD19, moderate expression level of Kappa, CD43, FMC-7, BCL-2, CD45 / CD14, low expression level of CD3, CD3 / CD16 / CD56, CD5, CD79a, CD11c, CD103, FMC-7, no expression of CD10, Lambda, CD43.

Follicular B-cell lymphoma was diagnosed in the second group of patients in 13,5 % of cases. This morphotype of a malignant tumor is characterized in most cases by an asymptomatic course, in a number of cases it is detected at the stage of metastatic bone marrow involvement [5].

As a result of performed immunophenotypic studies, the following immunophenotype was established: high expression of markers CD23, HLA-DR, CD22, Kappa, CD79b, FMC-7, CD3, moderate expression level of CD138, CD10, CD43, CD11c, CD19; low expression level of CD5, Lambda, CD103, CD3 / CD16 / CD56, absence of expression of CD79a, BCL-2, CD45 / CD14.

The monitoring of the course of the disease showed that the 5-year survival of patients with B-large cell lymphomas was 85 % for the early stages, with prevalent processes and involvement in the bone marrow – 26 % [6].

Thus, one of the key tasks of clinical oncology is timely highly informative complex diagnosis of the disease.

Immunophenotyping with the use of immunohistochemical method, the flow cytometry are the modern diagnostic algorithms in differential diagnosis and evaluation of the effectiveness of therapy for all types of the lymphoproliferative diseases [2; 4].

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INVESTIGATION OF DAMAGE OF OPPORTUNISTIC FUNGI IN MAN-MADE ECOSYSTEMS

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The study examined the premises of residential and public buildings for signs of bio-damaging. Microbiological analysis of isolates showed that the main agents of bio-damaging inside the premises are microscopic filamentous fungi. First of all building materials, were susceptible to colonization with micromycetes, were studied cultural and morphological properties of microorganisms selected from the foci of bio-damaging, was determined the tribal affiliation of the dominant cultures, were evaluated the growth rate of colonies and the density of biomass of the culture at 28 °C and 37 °C.

Keywords: alternaria, aspergillus, chaetomium, cladosporium, fusarium, penicillium, stachybotrys, trichoderma, ulocladium, mold fungi, damage of building materials.

The study group of opportunistic (potentially pathogenic) fungi – actively develop a direction of mycological research in recent years. Opportunistic fungi refers to those fungi that normally would not cause infections in otherwise healthy people but are able to cause infection under certain circumstances [1]. In connection with the increase in the number of diseases caused by conditionally pathogenic species of microscopic fungi, more attention is given to their monitoring in the environment [2].

The object of a research - microscopic filamentous fungi, isolated from the centers of mold damage to building materials.

The work purpose – studying of growth of the micromycetes involved in the bio-damaging of building materials at temperatures and conditions that are comfortable for human activity.

During work methods of superficial cultivation have been used.

In the work it was shown that the most common types of fungus-micromycetes of the following genera are located in residential areas: *Alternaria, Aspergillus, Chaetomium, Cladosporium, Fusarium, Penicillium, Stachybotrys, Trichoderma, Ulocladium, Verticillium.* The greatest variability of coefficient of radial growth rate was characterized *Aspergillus* and *Chaetomium.* Increase temperature limited rise 40 % of strains of the kinds *Chaetomium* and 33,3 % of the kinds *Cladosporium, Fusarium* and *Stachybotrys*, of 9,1 % and 6,0 % of the kinds *Penicillium* and *Aspergillus*, respectively. The most expressed by inhibition of growth at 37 °C were the representatives of kinds *Chaetomium* and *Stachybotrys* – the coefficient of radial growth rate compared to 28 °C decreased by 4,1 and 4,0 %, respectively. High growth activity in 37 ºC was characterized by representatives of the kinds *Alternaria, Aspergillus, Fusarium, Penicillium,* and *Ulocladium.*

The study of growth activity of selected fungi, cultivated at temperatures of 28 and 37 °C showed that the increase in temperature increases the biomass yield of thermophilic cultures in 0,5 times, and cold resistance is lower in 1,5–2 times. The highest yield of biomass at a temperature of 28 °C were at fungi of the kinds *Alternaria, Aspergillus, Verticillium*, and at a temperature of 37 °C, fungi of the kinds *Aspergillus, and Cladosporium.* The optimum temperature for the development of most crops opportunistic fungi isolated from lesions of moulds and destruction of residential premises is 20–35 °C. Since the temperature range 20–25 °C is comfortable in most residential areas, and the temperature at 35 °C is approaching to the natural temperature of a healthy human body. Thus, most cultures of fungi to growth and development in the environment of residential areas, having a negative impact on human health. When comparing the growth characteristics of fungi it was shown that the biomass yield is not necessarily dependent on growth rate. At a temperature of 28 °C of the fungus *Verticillium* biomass yield was higher than the rate of growth of the colony, while *Cladosporium* both figures were on the same level.

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THE INFLUENCE OF VARIED LEVEL OF PERSONAL ANXIETY ON THE ADAPTIVE CAPACITY OF STUDENTS

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The effect of the level of anxiety on the adaptive capacity of students during the examination session was studied. The results of the study showed the interrelation between the adjustment level and the anxiety level of students.

Keywords: adaptive capacity, anxiety, students.

Adaptation has an individual character, which largely determines the degree of its impact on the student's personality, his health, success in acquisition of new material, social interaction, etc. The impairment of adaptation mechanisms is able to make it difficult for students to adapt to the learning process and cause unfavorable alterations in the body, leading to health deterioration. One of the main criteria for the inability to adapt is the increased level of anxiety.

The purpose of the study is to examine and evaluate the adaptive capacity of the circulatory system of students with different anxiety levels during the examination session.

To collect the necessary information the Spielberger – Khanin anxiety scale was used. It is designed to identify the anxiety state and uneasiness as treats of personality and is based on a subjective assessment of the person's own experiences, sensations, and actions. The calculation of the adaptive capacity of the circulatory system was carried out considering the body weight, height, age, pulse rate and blood pressure. Using the scale, the adaptation level was assessed. Thirty virtually healthy third year students of ISEI BSU took part in the study.

According to the Spielberger – Khanin tests, the students examined were divided into 3 groups according to the level of trait anxiety: low (3 %), medium (43 %) and high (53 %). In addition, the level of state anxiety was assessed. Thus, 63 % of students have an average level and 30 % of students have a high level of this indicator, which is quite expected and can be explained by the reaction of young people to such a social and psychological stressor as a session. The assessment of the degree of adaptation of organism to the identified adaptive capacity showed that 43 % of the test subjects had satisfactory adaptation, 56 % of the test subjects had the tension of the adaptation mechanisms, poor adaptation and adaptation breakdowns were not identified. At the same time, the students with a high value of the adaptive capacity tended to have high values of the level of trait anxiety.

Thus, the results of the study showed that the adaptive capacity depends on the level of trait anxiety. A high level of trait anxiety affects not only the quality of communication, social-psychological indicators of performance efficacy, relationships with friends, conflicts, but also autonomic and somatic functions, which can contribute to the development of health problems.

THE PARAMETERS OF CARDIAC RHYTHM IN INDIVIDUALS OF DIFFERENT AGE UNDER THE INFLUENCE OF PHYSICAL ACTIVITY

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The research of the regularities of the adaptation's process of the organism associated with environment change is one of the most important problems of modern physiology and medicine. The given theme is actual nowadays, as it promotes the development of sports, helps to reach or improve sports achievements. The obtained results are used for the prevention and treatment of many diseases; allow us to identify opportunities for physiological mechanisms.

Keyword: physical activity, adaptation, cardiovascular system, blood pressure, heart rate, evaluation.

In everyday life people often subject themselves to loads of various kinds. One of the types is physical activity. In this research, we will talk about the effect of physical exertion on the parameters of the heart rhythm [1].

Adaptation of the body to physical loads consists of the mobilization and use of the functional reserves of the body, of the improvement of the existing physiological mechanisms of regulation. The basis of phenotypic adaptation is acquired by the mechanisms obtained by everyone in the process of daily life (ontogeny). There are two stages of adaptation – urgent and long-term. Urgent is an immediate response to a single impact of physical activity. The main burden falls on the regulatory mechanisms of the neurohumoral system. The maximum mobilization of physiological reserves is carried out, but they are spent uneconomically [4].

The difference in the right heart rate is the regular contraction of the myocardium with the same rest period and the number of strokes from 60 to 80 per minute. Changes in the work of the heart rhythm associated with the effect of physical exertion, cause various adaptations in the human body, which is the basis of health and high performance [2].

The objects of the research were the parameters of the heart rhythm under the influence of physical activity.

Aim of the research: to study the effect of exercise on the parameters of the heart rate and assess the role played by physical activity in persons of different ages.

Studies were conducted on young men and girls – students aged between 18 and 20 years. The evaluation of the main integrative hemodynamic parameters was performed measuring the pulse and arterial pressure at rest and under physical exertion. The level of physical working capacity was studied by conducting a sample with dosed physical loads. Subjects performed a stepwise-increasing load.

As a result of the research, changes in the parameters of heart function in young men and women of adolescence are demonstrated, which is determined by the effect of physical stress on the cardiovascular system. Using the parameters of heart rate of blood pressure and heart rate, it was revealed that the heartbeat of the majority of subjects is in the range from 38 % to 45 %.Evaluation of the fitness of the cardiovascular system was 40,6 % for young men, 42,5 % for girls. The results show inadequate heart training and indicate the predominance of adaptation of the cardiovascular system of young men over the system of adaptation of girls to physical exertion. At the same time, the parameter of the young men's heart rate is closer to the indicator of good heart's fitness 38 %.

Thus, running, in condition of regular training and selection of individual adequate workload, can solve problems with the cardiovascular system. Moderate physical training can significantly stop the age-related changes in the cardiovascular system, increase aerobic capacity and endurance (indicators of the biological age of the organism and its viability) [3].

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TRANSFORMING GROWTH FACTOR BETA AS A PROGNOSTIC MARKER OF FIBROGENESIS IN THE EXPERIMENTAL MODEL OF LIVER CIRRHOSIS

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A special role in fibrogenesis and immunomodulation is mediated by isoforms of the transforming growth factor β (TGFβ). The level of TGFβ1 and TGFβ3 genes expression in liver tissue as well as the extracellular cytokine determination in serum of rats with experimental liver cirrhosis may be used as the prognostic marker of fibrosis and cirrhosis development.

Keywords: transforming growth factor β, fibrogenesis, experimental liver cirrhosis.

Introduction. Cirrhosis is an end-stage liver disease accompanied with irreversible replacement of the parenchymal tissue by a fibrous connective tissue [1]. One of the most widely used experimental models of liver damage is the common bile duct ligation (CBDL) in laboratory animals, which provides the development of fibrosis followed by progression to cirrhosis at 4–6 weeks [2]. The main role in fibrogenesis belongs to the isoforms of transforming growth factor beta (TGFβ) – a multifunctional cytokine playing important role in immunomodulatory processes in organism [3].

Aim. Evaluate the serum level of TGFβ and the expression of the TGFβ1 and TGFβ3 isoforms genes in liver tissue of CBDL rats at different stages of fibrogenesis.

Materials and methods. Serum and samples of liver and spleen tissue from Wistar rats with induced CBDL model (n=6) or control group (n=5) were obtained during period of 6 - 11 weeks after model establishment. The control group of animals were performed a "sham" operation without imposing ligatures. The level of gene expression in liver tissue samples was determined by real-time polymerase chain reaction. Morphological study of the percentage of surviving hepatocytes was performed by staining histological sections of the liver. The extracellular level of the cytokine was evaluated by the enzyme immunoassay.

Results. Morphological examination of liver histological sections at 6 – 11 weeks of CBDL showed that the percentage of undamaged hepatocytes in the experimental group was 40,5 [25,5 ÷ 50] %, which is 2 times less than in the control group (95,5 [93,5 ÷ 96]. It was shown that the number of preserved hepatocytes in CBDL rats was significantly decreased and by 11 weeks was 3 times less than at week 6. A correlation was established between the percentage of functional hepatocytes and the index of spleen mass ($R = 0,9$, $p<0,05$), which indicates the involvement of immune mechanisms in fibrogenesis. As a result of molecular biological studies, it was found that expression levels of TGFβ1 and TGFβ3 in liver tissue of CBDL rats were significantly increased compared to the control group ($p<0,05$). Thus, the average level of expression of TGFβ1 molecules was 71,95 [30,7 ÷ 96,3] fold, and TGFβ3 was 27, 4 [12,8 ÷ 30,1] fold, which exceeded by 75 times and 13 times similar parameters in control animals. Analysis of the dynamics of TGFβ1 and TGFβ3 genes level of expression revealed the increase by 1,85 times and 2,85 times, respectively, from week 6 to 7. At week 8, the level of TGFβ3 isoform expression in CBDL rats was the same as at week 7. The ratio of TGFβ1 / TGFβ3 in CBDL rats during the study was gradually decreased, what was not observed in the control group. So, at week 6, this index was 7,41, and by the end of week 11 it was decreased in 6 times. A correlation between the percentage of preserved hepatocytes and the level of expression of the isoform of TGFβ3 ($R = 0,87$, $p<0,05$) was established. It was revealed that extracellular production of TGFβ in the serum of CBDL rats was 2 times less compared to the control group of animals and decreased as the disease progressed.

Conclusion. Fibrogenesis in CBDL rats was characterized with a significant increase in the expression of the profibrogenic isoform TGFβ1, a disbalance of ratio TGFβ1 / TGFβ3 and a gradual decrease in the extracellular cytokine concentration, which may be a key moment for the optimal determination of fibrogenesis markers and serve as a basis for the subsequent development of effective antifibrogenic therapy for pathological conditions liver.

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EPIDEMIOLOGICAL ASPECTS OF LUNG CANCER

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In Belarus, lung cancer takes the first place on the incidence of cancer among men. Lung cancer is a serious health and social problem. In the developed countries it is the most common type of cancer and the most common cause of death among oncological pathologies. The main focus is set on two factors: first – strengthen air pollution; second – the increase of tobacco usage.

Keywords: lung cancer, age and gender dynamics, risk factors which can lead to cancer, smoking impact, prevention, impact of the environment on cancer incidence, air protection

The object of research is the official statistics of the European database of the Republic of Belarus the incidence of lung cancer in the population.

The purpose of research – to study the epidemiological aspects of population sickness rates of lung cancer in Republic of Belarus, and to assess the medical and social significance of the problem in people's lives.

In the study, a retrospective analysis of lung cancer incidence rates in the Republic for the period 2010–2015 was conducted. Extensive and intensive indicators, rates of increase in morbidity, long-term trends by the method of least squares were calculated. The statistical processing of data and the graphical construction of the diagram were carried out using Microsoft Excel 2007.

As a result of a retrospective analysis of the incidence of malignant neoplasms in the lungs in the Republic of Belarus for the period from 2002 to 2015 we can draw the following conclusions:

• lung cancer occupies the first place in the structure of oncological morbidity; the number of men with lung cancer exceeds the number of women by 9–10 times;

• for the period from 2002 to 2015 there was an unstable tendency of reduction the incidence of lung cancer in the Republic of Belarus ($R^2 = 0,5972$);

• The overwhelming majority of patients are elderly with the age 60 years and over.

• During the studied period, there is a pronounced tendency to reduce the death rates, caused by lung cancer, of the population of the Republic of Belarus ($R^2 = 0,9443$).

Lung cancer more than other forms of malignant tumors is associated with pollution of air by carcinogens, smoking has an immense role in the development of lung cancer. Professional factors play a major role in the development of lung cancer.

OPTIMIZATION OF MORPHOLOGICAL METHOD OF APOPTOSIS RESEARCH IN CELL CULTURE

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Now there is no consensus on what parameters are optimum for an apoptosis research. We provided a research on optimization of a morphological method of a research of apoptosis in cell culture using a fluorescent dye acridine orange (AO). As a result, it was chosen such optimal characteristics as concentration of dye, concentration of cells in suspension, time and temperature of incubation. After the apoptosis assay procedure was optimized, the level of apoptosis in a culture of lymphocytes incubated for 48 hours in the presence or absence of 15 μg / ml phytohemagglutinin (PHA) was assessed using a morphological fluorescence method in our modification in patients with osteoarthritis.

Keywords: apoptosis, acridine orange, fluorescence, morphological method of research, cell culture.

The problem of investigation of apoptosis and its relationship with various diseases is relevant in biology and medicine. Now there is no consensus on what parameters are optimum for an apoptosis research. We provided a research on optimization of a morphological method of a research of apoptosis in cell culture using a fluorescent dye acridine orange (AO).

The study was based on a 48-hour culture of lymphocyte cells, a 72-hour culture of MSC and a 72-hour culture of CAL 51 carcinoma cells. Centrifugation was used to isolate the cells, as a result of which substances placed in tubes were separated into different substances according to the density level. Cells with higher density settle on the bottom of the tube, and a precipitate is formed. To control the intermediate loss of cells associated with subsequent manipulation with them, cell viability is calculated by the method of turning the trypan blue dye at a final concentration of 0,1 %. To evaluate apoptosis a fluorescent dye AO was used. With the help of this dye, the apoptotic cells are taken into account by the characteristic morphology of the nucleus (condensed and fragmented chromatin). AO selectively reacts with the nucleic acids (DNA and RNA) of the cell.

After the study, it was found that the most suitable concentration of fluorescent dye AO for the study of spontaneous apoptosis is 2 μg / ml. When adding a dye at a given concentration, it is possible to adequately assess the results of apoptosis in the cells under study. The optimum temperature for the incubation of cells is 37° C. As

a result of laboratory studies, it was found that the increase in the incubation temperature increases the intensity of apoptosis reactions in cells. With regard to the incubation time, the present study found that the most optimal incubation time, in the study of spontaneous apoptosis is 10 minutes. This time is sufficient for the AO to completely penetrate the cell and be embedded in nuclear DNA and RNA. The optimal concentration of cells in the study of spontaneous apoptosis in cells is $2x10^6$/ml. With the addition of a low concentration of cells, only single cells are observed in the test samples, as a result of which it is impossible to fully assess the nature of the morphological changes in cells in apoptosis. In the presence of a sufficient sample of cells in the sample, it is possible to adequately evaluate and draw reasonable conclusions about the course of apoptosis reactions in the cells under study.

After the apoptosis assay procedure was optimized, the level of apoptosis in a culture of lymphocytes incubated for 48 hours in the presence or absence of 15 μg / ml phytohemagglutinin (PHA) was assessed using a morphological fluorescence method in our modification in patients with osteoarthritis. A statistically significant decrease in the number of lymphocytes in apoptosis in the presence of PHA was found in comparison with spontaneous apoptosis in patients with osteoarthritis. The findings are consistent with a statistically significant decrease in lymphocyte concentration after exposure to PHA for 48 hours compared to similar parameters in the absence of stimulation. It should be noted that in all cases, the lymphocyte concentration increased with respect to the lymphocyte concentration at the beginning of the incubation ($1x10^5$ / ml cells).

THE ASSESSMENT OF THE EFFICIENCY OF THE CARDIAC CARE TO THE POPULATION OF GOMEL REGION

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The analysis of the statistical data of the state healthcare institution Gomel Regional Clinical Cardiological Center on a case rate and mortality from the circulatory system diseases in Gomel region from 2011 to 2015 showed the decrease of primary circulatory disease incidence of the population of Gomel region from 2011 to 2015 by 16 % andthe decreasein mortality rate from the circulatory diseases by 6 %.

Keywords: coronary artery disease, myocardial infarction, circulatory diseases, cardiac care.

Circulatory system diseases are the leading cause of death amongpopulationaround the world, they influence significantly on the performance and bioticpotential of the society and on the demographic safety of the state. High incidence and constant tendency to increase the case rate from the circulatory system diseasesis a problem for all developed countries of the world, notably the leading diseases are coronary artery disease, arterial hypertension and cerebrovascular diseases.

For the assessment of the efficiency of the cardiac care to the population of the Gomel region, the database of the in follow-up by the cardiologistpatients in the state healthcare institution Gomel Regional Clinical Cardiological Center from 2011 to 2015 was analyzed. Indicators of the case rate and mortality from the circulatory system diseases, the introduction of hi-tech types of patient care and their efficiency were considered.

During the observation period, the reduction was revealed in primary incidenceof circulatory system diseases(by 16 %), arterial hypertension (by 23 %), coronary heart disease (by 15 %), cerebrovascular illnesses (by 23 %), and indicators of the crude incidence rate decreased slightly. Bothabsolute and relative indicators of the mortality from the circulatory system diseases in Gomel region from 2011 to 2015 decreased by 6 %. Among the able-bodied population these indicators decreased by 26 % and 22 % respectively. The mortality indicator from an acute myocardial infarction in the healthcare institutionof Gomel region decreasedby 22 % by 2015 in comparison with 2011, from an acute disorder of the cerebral circulation decreased by 12 % by 2015. The quantity of the cardiac surgical treatmentperformedinthe state healthcare institution Gomel Regional Clinical Cardiological Centerincreased from 2011 to 2015 by 26 %. At the same time, the number of endovascular surgical methodsforcoronary vessels increased fourfold.

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THE INFLUENCE OF NEGATIVE FACTORS OF PRODUCTION ON THE STATE OF HEALTH OF EMPLOYEES IN THE ENTERPRISE “BELSHINA”

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At present time the industrial emissions lead to negative consequences, affect people's health, especially for workers of such enterprises. One of the indicators of bad health, is increasing growth of production and occupational diseases, a significant deterioration of newly detected abnormalities, the prevalence of chronic diseases, leading to disability. Studying of harmful chemical factors and their effects on workers of JSC "Belshina, health status of workers was analyzed.

Keywords: harmful factors, chemicals, hygienic conditions of production, health status, environmental protection.

The influence of the chemical factor during producing rubber products leads to various diseases, primarily the hepatobiliary system and the cardiovascular system. In particular, characteristic changes were secretory and pepsin-forming dysfunctions of the stomach against the background of a decrease in the protective barrier of the mucosa. Similarly, chemical substances have a direct effect on liver cells with a violation of the structure of lipid membranes and biochemical reactions, which subsequently leads to the development of necrotic processes. In addition, a number of studies have shown deterioration in health status with an increase in length of service and age.

The aim of research was to investigate the impact of negative factors of production on the health of employees of JSC "Belshina".

The analyses of morbidity with temporary disability of employees of JSC "Belshina" has been carried out.

Evaluation of the results of the analysis of morbidity with temporary disability makes it possible to say that the plant's overall level of occupational risk of morbidity with temporary disability must be attributed to the ultra-high in both cases and days of incapacity for work. The most minimal indicators of the level of occupational risk are established in the control group of the comparison, consisting of female employees of the plant management. In addition, potential "risk diseases" among employees of the enterprise have been identified, which include, first of all, domestic traumas. Catarrhal diseases, represented mainly by acute respiratory viral infection and acute bronchitis, and a disease of the musculoskeletal system such as dorsopathy are also quite often found in the RRF group, especially among women of the WCHR.

In conclusion, it should be pointed out that the results of the incidence of Belshina workers in the course of the study indicate that they have a more frequent occurrence among workers of the main occupations involved in the manufacture of rubber products themselves. It was found out that the highest rates of morbidity with temporary disability are found among the workers of the Belshina large-sized tire factory, especially among women.

At present the study of the state of health and the analysis of morbidity with temporary disability of workers in manufacturing enterprises causes certain difficulties in connection with the cancellation of instructions in sick-lists for temporary disability of workers not only of the names of diseases but also of the ICD- 10. At the same time, in the outpatient department, incidence rates with temporary disability of individual nosological forms of diseases by manufacturing enterprises are also largely not considered and, accordingly, are not evaluated.

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MATHEMATICAL MODELING IN MEDICINE

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Problems of the mathematical modeling of human body organs are considered. Mathematical method allow to contract computational algorithms that is proved to be very important under diseases diagnostics.

Keywords: mathematical modeling, systems of the human body, gene level, medicine.

In this note we analyze the mathematical statements of problems that are currently used in the mathematical modeling of medical and biological problems.

The choice of some mathematical models in the description and research of medical facilities depends on the individual knowledge of the specialist and the characteristics of the tasks being solved. The object of research in modern mathematical modeling is practically all the basic organs and systems of the human body: (i) the circulatory and respiratory system; (ii) the central and peripheral nervous systems; (iii) the digestive system; (iv) the kidneys and the liver; (v) the musculoskeletal system; (vi) the organs of vision and the skin, etc. Processes taking place at the cellular and gene levels cause significant interest. In so doing, the mechanisms of the onset and progression of diseases are studied numerically. Mathematical models of organs and parts of body are based on mechanical models.

Mathematical methods appear to be not only the most accurate, but also allow to create the most correct construction of computational algorithms, which is very important under diseases diagnostics.

The mathematical approach not only facilitates an accurate quantitative description of a particular problem by constructing one or another suitable model, but also provides the way of solving the task.

This review presents the most typical mathematical models which are currently used for the given class of problems.

ALLELIC DISCRIMINATION AS A METHOD FOR THE ESTIMATION OF SOCIAL INTERACTION

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Allelic discrimination gives the possibility to indicate a single nucleotide polymorphism (SNP) that may shed a clearer light on the correlation between genetic variation and its effect on the observed phenotype. Current method was used for identifying the oxytocin receptor gene polymorphism, which determines the degree of sociality.

Keywords: allelic discrimination, single nucleotide polymorphism, sociality, social interaction, polymerase chain reaction, genotyping, population genetics.

In the last few years, the method of allelic discrimination has been developed in molecular genetics. The assay detects variants of a single nucleic acid sequence. Single nucleotide polymorphisms (SNP) are one of the most

common forms of human genetic variation [1]. SNPs are biallelic and occur about every 1,000 base pairs throughout the human genome. SNP are powerful markers for mapping genes that cause disease.

Oxytocin is a hormone of the hypothalamus, which is closely related to human social behavior. Intranasal administration of oxytocin improves the ability to differentiate the mental state of others and increases attention to the eye region of the other human and improves the ability to understand their mental state [2]. Genetic variations in the gene of the oxytocin receptor (OXTR) are related to individual differences in responses to social cues.

The SNPs are located in the non-coding regions of the oxytocin receptor gene. Most of the OXTR gene is the same for all people, but for different nucleotides, different versions of the gene may be present. The gene of this receptor exists in two versions: in a certain section of the DNA sequence there can exist either adenine (A-version) or guanine (G-version). It is believed that the presence of one or another variant of the gene corresponds to the psychological profile of a person: how resistant it is to stress and whether it is easy to be depressed.

Allelic analysis of discrimination classifies unknown samples as homozygotes (samples having only allele 1 or allele 2) and heterozygotes (samples having both allele 1 and allele 2). Analysis of AD measures the change in fluorescence of dyes associated with probes.

We analyzed the rs53576 single nucleotide polymorphism in the samples of buccal epithelium obtained from 20 people (age range 20–25 years). Their DNA was isolated using a standard protocol. Polymerase chain reaction (PCR) master mix was prepared by mixing PCR buffer, ddH2O, nucleotides (dNTPs), TaqMan probe (which contains two fluorescent dyes: ROX dye-specific for allele G and FAM dye-specific for allele A), two primers, enzyme Taq polymerase and DNA. Each DNA sample was analyzed in 3 repetitions together and the 4th one, without DNA, was the negative control.

The results had shown that from 20 people, 9 of them are GG homozygotes, 1 is AA homozygote, and 10 people are G/A heterozygotes.

The results obtained from RT-PCR were confirmed by incubating samples with the restriction enzyme (BamHI) and the number of fragments was determined using electrophoresis. In the case of GG homozygote – we had one fragment at 118 bp, AA homozygote – two fragments at 43bp and 75bp, and in the case of heterozygotes – 3 fragments at 43, 75 and 118bp.

Our results lead to an important insight about the great efficiency of the designed system of genotyping SNP. Selected primers, probes, fluorophores and quenchers matched to the probes work well, allowing to definitely distinguish both homozygotes and heterozygotes from each other. As a result, this method is capable to detect associations between the genetic variation and its effect on the observed phenotype (in our case, the correlation between OXTR gene rs53576 polymorphism and the degree of social interaction).Thus, the method of allelic discrimination can be used both for population analysis and for the estimation of SNP in individuals.

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BLOOD ADRENOCORTICOTROPIC HORMONE LEVEL IN WHITE MICE UPON HEAT AND COLD EXPOSURE

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In order to study the functioning of hypothalamic–pituitary–adrenal (HPA) axis under temperature stress, the level of adrenocorticotropic hormone in white mice plasma was investigated during exposure to various strengths of heat and cold. The study revealed that upon the lethal effect of temperature stress the degree of HPA axis response rapidly increases without returning to basal activity, while exposure to weaker ambient temperature effect evokes a short-term activation of the HPA axis with a subsequent return to the basal level.

Keywords: hypothalamic-pituitary-adrenal axis, heat stress, cold stress, adrenocorticotropic hormone.

Currently, the study of adaptation responses to rapid changes in the ambient temperature is urgent as a result of increasing number of abnormal temperature conditions in various regions of the Earth, reclamation of Antarctica and Arctic regions, mountain heights, deserts, and space. Extreme temperature conditions in these regions have a strong impact on the body, inducing stress response. The main neuroendocrine mechanism of the body reaction to various stressors is activation of the hypothalamic–pituitary–adrenal (HPA) axis, resulting in a rapid increase of glucocorticoids, which mobilize the body's structural and energy resources that are used for the subsequent forming of the systemic structural trace of adaptation [1].

To study the HPA axis activity under stress condition it is essential to investigate the concentration of adrenocorticotropic hormone (ACTH), as it's the major stimulator of glucocorticoids release in pituitary – adrenal section. Changes in ACTH level in circulating blood indicate the degree of the HPA axis response, which makes possible to draw the conclusion about the patterns and intensity of stress response, particularly in its acute phase [2].

The aim of present study was to examine the dynamics of changes in ACTH plasma level in white mice during cold and heat exposure.

The objects of the study was white mongrel mice, weighing 20–25 g. Experimental groups were kept in a climatic chamber for 3 h at –5; 0; 35; 40 and 45 °C, and control group were kept in thermoneutral conditions. Blood sampling were done from lateral caudal vein 0,25; 0,5; 1; 2; 3 h after the beginning of exposure. Plasma ACTH level were measured via a radioimmunoassay kit (CIS ACTH-PR, France). The experiment was done taking into account the principles of bioethics and the provisions expounded in the European Convention for the Protection of Experimental Animals.

Analysis of obtained results revealed that upon exposure to –5 °C plasma ACTH level was reached the maximum 5 min after the beginning of stress (+321 %), subsequently decreased 10 min later, repeatedly increased by 30 min and returned to baseline values by 1 h. Current temperature stress leads to the death of all animals in the proper group after 2 h. A resembling dynamics were present at 0 °C, but in this case, the peak of ACTH secretion was expressed in a lesser degree (+40 %).

Under heat stress condition the following pattern is present. Upon exposure to 35 °C a significant rise of ACTH was observed after 15 min (+46 %), and later its level decreased to the baseline. During exposure to 40 °C plasma ACTH level increased by 2-fold after 15 min and repeatedly after 1 h. At 45 °C a rapid significant rise in ACTH secretion was observed, which reached the peak by 30 min (+295 %). Current temperature stress subsequently led to a sharp decrease of ATCH level and resulted in the 100 %- death of experimental animals.

Obtained results testify the fact that the degree of the HPA axis response grows up along with increasing force of the temperature factor. In addition, upon the lethal effect of temperature stress, the degree of HPA axis response rapidly increases without returning to basal activity, while exposure to weaker ambient temperature effect evokes a short–term activation of the HPA axis with a subsequent return to the basal condition. Accordingly, a contribution of non–specific adaptive reactions to forming resistance to heat and cold exposure increases along with the rising strength of temperature stimulus.

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THE INCIDENCE OF PATHOLOGIES OF A THYROID GLAND AMONG THE POPULATION OF REPUBLIC OF BELARUS

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This publication presents the analysis of statistical data of the incidence of thyroid cancer among population of the Republic of Belarus. Observed trends of increasing occurrence of pathologies of this localization, as well as decreasing mortality of patients from malignant tumors of the thyroid gland are described.

Keywords: thyroid gland, malignant neoplasms, statistics, morbidity, mortality.

Nowadays, the problem of a thyroid gland malignant remains to be in the priority due to its high occurrence among the persons of working age all over the world and, in particular, in Belarus [1].

Annually 122 thousand cases of a thyroid gland cancer are registered in the world which is 1 % of all registered cases of malignant tumors. In different regions of the world the standardized incidence indicator among 100 thousand of population fluctuates from 1,9 to 19,4 for women and from 0,8 to 5,0 for men [2].

After the Chernobyl accident and irradiation of Belarus residents with radioactive iodine, the incidence had been increasing in high gear for 20 years since 1990, and continues to remain at a high level.

During the pre-emergency period, thyroid cancer was rare in all six regions of Belarus: the average incidence rate was 1,3 per 100,000 of population [3].

On average, the incidence of thyroid cancer among adults, comparing with the pre-emergency period, increased by 3,2 times [4].

There is a confirmation of the steady growth of the cancer incidences among population provided by GLOBOCAN 2012 estimated data and real indices of the Belarusian Cancer Registry (9,1 and 9,3 respectively) [2].

In 2013 among all malignant neoplasms, the thyroid gland cancer ratio was 2,5 %.

Basing on the numerous statistical data it is to state that there is a conservation of the thyroid gland pathologies growth in Republic of Belarus due to the Chernobyl accident consequences.

The number of new diagnosed cases of thyroid pathologies for the period of 2013 was 1092. According to data of the register, 65,5 % of cases from this number, have been registered at early stages. 94,4 % of them were detected during preventive examinations. 2,1 % of the diseased had been leaving for less than a year [2].

Mortality ratio from a thyroid gland malignant neoplasm is at a low level; in 2013 it was 0,6 cases on 100000 of population and has slightly decreased in 10 years. The same tendency occurred in the ratio of mortality to the number of incidences, it has decreased from 6,6 to 5,2 % [2]. The decline in mortality due to the pathology of this localization can be explained by increased level of medicine and existence of more perfect early identification and treatment of diseases of a thyroid gland.

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FACTORS OF INFORMATION ENVIRONMENT IN THE ASPECT OF ECOLOGICAL MEDICINE AND PSYCHOLOGY

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The article analyzes the relevance of studying the information environment in the context of medicine, ecology and psychology.

Keywords: media environment, information environment, medical ecology, technosphere, noosphere, environmental factors, information ecology.

Medical ecology studies the influence of the environment on a person. In the aspect close to media ecology, we consider the impact of a new environment called information, or media environment, on a person. What is the information environment?

The technosphere and the noosphere merge into a tandem of information signals and communication media, forming an information environment i.e. media environment [3; 4]. The term "media environment" is denoted as the environment surrounding a person, formed by technical means of information transfer and carrying out the involvement of a person in macro- and micro-groups (starting with communication with the nearest social environment, and up to regional, state, international contacts and interactions), as well as forming new social, material and spiritual conditions of human existence and activity. Any interaction between the organism and the environment exists in the form of mutually conditioned contacts, so in the case of the media environment, a person acts as its creator, designer and the main regulating mechanism, and the environment in turn provides him with the resources necessary for existing in it and has a specific ecological impact on him.

The ability of the information environment to influence the state of a person's mental, physical and social well-being form the need for measures to improve the ambient information environment. The basic medical and ecological features that the information ecology collides are:

- the impact of information on the human thinking process. Also, information flows affect not only mental work, fatigue, impaired attention, but also the possibility of philosophical criticism of the information from the media;
- information stress, as a factor in the development of diseases of the cardiovascular, nervous, digestive and immune systems;
- the impact of information flow on the human subconscious;
- reduction of individual or population psychological potential (opportunity to carry out a productive life activity);
- the influence of psycho-social information factors on the occurrence of disabling mental disorders, behavioral dysfunctions, such as anxiety, depression, psychosomatic disorders, suicide [1].

In light of these, we can talk about the importance of the existence of disciplines which study people and the information space, as well as disciplines aimed at preventing and minimizing the harmful impact of media space on human.

In this field, works by a physician, a member of the British Ecological Society A. L. Eremin, who studies the field of information hygiene, which forms environmental strategies based on models of the higher nervous activity of a person, are the most important. Hygienic norms, built on neural activity, excitation and inhibition processes, reflex arcs and other nervous activities, can be used to prevent the negative influence of information on a human [2].

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ANALYSIS OF RADIOBIOLOGICAL PLANNING OF IRRADIATION BREAST TUMORS BASED ON THE MONACO SYSTEM

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The role of radiobiological planning of radiation therapy at treatment of a malignant tumor of a breast tumor has been specified. Three main techniques of planning of radiation therapy applied at the Minsk city clinical oncologic dispensary are surveyed. They are: 3D conformal radiation therapy, intensity-modulated radiation therapy (IMRT), volumetric modulated arc therapy (VMAT). Advantages and disadvantages of these techniques are described, the area of their use is designated.

Keywords: radiobiological planning, intensity-modulated radiation therapy, volumetric modulated arc therapy, breast tumor.

Various quantum and corpuscular radiations can be applied to impact on a cancer tumor. The efficiency of modern radiation therapy is defined by optimum calculation of a dose of radiation and high precision of her leading to the patient. Any malignant tumor is unique in nature. Therefore, there is no universal method of radiotherapy, effective for the treatment of any malignant neoplasm. The traditional course of radiation therapy for left breast cancer is accompanied by impact of high doses of radiation to the lungs and the heart. Before starting the course of irradiation of the breast tumor, it is necessary to carefully develop his plan. It will provide the maximum effect of radiation therapy and reduce the risk of serious radio induced cordial complications (ischemic heart disease and myocardial infarction). The purpose of radiobiological planning of radiation therapy is to define the minimum possible zone of radiation which at the same time will provide full impact on all elements of a tumor.

One of the main areas of work of the Minsk city clinical oncologic dispensary is modern radiation therapy. It is equipped with two modern linear accelerators Versa HD and Elekta Infinity. As at a breast tumor the target lies on a surface, radiation therapy is made by fascicles of photons with energy 6 MV. Calculation of plans of radiation therapy is performed on the basis of the system of planning of sessions of the radiation therapy modulated on intensity and volume of Monaco. The planning of the Monaco system is one of technologies of new generation. It provides a possibility of use of function of combination of images, contour imaging, simulations and visualization of plans. Its application increases efficiency of beam influence on the basis of spatial and temporary distribution of the dose of ionizing radiation.

In the planning of radiation therapy three main techniques are used.

1) 3D conformal radiotherapy (3D CRT). The main disadvantage of the traditional course of 3D-conformal radiation therapy at breast cancer is that the high doses of radiation it lead to the risk for organs – lungs and heart. Side effects of radiation arise only in radiation zone. For the decrease of heart overloading, the tangential movement of fascicles of radiation is used. Calculation 3D CRT of plans in the Monaco system is carried out with the use of an algorithm Collapsed Cone. At assessment of the cover it is necessary to consider that that 90 % of a dose (45 Gr) have to cover more than 90 % of volume of a zone of processing. "Hot spots" make 107 % of a dose (53,5 Gr).

2) IMRT stands for intensity-modulated radiation therapy. IMRT is a type of radiation therapy in case of which by means of the linear particle accelerator the radiation bundles, which are precisely corresponding to the form of a tumor are created. Each bundle of radiation to be divided into a set of the small-sized bundles capable to change intensity. IMRT provides high doses of radiation in a zone of a tumor and the lowered doses in the field of healthy fabrics Besides, IMRT can create concave area on the edge of a field of radiation therapy. Application of this technique requires more long and careful planning. The quality of treatment by radiation therapy with intensity modulation is much better, than in case of traditional conformal radiation. Treatment of breast tumors is performed by seven fields. Each field breaks on 24-27 segments. Calculation of plans is performed with use of an algorithm of Monte Carlo. At assessment of a covering it is necessary that 95 % of a dose (47,5 Gr) a cover more than 95 % of volume. "Hot spots" make 110 % of a dose (55 Gr). At the same time, the maximum dose on a target doesn't exceed 115 % of the brought dose (57,5 Gr).

3) VMAT is volumetric modulated arc therapy. VMAT is a new type of a technique even more targeted, more effective and more comfortable for the patient. The equipment for radiotherapy at such treatment rotates around the patient. The intensity of a bunch of radiation constantly changes. The quantity of degrees of freedom of radiation increases. Advantages of radiation therapy on VMAT technology: high precision; short terms of treatment; lower doses of radiation. It reduces risk of negative long-term side effects.

Covering assessment by a technique of VMAT is made as well as for IMRT of plans. For the calculated plans of radiation therapy by the IMRT and VMAT methods the expected time of a holiday of a dose was 282,76 and 108,01 seconds. At the same time quantity of monitor units for IMRT of the plan 818,13 MU, and for VMAT – 520,84 MU, 3D CRT – 222,28 MU.

Further improvement of methods of radio biological planning of radiation of malignant tumors solves a problem of the most effective aim impact on the pathological center previously calculated radiation dose.

EPIDEMIOLOGY OF MYOCARDIAL INFARCTION IN THE REPUBLIC OF BELARUS

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Despite the improvement of methods for diagnosis and treatment of cardiac patients, the results of cardiovascular diseases remain the most pressing problems of most countries in the world in the 21st century. Myocardial infarction refers to the greatest problems in modern times. Is the most severe manifestation of coronary heart disease, develops more often as a result of coronary artery atherosclerosis.

Keywords: cardiovascular diseases, mortality, analysis, morbidity.

Based on official statistical data, a retrospective analysis of morbidity and mortality from myocardial infarction in the Republic of Belarus for the period 2010–2015 was conducted.

For the analyzed period of observation, the incidence of acute myocardial infarction in the Republic of Belarus decreased by 27 %. The indicator of the trend over the studied period was $A_1 = –6{,}03\ ^0/_{0000}$. The average annual rate of decline was –7,2 %.

To identify territorial differences, a comparative analysis was made of the incidence of acute myocardial infarction in the regions of the Republic of Belarus in 2010 and 2015.

The analysis showed that in 2010 the lowest indicators are recorded in the Brest and Mogilev regions (the figures were 147 $^0/_{0000}$ and 151 $^0/_{0000}$, respectively), as well as in the Gomel region (152,7 $^0/_{0000}$), and the largest – in g In Minsk, which in 2010 was 210 $^0/_{0000}$.

In 2015, there is a decrease in the incidence rate of acute myocardial infarction not in all regions of the republic. There is an increase in the incidence rate in the Brest and Gomel regions (indicators were 170,1 $^0/_{0000}$ and 170,3 $^0/_{0000}$). The greatest decrease is noted in the Grodno region (1,35 times).

The analysis of the territorial features of the incidence of acute myocardial infarction in the Republic of Belarus suggests that the morbidity rates of the Minsk population are statistically significant ($p<0{,}05$) higher than the similar rates of morbidity in other regions (with the exception of the Grodno region) and the Republic of Belarus as a whole.

In the structure of mortality from cardiovascular diseases, the specific gravity of mortality from myocardial infarction varies between 0,017 – 0,022 %, but despite this myocardial infarction is a socially significant disease and requires the study of epidemiological characteristics.

Myocardial infarction can occur with arterial hypertension and without hypertension. The proportion of cases of myocardial infarction with arterial hypertension increased by 32,1% at the end of the period, without arterial hypertension decreased by 32,1%, which confirms the association of high blood pressure with a risk of death from major cardiovascular diseases (myocardial infarction, ischemic disease heart, etc.). In the age structure of myocardial infarction, more than half of the deceased are people older than the able-bodied age.

Along with the decrease in mortality from myocardial infarction in general, the death rate from myocardial infarction with arterial hypertension is increasing, which indicates a significant effect of elevated blood pressure as a risk factor.

Characterizing the epidemiological trends of morbidity and mortality in the Republic of Belarus from myocardial infarction in general, it can be said that they are determined, and probably will still be determined by the population of elderly and senile age. Identified as a result of the analysis of the features of myocardial infarction, depending on the concomitant arterial, show the urgency of preventing high blood pressure, medical examination of people with cardiovascular diseases and outpatient rehabilitation of patients with acute myocardial infarction.

RISK ANALYSIS OF DENTALCARIES FOR CHILDREN'S POPULATION OF BORISOV

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Dentistry of childhood is one of the most complex clinical disciplines. Attention to it is due to a significant proportion of children among the population of our country, and the sphere of assistance to the children's population concerns the most promising part of society.

Keywords: caries, diseases of the oral cavity, complicated caries, installations of a seals, the child population.

Relevance. Dental caries is the most commonhuman disease. Almost all adults and children in the world are affected by it. It is now generally accepted that the prevention of dental diseases contributes to the prevention a number of diseases of internal organs. The rate of intensitygain of caries is extremely necessary for a clear organization of planned sanation of the oral cavity and dispensary dental care for children, as well as assessing the effectiveness of dental care [1; 2].

Purpose. Using quantitative methods of assessment to analyze the dynamics of indicators of caries morbidity among preschool and school-age children in Borisov.

Objects and methods of research. The subject of the study was information on cases of dental caries and the number of children, served by the Borisov Children's Dental Polyclinic, and also the results of a survey of parents of 90 preschool children for the use of easily digestible carbohydrates. The calculation of extensive and intensive indicators, the analysis of dynamic series by the method of equalizing the first-parabolic series, the calculation of the relative risk of dental caries for preschool children using digestible carbohydrates regularly, the comparative analysis of the indices in two sets for the reliability of differences were used in the work.

Results and its discussion. During the entire period of study, significant differences in the values of the incidence rates of caries in school-age children were noted in comparison with those in preschool children ($p > 0,05$). The analysis of the dynamic series of dental caries in the children's population of Borisov in the first-order parabola revealed a significant decrease in the index among children of school age ($A1 = –1,47$ %, $R2 = 0,88$); the tendency of the dynamic incidence rate of children of preschool age ($R2 = 0,08$) wasn't revealed. The calculated cumulative risk indicators for the period from 2010 to 2014 to get dental caries for preschool children (1,297 + 0,121) % and school-age children (1,434 + 0,187) % of Borisov have no significant differences ($t = 0,69$, $p>0,05$). To identify possible causes of caries among children of younger age groups, 90 parents of preschool children served by the Borisov Children's Dental Polyclinic were interviewed. Calculation of attributive effects revealed that if we assume that the regular use of easily assimilated carbohydrates in the form of sweets is a preventable cause of caries among preschool children, we can expect a 25 % decrease in the incidence, with full control of their use in the group that regularly consumes sweets. The calculated relative risk of dental caries for children regularly and according to the parents occasionally consuming sweets was 2,01 [0,82, 2,91], and taking into account confidence intervals was more than 2 times higher than children consuming sweets under strict control of parents.

Conclusions. The revealed reliable differences in the direction of decreasing the incidence rates of caries of school-age children served by the Borisov Children's Dental Polyclinic are the result of using of international experience in the prevention of dental diseases. Data on dental habits of the lifestyle of children and adults responsible for the formation of these habits (parents and teachers) and their level of knowledge on dental health are key information in the implementation of the caries prevention program.

THE USE OF LOW INTENSITY LASERS IN PATIENTS WITH DIABETES MELLITUS TYPE 2

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In this work a comparative analysis of patients with diabetes mellitus type 2 and without diabetes type 2 before and after the laser treatment in patients in Rechitsa central district hospital is shown. On the basis of the work, you

can see the effectiveness of the impact of magnetic-laser device «Vityaz» in patients with disease diabetes mellitus type 2.

Keywords: Diabetes mellitus type 2, low laser intensity, laser magnetic therapy, infrared radiation

The diabetes mellitus type 2 is a chronic disease of the pancreas with impaired carbohydrate metabolism and the development of high blood sugar level due to the decrease in the sensitivity of tissues to insulin and violations of his generation.

In Belarus more than 220 thousand people suffer from diabetes mellitus.

The impact of laser device «Vityaz» in patients with disease diabetes mellitus type 2 is analyzed.

Under the influence of the device there is a reduction of blood sugar levels of patients. The use of laser device «Vityaz» has a positive effect and it used successfully as a preventive and therapeutic factor in combination with other medicines in the treatment of diabetes mellitus type 2.

To research the effect of low laser intensity «Vityaz» a comparative analysis of level of glucose in capillary blood before and after meal in patients with diabetes mellitus type 2 while receiving medication and patients without diabetes mellitus type 2 was carried out in this work.

It was found that the blood sugar levels in patients with diabetes mellitus type 2 and without diabetes depend on food intake. Blood sugar is less before meals, after a meal the blood sugar level increases depending on food intake.

Patients with diabetes mellitus type 2 get complex lowering of the level of blood sugar: medicines together with the influence of low intensity laser on the pancreas.

Quick effect is obtained in the treatment of diabetes mellitus type 2 by the method of laser magnetic therapy: combining the effects of infrared radiation and a constant magnetic field. There is a significant reduction in blood sugar with the help of complex effects.

It was established that the laser device has a positive effect on blood sugar levels as in patients with diabetes mellitus type 2 and in healthy patients. The sugar level in the blood reduces.

A complex effect on the pancreas has a positive effect on improved of indications of blood sugar levels. Laser therapy of diabetes mellitus type 2 is primarily aimed at improving the efficiency of pharmacological treatment: stimulation of hormonal activity of the pancreas leads to reduced need for glucose-lowering medication at 50 %.

The diabetes mellitus type 2 is not cured completely, but condition improves. In order to experience a full quality of life and well-being, you should follow an appropriate diet and monitor the progress of the disease with regular visits to the endocrinologist.

It is impossible to cure of diabetes mellitus by method of low-intensity laser therapy, but it is the only opportunity to eliminate regularly concomitant vascular lesion in diabetes mellitus.

SECTION 3

PROBLEMS OF MODERN ENVIRONMENTAL SAFETY

(BIO-MONITORING, BIO-INDICATION, BIO-REMEDIATION, RADIOECOLOGY AND RADIATION SAFETY, ENVIRONMENTAL MONITORING, MANAGMENT AND AUDIT, INFORMATION SYSTEMS AND TECHNOLOGIES IN ECOLOGY)

FEATURES OF SPAWNING OF A COMMON FROG (R. TEMPORARIA) AT MELIORATIVE CHANNELS

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The degradation of habitats leads to a fast-moving decline in the population size of amphibians. One of the main problems is the impact on the most vulnerable stages of their life cycle. The article analyzes the ability of amphibians to spawn in the conditions of drainage melioration.

Keywords: melioration, amphibians, spawning, reproduction of amphibians

According to WWF's Living Planet Report 2016, the most common threat to shrinking amphibian populations is the loss and degradation of their habitats, in particular, drainage melioration. Amphibians are cold-blooded; therefore they have relatively small individual habitats and are limited in their ability to resettle. Drainage takes the second place in anthropogenic impact on the population size of amphibians. At the same time, melioration not only leads to the fragmentation of populations and destroys the biotopes convenient for amphibian life, but also affects embryos and larvae, the most vulnerable stages of the life cycle. The matter is that all the amphibian species that live within our country during the breeding season necessarily accumulate in reservoirs where they spawn, and where the larvae, which also need water, develop. For spawning amphibians choose abandoned ponds, swampy lakes, old deep ditches or quarries, river backwaters, bogs, etc. However, in many regions of the country, the swampland is drained for later use as a crop area. If the characteristics of amphibian biology are not taken into consideration during melioration, amphibians can be deprived of their natural spawning grounds, which leads to a decrease in a population size.

The research is conducted on the territory of the Minsk region near the Zelenoye village. This area is subjected to large anthropogenic load. The melioration of the region along the river valley, water withdrawal for the needs of cooperatives built without observing any rules of the sanitary zone of cottages have led to great changes.

Research № 1. The weather conditions are the following. The temperature is +9 °C, the wind speed is 2 m/s (southeast), the humidity is 62 %, the pressure is 734 mm Hg. The route length is 4240 m. The surveyed area is 6360 m^2. The main indicators of spawn mass distribution are the following. The general number of spawn masses are 604; the number of marked spawn masses are 41; the average number of spawn masses in a congregation are 14,7; the distribution density of the spawn masses along the registration line (the concentration coefficient of spawning) is 0,21; the average distance between the spawning sites is 71 m.

Research № 2. The weather conditions are the following. The temperature is +8 °C, the wind speed is 4 m/s (southeast), the humidity is 87 %, the pressure is 733 mm Hg. The route length is 4420 m. The surveyed area is 6603 m^2. The main indicators of spawn mass distribution are the following. The general number of spawn masses are 219; the number of marked spawn masses are 22; the average number of spawn masses in a congregation are 9,95; the distribution density of the spawn masses along the registration line (the concentration coefficient of spawning) is 0.11; the average distance between the spawning sites is 84 m.

The timing of amphibian spawning entirely depends on the ambient temperature. During the research the temperature was +9 °C, which is optimal for amphibians. Research № 1 shows 604 spawn masses, while research № 2 only 219. The decrease in the number of spawn masses indicates the end of the breeding season this year.

The average number of spawn masses in a congregation are 14,7 and 9,95, which is lower in comparison with the average number of spawn masses in natural wetlands. The distribution density of the spawn masses along the registration line is 0,21 and 0,11, which is also a very low indicator.

The precise dependence of the decrease in the indicator values characterizing the reproduction of amphibians in the conditions of melioration can't be revealed, since this process in general depends on many other factors such as temperature, humidity, pressure, water acidity, aluminum ions content, etc. However, the research on the amphibian spawning has made it clear that melioration channels have poor efficiency as the spawning grounds for amphibians. In the drainage melioration zone many indicators of the spawning change towards a decrease.

ANALYSIS OF INFLUENCE AND CONSEQUENCES OF ACCIDENTS AT CHERNOBYL AND FUKUSHIMA

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The Chernobyl and Fukushima nuclear power plant accidents are considered to have the most drastic environmental impacts, which caused serious damage to the different aspects of the affected countries and the world development in general.

The composition of radioactive releases was different though. The accident at the Chernobyl NPS was accompanied by the release of irradiated nuclear fuel solid particles and fission products ("hot" particles) with a different isotopic composition. The accident at the Fukushima NPS was accompanied largely by the release of volatile isotopes, in particular, the isotopes of iodine and cesium. The effect of β- and α-radiation on the radiation situation was not so strong compared to the accident at Chernobyl.

Keywords: Chernobyl, Fukushima, isotopic composition, iodine, cesium, β-radiation, α-radiation

During the lifetime of one generation there were 4 major radiation accidents with a contamination area in different countries: at the atomic plant "Mayak", USSR, 1957; at the Three Mile Island nuclear power station (NPS), USA, 1979; at the Chernobyl NPS, USSR, 1986; at the Fukushima NPS, Japan, 2011.

The nuclear accidents in Chernobyl and Fukushima are considered to have the most drastic environmental impacts, which caused serious damage to the different aspects of the affected countries and the world development in general.

The 2011 nuclear accident at Fukushima Daiichi and the 1986 accident at Chernobyl were both rated 7 on the International Nuclear and Radiological Event Scale, but the accidents were starkly different in their cause, the governments' response and health effects.

The accident at Chernobyl stemmed from a flawed reactor design and a human error. It released about 10 times the radiation that was released after the Fukushima accident. The accident at Fukushima occurred after a series of tsunami waves struck the plant and disabled the systems needed to cool the nuclear fuel.

The composition of radioactive releases was different as well. The accident at the Chernobyl NPS was accompanied by the release of irradiated nuclear fuel solid particles and fission products ("hot" particles) with a different isotopic composition. The accident at the Fukushima NPS was accompanied largely by the release of volatile isotopes, in particular, the isotopes of iodine and cesium (Chernikov, 2011). The effect of β- and α-radiation on the radiation situation was not so strong compared to the accident at Chernobyl.

The consequences of the accidents at Chernobyl and Fukushima can be compared based on the following indices:

1. The release of radioactive substances into the atmosphere: 340–800 PBq (Fukushima) 5200 PBq (Chernobyl);

2. The contamination of the territories of their countries: 8000 km^2 (Fukushima) and 450000 km^2 (Chernobyl);

3. The contamination of the territory of other countries. The accident at the Fukushima NPS did not cause pollution in other countries, while 250000 km^2 in Western Europe were polluted after the Chernobyl accident.

4. The area of evacuation: 10800 km^2 (Chernobyl) and 1100 km^2 (Fukushima). The evacuation of the population: 400000 people (Chernobyl) and 83000 (Fukushima).

5. The loss of lives from the acute radiation disease within 4 months after the accident: 28 (Chernobyl) and 0 (Fukushima).

The above comparison shows that the scale of the accident at the Chernobyl NPS is about 10 times greater than the scale of the accident at the Fukushima NPS. The accident at the Chernobyl NPS was an international disaster with pollution in other countries. The pollution at the Fukushima NPS accident is limited to the areas within Japan. The release of radioactive substances and radiation situation in the polluted areas within 30 km zone of

Chernobyl NPS caused grave consequences for the health of the liquidators. The results of the exposure to β-radiation were "nuclear sunburn" e-skin blackening of faces and hands of the first liquidators, and nuclear quinsy e-continuous hoarse cough due to throat and bronchia burn.

STRUCTURE OF SOFTWA RE AND HARDWARE COMPLEX FOR MONITORING AND CONTROL OF PARAMETERS AND MODES OF SOLAR COLLECTORS

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Some characteristics and features of structure of software and hardware complex for monitoring and control of parameters and modes of solar collectors are considered, that will allow realizing remote automated operation with this equipment that is difficult to maintain, as well as located in hard-to-reach places, and make prerequisites for rather effective and optimal solutions of its using.

Keywords: structure, software and hardware complex, monitoring and control, solar collectors.

Currently, due to the large demand of the automated management of various devices and the measurement of various media parameters, there have been proliferated different software and hardware complexes for monitoring and control of large amount of parameters and modes and special embedded systems – microprocessor (microcontroller) hardware and software management systems that are intended, as a rule, for functioning in the devices that are controlled directly by them. Such devices can be applied to automated or automatic adjustment and manufacturing control equipment, telecommunications equipment, machines with computer numerical control, automated teller machines, payment terminals, etc. It is also advisable to use similar systems in the field of renewable energy in order to optimize the operating modes of the corresponding equipment.

One of the software development platforms for such systems are Microsoft .NET Micro Framework or Arduino. They allow in environments Microsoft Visual Studio or Arduino IDE using the C# or C++ programming language to create applications for different embedded devices, which are characterized by the minimum weight, size and power consumption as they are placed within more complex equipment. These platforms are rather popular because the code (managed for C# language) is created using a high-level language and it simplifies the process and reduces the time of software development for hardware platforms. In this, during stand-alone functioning of the debugging board it is not required to use a computer with an operating system and development environment later.

Some of the application areas of mentioned above systems in the environmental problems:

- collecting and processing of data from sensors located in different equipment, for example, such as used in the renewable energy sector;
- remote monitoring and control of equipment parameters of the industrial and infrastructure facilities;
- building of geographically distributed systems of data collection and processing for monitoring of environmental parameters, and the like.

To test the effectiveness of using microcontroller embedded systems for solving environmental problems it is planned to develop an automated system for monitoring and control the status and operation of solar collectors. Key features of this system and its developed functional structure:

- data collection for the building of various dependencies of temperature and its differences from time in specific places of equipment;
- calculation of energy performance for a predetermined periods and formation of data for charting characterizing energy efficiency of equipment;
- monitoring of the current values of equipment's parameters;
- control of different equipment's operating modes.

In solving of presented problems for software implementation, deployment and debugging of software directly on the physical device can be used the following:

- debugging board with the microcontroller of ARM Cortex M or AVR architecture;
- sensors, actuating devices and shields (expansion cards);
- computer to which the debugging board is connected;
- installed integrated development environment and software framework and development tools (kit).

Thus, developed functional structure of software and hardware complex for monitoring and control of parameters and modes of solar collectors will allow to create a mentioned above system that can realize remote automated operation with solar collectors that are difficult to maintain, as well as located in hard-to-reach places, and make prerequisites for rather effective and optimal solutions of its' using.

SPATIAL-TEMPORAL CHANGES OF EMISSIONS OF POLLUTING SUBSTANCES IN ATMOSPHERIC AIR OF BELARUS

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Atmospheric air is one of the vital elements of the environment, a favorable condition which is the natural basis of sustainable socio-economic development of the state. In the work of the basic indicators characterizing state of atmospheric air of the Republic of Belarus for the period from 2010 to 2016.

Keywords: atmospheric air, quality, pollution, greenhouse gas, assessment.

Air condition is largely predetermined volumes of pollutant emissions from stationary and mobile sources. During the 2005–2016 there is a general tendency to reduce them. Since 2010 total emissions of pollutants into the atmosphere has stabilized, while there was a slight increase from their stationary sources and the reduction from mobile sources. In 2015 it noted a significant reduction in pollutant emissions of mobile sources in comparison with the previous two years (from 881–928 to 801 thousand tons) and an increase of 22,8 % compared to 2010 emissions from stationary sources (from 377 to 463 thousand tons) [1].

The highest emissions are typical for industrial centers (Navapolack, Mazyr, Minsk – more than 30 thousand tons), as well as the values of emissions per unit of area (more than 15 tons / km2 for the listed cities) and 1 person. (Mazyr, Navapolack, Kasciukovičy, Novalukomĺ – to more than 250 kg per person).

The structure of emissions from stationary sources by economic activity is characterized by an increase in the share of agricultural organizations (from 13,2 % in 2010 to 33,7 % in 2016) and a decrease in the share of manufacturing companies (with 49,6 % to 40,2 %). Share of organizations of other types of economic activity compared with 2010 has not changed significantly.

A significant impact on climate change, greenhouse gas emissions have. The main greenhouse gas in Belarus is carbon dioxide (CO2), whose share in the greenhouse gas emissions of CO2 equivalent of about 65,0 %, followed by methane (CH4) and nitrous oxide (N2O), each more than 17,0 %, respectively, the proportion of HFC, and SF6 is practically zero, and thousandths of a percent. During the period 1990–2015 carbon dioxide emissions have decreased by 41,7 %, nitrous oxide at 29,0 %, methane emissions increased by 8,3 % [2]. Sources of greenhouse gas emissions in Belarus are primarily the "Energy", "Agriculture" and "Waste".

According to the results of observations of air quality in the framework of the National Environmental Monitoring System found that during the 2005–2016 the content of pollutants in the air most of the cities controlled by the Republic of Belarus was below the maximum permissible concentration (TVL). The proportion of samples with concentrations of pollutants from 0.5 MAC or less accounted for 93,0 %, and the number of samples exceeding the maximum single TVL, in 2014 amounted to 0,9 %.

Air condition industrial centers of the country quite well. For a long period, the average annual concentrations of most of the regulated pollutants below the MRL and the number of days with average daily concentrations of particulate matter PM-10 in the air above the TVL in most monitored cities (Mahilioŭ, Žlobin, Hrodna, Salihorsk, Polack, Navapolack, residential areas of the city of Homieĺ, Viciebsk and Minsk) is significantly lower than the EU countries to target. Only occasionally average daily concentration of nitrogen dioxide and sulfur dioxide exceeded the TVL in certain cities [3].

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IAEA REQUIREMENTS FOR ACCOUNTING AND CONTROL OF NUCLEAR MATERIAL AT NPP

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Almost all countries use nuclear technologies for various peaceful purposes, including food security and water security, energy production, industrial applications, agriculture and health. Only a few of these activities involve the use of nuclear material, which potentially can be switched to the manufacture of nuclear weapons or other explosive devices. In this regard it is considered appropriate to monitor the use and presence of nuclear material.

Keywords: IAEA, safeguards, nuclear technology, nuclear material accounting.

At the international level it is the responsibility of the International Atomic Energy Agency (IAEA) to deal with the non-proliferation problem. With the help of the developed system of measures, called international safeguards, the IAEA monitors the use of nuclear material for peaceful purposes only.

The purpose of IAEA safeguards is "the timely detection of the diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and the deterrence of such diversion by the risk of early detection".

The IAEA in their monitoring activities uses the developed system of measures (safeguards) set out in the comprehensive safeguard agreement (INFCIRC/153). For the purpose of ensuring the practical implementation of the safeguards the agreement provides the use of material accountancy as a safeguard of paramount importance, in conjunction with the preservation and surveillance as important complementary measures.

The nuclear material accounting is a set of measures and technical means that allow with sufficient reliability to determine the present amount and the flow of nuclear material. The accounting and control of nuclear materials is carried out at two levels: at the facility level and at the state level.

At a facility operational and reporting documentation is kept. The operational documentation includes the important supporting documentation that helps clarify the content of the reports. The reporting documents are sent to the regulatory authority. After the inspection the regulatory authority sends the reports to the Agency.

In accordance with the requirements three types of reports are sent to the IAEA:

- inventory change report (ICR) (a detailed list of all receipts and shipments of nuclear material);
- material balance report (MBR);
- physical inventory listing (PIL) provided together with a MBR.

The system of accounting and control of nuclear material at the facility is based on the principle of split areas of a facility on a separate balance areas (MBAs), which material balance of nuclear material is carried out. In each MBA there are the places where nuclear material can be measured to determine its flow and present amounts (KMP).

An important challenge for Belarus today is creating a modern system for accounting and control of nuclear materials at the Belarusian nuclear power plant. The creation of such system not only provides a reliable basis for the application of IAEA safeguards, but also allows increasing the accuracy of the data on nuclear material.

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CHARACTER OF TROPHIC RELATIONSHIPS OF LOCKS (ACRIDIDAE) AS THE FITOPHAGIC CONSUMERS ON THE EXAMPLE GLYPTOBOTHRUS APRICARIUS

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The material on the role of locusts – as consumers-phytophagous in transformed biogeocenoses (agrocenoses) is presented.

Keywords: locusts, consumers-phytophagous, diet, increase, density

There is a fact that the impact of climatic change, antropogenic factors and man-made disasters on the environment has increased in the recent decades. This affects the fauna composition and its structural and functional features in different parts of the world. This also applies to the insects: the species able to damage the environment take priority if the conditions are favorable for them.

Acridoids (Acrididae) – representatives of orthopterous insects (Orthoptera) – dominate among the species able to produce insect epidemics and affect the biogeocenoses by reducing the biomass. That is why this species is classified as potencially dangerous, herewith being the dominant group of primary consumers of phytophagous. Moreover, the acridoids are considered to be good models and indicators of the environmental conditions.

Regarding the harm caused by the acridoids to the ecosystems functioning, the hugest damage done by the acridoids in the forest-steppe zone covers the territories regularly used in agriculture. The literature says that the acridoids utilize up to 20 % of plants green parts. There is also regional specificity of this value. By the way, it is necessary to understand, that the literature takes into consideration not the standard acridoids that cause much more damage.

The purpose is to assess the interaction between the major components of the biogeocenosis (plants and phytophages) based on the nature of the trophic structure of the Chorthippus apricarius – Glyptobothrus apricarius.

The experiment allowed to obtain the data on daily nutrient requirement of a mature Chorthippus apricarius– (Glyptobothrus apricarius) and determine the relationship of this value and density. It is set that congestion has a negative impact on the organism's physiological state, that leads to the inactive nutrient intake and slow nutrition. The experiment also helped to reveal the decrease of daily ration and weight gain by increasing the density of apricarius per unit volume. This species is registered to actively lay generative production, that is considered to be the adaptive reaction to save the species and contributes to the insect's epidemics.

It was established that the daily intake of feed as well as the increase in body weight in non-herd locusts (by the example of the brown horse) – parameters that reflect the physiological state of the organism are in inverse proportion to the density. Their values decrease with increasing density of individuals per unit volume, which corresponds to the data obtained for aquatic invertebrates.

It is known that in herd locusts, physiological and behavioral responses have a different specificity and are expressed by a sharp increase in numbers, as well as by the ability to form flocks or swarms, causing enormous damage to crops and meadows.

DEVELOPMENT OF A METHOD FOR ASSESSING THE STATE OF THE ENVIRONMENT OF AN INDUSTRIAL CITY USING RUDERAL PLANTS BASED ON CITY ZHODINO

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Development of a method for assessing the state of the environment of urbanized areas on the basis of eco-floristic ruderal vegetation classification on an example of a city Zhodino. An analysis of the current state of the flora in Zhodino city will make it possible to identify species that have adapted to the conditions of the urbanized environment, which can later be used to optimize the vegetation cover and improve the hygienic state of urbanized areas.

Keywords: environment, ecotopes, urbanization area, ruderal plants, contamination, desertification.

Nowadays the territory of the city and his suburban area are the leading form of the territorial and socio-economic organization of modern society. The components of environment of the city such as relief, atmosphere, ecotopes with artificial soil are changing because of urbanization process and household activities. It's very important to save the ecology of the city according to sustainable socio-economic development. Plants are one of the main components in environment of urbanization area and they do some important ecological functions. Plants are important sanitary-hygienic, town-planic and aesthetic element of landscape architecture of the city; they are reducing a harmful effect on working, living and rest conditions; we can use urban plants like bioindicators for determination anthropogenic contamination. Natural processes and anthropogenic activity like chemical contamination of air and soil, groundwater pollution are impact for the growth of urban plants. According to this impact flora and vegetation changes in the city, the stability of natural biocoenosis is reduced, new artificial biocoenosis are created, the temperature in the city is increased because of process of desertification. In this reason it's important to research natural and ruderal communities of plants.

An analysis of the current state of the flora in Zhodino city will make it possible to identify species that have adapted to the conditions of the urbanized environment, which can later be used to optimize the vegetation cover and improve the hygienic state of urbanized areas.

During the research we will:

- make an inventory of species composition of vascular plants in Zhodino with the identification of a list of aboriginal species;
- identify the nature of the change in the species composition of the vegetation of suburban and urban areas under the influence of anthropogenic factors;
- do taxonomic, chorologic, ecological, geographical, biomorphological analysis of flora Zhodino;
- develop recommendations aimed to improving the hygienic state of the urban environment by optimizing the vegetation cover.

In a result syntaxonomy of industrial town Zhodino will be develop, which can use like scientific basis for the organization of phyto-reclamation activities and environmental monitoring. Typology of ruderal communities, developed on syntaxonomy may be used in urban environment optimization projects (for development recommendations aimed to reducing costs and increasing the efficiency of work on the reclamation of disturbed human landscapes at gardening of cities, landscaping lawns, parks, playgrounds and sports grounds, ruderal ecotopes).

SOLAR FLARES AND THEIR IMPACT ON HUMANITY

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Solar flares and their impact on humanity are described.

Keywords: solar flare, Sun, negative effect, people.

At the beginning of the last century it was observed that solar activity has a direct impact on the Earth, as well as on all living and nonliving objects. One of the most significant manifestations of solar activity is a solar flare (SF). Today scientists in many research centers and institutes study this phenomenon.

Like any other star, the Sun represents a huge gas ball. It rotates around axis. The speed of rotation of different parts of the Sun is different. The poles move slowly, and the equator rotates faster. As a result, the magnetic field of the Sun together with the plasma is twisted in a special way and becomes so intensive that it begins to rise to the Sun's surface. In these places, the activity increases, what leads to the appearance of the SF's. Scientists identify the five classes of this phenomena: A, B, C, M and X. Depending on the class, the power of ejected energy and the speed of solar particles these categories are assigned a corresponding numerical value. During a class X of the SF there may be violations of radio signals and satellite broadcasts. In addition, during few days magnetic storms can be observed. M-class SF's cause weak magnetic storms, as well as irregularities in signals, mainly in Polar Regions. All other SF's do not cause significant harm to our planet and are visible only in the Earth's atmosphere.

The SF's have a negative effect on the operation of technical devices: radar devices fail or work intermittently; there is often a loss of communication with ships and submarines, navigation devices of airliners sometimes stop working.

Also, the SF's have a negative effects on the human body: people lose attention and reduce the speed of reaction to external stimuli; scientists found that during the period of the SF's the blood condenses, that is, why

SF's are especially dangerous for people suffering from hypertension or prone to blood clots; people with mental illnesses and disabilities during the SF's are have exacerbation.

METHODOLOGICAL APPROACHES TO THE DETERMINATION OF THE VALUE ESTIMATION OF ECOSYSTEM SERVICES AND BIOLOGICAL DIVERSITY OF THE LUNGS OF THE REPUBLIC OF BELARUS

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The cost estimate of ecosystem services is based on the valuation of the ecological resource of different types of ecological systems. Methodological approaches to determining the valuation of ecosystem services and biodiversity have become the basis of the technical code of established practice.

Keywords: ecosystem services, biological diversity, the technical code of established practice, meadow lands, nature management.

The increasing scarcity of the planet's resources is currently actualizing the development of a wide range of issues related to ecosystem services, including their identification, assessment, identification of potential sellers and buyers, compensation mechanisms, and the formation of markets for these services.

The possibility of providing ecosystem services is due to one of the most important environment-forming resources on the planet, providing the possibility of sustainable development of ecosystems, conservation of habitat and biological resources – biological diversity. The latter is the guarantor of ecological balance on the ground and sustainable development in general.

The main problem of the reproduction of ecological resources of ecosystem products and ecosystem services is an underestimation of their economic value, caused by methodological impotence before the value evaluation of the colossal complexity of nature, its functions and interrelations.

At the same time, various assessments can play a non-constructive role, which absolutize the economic value of nature, deriving it for real value relationships and financial relations and thereby nullifying the latter's importance in making global and local management decisions for sustainable development.

Taking into account the critical consideration of methodological approaches that have adopted the concept of the overall economic value of natural goods, another methodology for the valuation of ecosystem services and biological diversity based on the concept of reproductive natural rents as a modern modification of the classical theory of land rent is proposed.

In this regard, the ecosystem service should be considered as a special form (direction) of use (conservation, reproduction) of the components of the natural environment (ecological resources) to meet a variety of social and environmental needs.

Such a definition is more correct for disclosing the essence of the concept of "ecosystem service" and its assessment, since the service can arise (to be obtained) only in the course of nature management or nature protection activity. Considering the ecosystem service outside nature management is not only wrong, but also methodologically unacceptable.

Biological diversity is an ecological resource that is an ecosystemic trophic relationship between the optimal aggregate of bioorganisms and their habitat, which provides a sustainable environment-forming effect of the functioning of natural ecosystems.

The calculation of the integrated valuation of ecosystem services is carried out according to four main types of ecological systems: forest, meadow, marsh and water. For areas where different types of ecological systems occur (for example, forest growing on a swamp, etc.), an assessment is made for each type of ecological system and the results are summarized.

Methodological approaches to determining the valuation of ecosystem services and biodiversity have become the basis of the technical code of the established practice of TAP 17. 02-10-2012 (02120) "Environmental protection and nature management. Rules of nature protection and nature management (general environmental requirements). The procedure for the valuation of ecosystem services and the value of biological diversity ".

This document regulates the procedure for determining the valuation of ecosystem services and the economic value of biodiversity for making managerial decisions in the environmental sphere and developing paid nature management.

ANALYSIS OF ENVIRONMENTAL ASPECTS TO OJSC "MINSK TRACTOR FACTORY"

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In this paper, an analysis of environmental performance at the enterprise and the documentation of EMS is conducted. The analysis made it possible to identify a number of environmental aspects that affect the environment, including air, water and wastewater, soil, and also systematize data that include quantitative and qualitative characteristics of the waste.

Keywords: priority environmental aspects, sources of pollutant emissions, water supply, waste management, environmental activities.

OJSC "MTF" is engaged in the development, manufacture and export of wheeled tractors and spare parts for them, organizes their production on a licensed basis, renders services in setting up and carrying out the service. In addition to tractors, the company's products are also special purpose machines for logging, forest care, special vehicles for public utilities, as well as forklifts and machines for work in mines.

The analysis of environmental activities at the enterprise and the documentation of the EMS have revealed a number of environmental aspects that have an impact on the environment, including on atmospheric air, water consumption and wastewater, and soil.

The enterprise has 1794 organized sources of pollutant emissions into the atmosphere, 306 emission sources are equipped with gas treatment plants. Also, the company has 850 mobile emission sources. 73 substances of various hazard classes are emitted into the atmosphere from the territory of the Minsk Tractor Plant. In total, 7921,099 tons of pollutants are emitted in a year.

At OJSC "MTF" there is no emission of pollutants above the limit, and the enterprise throws out 353 tons of greenhouse gases (carbon dioxide) per year. [1]

The source of water supply at OJSC "MTF" for household, drinking, industrial and fire-fighting needs is its own water intake and water supply of the city's centralized water supply system. The water intake consists of 13 wells with a depth of 61–78 m, a capacity of 4,4–36,0 m^3/h, two wells are conserved. The source of industrial water supply of the plant is the Chizhovskoe Reservoir on the Svisloch River (MHPP-3 water intake), as well as the purified water after the sewage treatment plants of the plant's sewage and conditionally pure sewage. The water consumption of the enterprise is 8663 m^3/day, including:

- for domestic and drinking needs – 5192 m3 / day;
- for production needs: drinking quality – 2189 m^3/day, technical quality – 1282 m^3/day. [2]

The production process at OJSC "MTF" is accompanied by waste generation. They are divided according to the types in accordance with the "Classification of waste" and hazard classes. Total waste generated 267609,214 tons/year (excluding waste mercury lamps). The amount of waste that is transferred to outside organizations for use or used in own production is 241449,119 tons/year (90,2 %) to be disposed of – 22918.260 tons/year (8,6 %). Also on the territory of the enterprise 11,207 tons of galvanic waste are stored. [3; 4]

The analysis of environmental aspects identified 16 priority aspects. [5] These include:

- emissions to atmospheric air (nitrogen dioxide, carbon monoxide, solid particles in aggregate (gravel dust), sulfur oxide), (VOC), (carbon monoxide, nitrogen dioxide), (natural gas consumption);
- treatment of waste products to be disposed of (old varnishes, paints hardened, as well as cured residues in barrels, paper and rags contaminated with paintwork materials, lacquers and paints varnish, old varnishes, paints that have not hardened), (wet dust melt for purging exhausts);
- handling of BMP, as well as waste that is to be reused or transferred to third parties (waste molding mixtures), (slags of iron foundries, steel slag, granulated granulated slag, scrap of refractory products produced from cast iron products, scrap of refractory products from injection molding products steel), (waste ceramic molds for investment casting of cast steel products), (waste from disassembly of buildings), (furnace debris (breakdown) of metallurgical processes), (iron containing I dust without harmful impurities FFS);
- discharge of contaminated sewage into the network of urban rainwater (suspended substances, petroleum products, BOD5).

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MODELLING OF NONLINEARITY OF LIGHT COLLECTION IN LARGE-VOLUME SCINTILLATORS

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In the state of progressive extension of information technologies around the world, non-analytic methods of calculation are widely used by means of powerful computer systems. In particular, it is very effective today to use the Monte Carlo method to simulate the transport of ionizing radiations in different materials.

Keywords: Monte Carlo method, scintillation, optical photons.

The systems of radiation portal monitors are an effective way to provide homeland security on potential dangerous objects. Recently, the idea of categorization of isotopes to increase the speed and quality of inspection at customs facilities has been actualized. In RPM the large volume scintillators are usually used to achieve the maximum sensitivity at low exposure rate. This inevitably leads to the problem of nonlinearity of light collection. In other words, the amount of light detected depends on the detector point where the flash occurred. The nonlinearity of the light collection results in a deterioration of detector's resolving power and, consequently, the possibility of correct categorization of isotopes.

GEANT4 is an open-source software toolkit for simulation of the transport of different types of particles through matter [1]. It has traditionally been used in medium and generally high energy physics applications. However, there is on-going development to extend the capabilities of this toolkit beyond this traditional scope [2]. In particular, some effort has been made into applying GEANT4 in the simulation of the optics of scintillation. For example, the simulation may commence with the propagation of a charged particle and end with the registration of the ensuing optical photons on photo sensitive areas, all within the same event loop [3].

In this research capability of GEANT4 to predict the nonlinearity of light collection in large-volume scintillators was investigated.

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AUTOMATING THE MANAGEMENT OF THE PORTAL RADIATION MONITORS SYSTEM

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Modern world is filled with events that disastrously influence nature and society. Some of these events, such as acts of terror at potentially dangerous facilities or illicit trafficking of ionizing radiation sources and nuclear materials, can be prevented by usage of specialized radiation monitoring systems – radiation portal monitors. Automation of management of such systems allows to speed up and increase work quality of various security services.

Keywords: radiation control, automation, software.

Radiation portal monitor systems are the means of continuous radiation monitoring. They are designed to detect sources of gamma and neutron radiation. Usage of such systems is the effective means of securing potentially dangerous facilities and increasing speed and quality of inspections at customs.

In addition to detection elements and processing units, radiation portal monitor systems generally include also specialized software. This software allows to optimize the operation and management of such systems, in particular it allows to control system remotely, supervise it and automate processes of radiation situation data acquisition, analysis and reporting.

Usage of specialized software as the part of radiation portal monitor system the increases efficiency of the work of customs authorities in field of radiation control. It allows to receive timely information on the radiation status at control points, capture a photo or video image of alarming objects, automates the process of creating reports on the effectiveness of control over the illicit trafficking of nuclear and radioactive materials. This ensures an early warning about the possibility of radioactive contamination or terrorist act.

This study defines concept and describes the process of automating the management of the portal radiation monitors system by developing and implementing specialized software.

BIOINDICATION WITH THE USE OF TRIFOLIUM REPENS L.

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Bioindication methods are important in carrying out environmental monitoring as a result they have recently received widespread acceptance and prevalence. No matter how modern the equipment for controlling contamination and detecting harmful impurities in the environment is, it cannot be compared with a complex "live device" that reacts to various changes, reflecting the impact of the entire complex of factors, including complex compounds of various ingredients.

The aim of the work is to assess the ecological state of the districts of Minsk, Nesvizh and Volma, characterized by the most developed industry, and the main recreational zones located in them, by the method of analysis of genetic polymorphism in populations of white creeping clover according to the variety of the "gray" pattern on the leaves.

Keywords: bioindication, bioindicators, creeping white clover (Trifolium repens L.), polymorphism

Collection of material was carried out in summer, in July. In total, 25 test sites were examined. During the research, the industrial part of the city of Minsk, the city of Nesvizh and the ecological park "Volma" of the Dzerzhinsky district was covered. The collection points were at a considerable distance from each other. Observations of the change in the pattern on the leaves of the meadow clover were carried out by counting forms with different patterns and without it on trial plots. In addition, the frequency of occurrence of detected phenes (in %) was calculated. All the hairdryers we detected were checked with known forms in the literature [3], and when new forms were found they were recorded into a table.

As a result the following conclusions were drawn:

The pasture populations of the Dzerzhinsky and Nesvizh regions were investigated, where 5–7 genotypes with different leaf patterns were identified. In addition to the age of the population, the level of pollution of the growth medium is of great importance here. In this respect, Dzerzhinsky and Nesvizhsky belong to ecologically cleaner regions. On the contrary, the tendency of polymorphism increase is typical for Minsk and its territories, contaminated with exhaust gases of roads, emissions of petrochemical enterprises, 10–12 genotypes were detected. In Nesvizh, anomalous forms of clover have been found, but in general the *vv* genotype is 34,95 %, which indicates a rather favorable habitat for this plant. In the city of Minsk, the frequency of occurrence of the genotype *vv* is 34.3 %, rare genotypes are also found: V^PV^P – 0,2 % and V^BV^B – 0,1 %. There is a wide variety of genotypes on the territory of Minsk. At the total count, the share of unchanged leaves in the sample was about 30 % and varied at some points from 11 to 53 %. The total share of the changed phenotypes was about 71 %, and varied from 47 to 89 %.

The analysis of the conducted studies showed that the pattern on the clover leaf is sensitive and the number of phenotypes increases with an increase in the anthropogenic load. In Minsk, there are clear signs of a load of mutations caused by the impact of anthropogenic factors, in comparison with the points selected in Nesvizh and Volma.

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NEUTRON-PHYSICAL AND THERMOPHYSICAL CALCULATIONS OF WWER-1200. SOFTWARE COMPLEX CASCADE

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The WWER-1200 reactor facility is considered, which is the logical continuation and development of the family of water-water power reactors (WWER) in the direction of increasing the generated electricity from one unit. Neutron-physical calculations (NPC) are carried out for a given reactor facility, both at the design stage and during operation.

Keywords: neutron-physical calculations, core, reactor.

The main task of the NPC for nuclear reactors is to justify their structure, type and design of the reactor installation as a whole, and to determine the set of neutron-physical characteristics that meet the current requirements for safety of nuclear power plants at all stages of the life cycle.

By purpose and target, the neutron-physical calculations can be attributed to the following main areas:

o neutron-physical calculations necessary to justify design and engineering solutions at the design stage of the reactor installation;

o calculation analysis of the behavior of neutron-physical parameters of the core, which is necessary for the technical justification of nuclear safety of operation of the reactor installation in all normal modes, including design accidents;

o calculation justification of measures to improve the safety of operation of the reactor installation and the introduction of new elements of the core;

o neutron-physical calculations necessary to support the current operation of the reactor facility in normal modes.

When designing WWER and predicting their characteristics during operation, the software complex CASCADE is applied, which includes the following main programs;

1) the program BIPR-7A is designed to perform a large-scale three-dimensional calculation the core of the WWER;

2) the program PERMAK-A is designed to perform small-scale small-groups two-dimensional diffusion calculations;

3) the program PIR-A is designed to process operational data, restore three-dimensional fields of energy release and compare the results of measurements with the calculation;

4) the program PROPOK-A provides the interactive mode solution of the task of optimizing the overload of the WWER reactor for a given nomenclature of cassettes loaded into the core;

5) the program HIPI-A is a system of information storage and retrieval, provides interaction of programs included in the complex.

Based on the information presented a general conclusion can be drawn that the significance and importance of neutron-physical calculations of WWER is difficult to overestimate. This is confirmed by the general nomenclature and the volume of neutron-physical calculations for all types of WWER: starting from the design NPC of the preliminary design of the reactor and ending with operational NPC during the reactor operation.

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PRACTICAL EXPERIENCE OF THE APPLICATION OF THE STRATEGIC ENVIRONMENTAL ASSESSMENT IN THE REPUBLIC OF BELARUS

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Practical experience of the application of the Strategic Environmental Assessment is shown. The legislative base of the Republic of Belarus on SEA is analyzed. The main benefits of including the SEA tool in the process of adoption of strategic documents are highlighted.

Keywords: Strategic Environmental Assessment, The UNECE Protocol on Strategic Environmental Assessment, pilot projects, procedure, town-planning projects, the drafts of programmes.

The Strategic Environmental Assessment (SEA) is widely used for designation of a systematic decision support process, aiming to ensure that environmental aspects are considered effectively in policy, plan and programme making. In international practice, SEA is considered to be an effective tool contributing to sustainable development.

The application of SEA and its integration in the procedure of strategic decision-making is mandatory for the countries that have ratified The UNECE Protocol on Strategic Environmental Assessment to the Convention on Environmental Impact Assessment (EIA) in a Transboundary Context (Kiev Protocol on SEA). In the Kiev Protocol on SEA the objects of SEA are specified, implementation guidelines for SEA are defined and some international requirements for the use of the SEA tool are revealed. In the Republic of Belarus, several projects within the framework of pilot projects with use of the SEA tool have been realized. In particular, Strategic Environmental Assessment of the 2006–2010 National Tourism Development Programme of the Republic of Belarus; National Programme of the Inland and Sea Transportation Development of the Republic of Belarus for the period of the 2011–2015; Scheme of the complex territorial organization of Myadel district have been implemented.

In January 2017 the Law of the Republic of Belarus from 7/18/2016 N 399-Z On the State Environmental Assessment, Strategic Environmental Assessment and Environmental Impact Assessment came into force. For the first time in the Republic of Belarus, the SEA procedure along with environmental impact assessment and the state environmental assessment has been defined at the legislative level. Under this Law, regulations have been prepared specifying the procedure of Strategic Environmental Assessment. These regulations include a list of required documents which should be subject to the SEA procedure in our country: 1) the drafts of programmes containing the provisions that govern the relations in the field of environmental protection and rational use of natural resources (including waste management, the subsurface use sphere), agriculture, industry, transport, energy, tourism and also the projects providing modification and (or) additions in them; 2) town-planning projects, except for master plans of urban-type settlements and rural settlements and also the projects providing modification and (or) additions in them.

Besides, methodological recommendations pursued under the guidance the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus, give detailed consideration of the individual stages of the development and adoption of strategic documents and the corresponding steps of SEA, which can be included at each stage. The main benefits of the application of the SEA tool in the process of the adoption of strategic documents can be represented in the following points that have been learnt from the experience in the expert group in Belarus:

- The importance of an integrated approach in consideration of social and economic and environmental issues which experts in SEA offer in addition to setting out the objectives and purposes of the considered document;
- The analysis of normative legal documents for the maximum compliance of the developed strategic document to sustainable development goals is carried out;
- The work of the expert group on SEA gives the chance to improve the estimated document by including not only economic but also social and environmental aspects.
- The information obtained as a result of the application of SEA has to be considered when updating the strategic document.

ANALYSIS OF ENVIRONMENTAL ACTIVITY AT OJSC "MINSK RAILWAY-CARRIAGE REPAIR WORKS"

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In this work the analysis of compliance with the requirements of legislation in the field of environmental protection, including in the field of waste management, in terms of protecting air, ozone layer, use and protection of water. The materials of the inventory of sources of emissions of pollutants into the atmosphere and the inventory of production wastes, instructions for the management of production wastes, instructions for the implementation of industrial control in the field of environmental protection, rational use of natural resources, environmental passport, and others were considered.

Keywords: environmental protection, protection of atmospheric air, water protection, waste management.

OJSC "Minsk Railway-Carriage Repair Works" is the largest organization in the Republic of Belarus, performing capital repair and repair of railway rolling stock.

At present, the company has 165 emission sources, including organized 158, unorganized – 7 and equipped with equipo de limpieza de gas – 25. A total of 51 names of harmful substances are emitted into the atmosphere. Sources emitting dust and having a dust concentration in the flue coming from the source of 50 mg / m3 are equipped with equipo de limpieza de gas. The standards for permissible emissions are set for 125 sources of emissions and for 46 pollutants.

Prior pollutants are hydrocyanide (hazard class 2), particulate matter (hazard class 3), aliphatic hydrocarbon limiters C1-C10 (hazard class 4), xylenes (hazard class 3), toluene (hazard class 3), ethyl benzene (hazard class 3), dust is inorganic with the content of SiO_2 < 70 % (hazard class 3), carbon oxide (hazard class 4), nitrogen (IV) oxide (hazard class 2), ammonia (hazard class 4). The enterprise belongs to the IV class and the size of the sanitary zone is 100 meters.

It was found that the actual emissions of pollutants in 2012 amounted to 43,428 tons, in 2014 to 42,359 tons, and in 2016 to 65,697 tons. The increase in pollutant emissions is due to the fact that the repair of wagons and wheel sets has increased, as well as the commissioning of a new workshop.

An analysis of the management of industrial waste for the period from 2012 to 2016 revealed that 56 types of wastes are generated from them: 2 % of the first hazard class, 5 % of the second hazard class, 48 % of the third hazard class, 34 % of the fourth hazard class and 11 % not dangerous.

The effective work should be noted in the field of waste management. In 2012 the company had 1803 tons of waste (excluding mercury-containing waste and waste containing PCBs), in 2014 – 1697 tons, and in 2016, 1681 tons, there is a decrease in generation of waste at 122 tons, including the waste going to the disposal decreased by 63 tons.

In 2012, 91 tons were handed over for storage, 0,4 tons for storage and 1,712 tons for burial, and in 2016 it was transferred for use of 31,5 tons, for storage of 0,35 tons and for disposal of 1649 tons. This is connected with the fact, that there was organized a full separate collection of waste and primary accounting of generated waste at the enterprise.

The territory of the enterprise is equipped with an in-house network of household, industrial and storm sewers. There are 17 storm water wells in the territory. Discharge of domestic and industrial wastewater is carried out in urban municipal sewerage networks in 2 issues. The storm sewage is discharged into the city storm drainage networks by 1 release.

On the territory of the enterprise there are treatment facilities, which are a sump-accumulator consisting of two tanks of 50 m3 each equipped with an oil trap, sewage after treatment of sewage at treatment plants is: pH – 6–9; Suspended solids – 0,9 mg/l; dry residue – 1000 mg/l; chlorides 350 mg/l; sulfates – 500 mg/l; oil products – 0,2 mg/l;

Analysis of water use for production needs revealed that in 2012, 39 thousand m3 / year was used, in 2014 – 38,3 thousand m^3/year, and in 2016 – 33 thousand m3 / year. The decrease in water consumption is due to the fact that the washbasins of the carriages were dismantled, the boiler in the boiler room was dismantled.

The company annually carries out measures to reduce emissions of pollutants into the air, discharges into sewage and production of wastes, in particular such as the use of ozone-friendly refrigerant R-134 when refueling air conditioners of wagons ,the reconstruction of gas cleaning equipment, the purchase of equipment meeting environmental requirements, the equipment of the site with a hard surface for: the collection and storage of metal

waste and waste from the dismantling of wagons, the installation of energy-saving lamps, checking the efficiency of gas cleaning units, improving the separate collection of waste oil, worn tires, rubber-containing waste, paper and cardboard waste, as well as at a fixed frequency an inventory of emissions of pollutants into the air, an inventory of production wastes.

ANALYSIS OF THE ENVIRONMENTAL WASTE STATISTICS. BACKGROUND OF THE ELECTRONIC STATISTICAL REPORTING FORMS

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Organization of industrial waste management system in the Republic of Belarus is one of the priority tasks in the field of ecology. To assess the effectiveness of action in this area, the development of the targets and taking strategic decisions in our country for more than 20 years, there is a form of state statistical reporting on waste. The statistical data transmitted on paper to the RUE "BRC" Ecology " today, employees of the organization carry out date further analysis and processing.

Keywords: Database technology (DB), IT-technology, Industrial waste management, GIS-technology, EF modules.

Database technology (DB) under the control of MS Access is now used for the processing and storage of statistical data

Creation of electronic forms of statistical reporting on the treatment of industrial waste (hereinafter – EF) with web-tools can become a bright example of the use modern information technologies in environmental protection activities.

EF is a client-server application and has a number of advantages:

1) collection of information takes much less time, thus reducing labor costs by making data in the database table;

2) validation (compliance) of input data on the client side (a nature-user) includes a comparison of data for several years, and completely eliminates the possibility of erroneous data in the database;

3) the amount of stored information is not particularly limited;

4) the use of GIS-technology provides more visual and complete information in territorial aspect;

5) there is a possibility of interaction between different information resources in the field of waste management and EF (eg, for the purpose of environmental agencies coordination).

To date, it solved a number of issues related to the creation of the EF:

1) an assessment and analysis of the information technologies used in environmental statistics, taking into account international experience;

2) The structure of the EF, the algorithm of its work and possible links with existing information resources used by environmental protection activities;

3) developed the design of the user interface of the system with a view to minimizing the user effort;

4) identified enablers ESP project.

During the next few it is planned to amend the regulations governing the issues of environment statistics, the implementation of the pilot version of the EF and its functional staff tested RUE "BRC" Ecology "for the possibility of using EF as an alternative to existing technologies, the creation of new EF modules for a more visual representation of information using GIS-technology.

INFLUENCE OF NATURAL SORBENTS ON RADIONUCLIDES BUILD-UP IN ANIMAL ORGANISMS

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The article deals with the aspects of using natural sorbents in order to protect animal organisms from harmful long-lived radionuclides. The influence of natural sorbents on reproductive qualities, growth and development of animals is considered. The influence of various natural sorbents on the level of radionuclide in the animal organism has been studied in terms of farm animals, in particular cows.

Keywords: sorbents, radionuclides, cesium, strontium, animals.

Rapid development of industry and agricultural production in the country has led to the contamination of the biosphere by chemicals. The catastrophe at the Chernobyl nuclear power station has only exacerbated the ecological situation in the country. Since that moment the concentration of radionuclides in natural environments has exceeded pre-emergency levels significantly. Most of the territory of Belarus is polluted with long-lived radionuclides, which pose a potential hazard to humans and animals. Currently, biological hazards are caused by long-lived isotopes, mainly ^{137}Cs and ^{90}Sr.

Radionuclides in chain order "soil-plant-animal" enter the human body and accumulate. This contributes to the formation of an internal exposure dose of the population and its level is often higher than the permissible average annual radiation standard [1]. Therefore, one of the serious tasks of agriculture is to prevent from the accumulation of radioactive elements in the organisms of farm animals and to manufacture ecologically "clean" production.

About 95–98 % of radionuclides enter animals through the gastrointestinal tract with feed and water [2]. Reduction of the radionuclides intake by animals can be achieved by balancing the animals diet according to mineral elements and vitamins, which will decrease the concentration of radionuclides and other toxicants in livestock products.

The most effective and simple way, preventing the entry of radionuclides into livestock products, is the natural sorbents in the diet of farm animals. They include common clay, zeolites, bentonite, humolite, vermiculite and others.

According to N. Lysenko's research, zeolites can reduce the amount of radioactive cesium in milk and muscle tissue of cows by 30 %. Mordenite in experiments of this author on goats at a dose of 5–10 g / day contributed to an increase in the rate of urinary excretion of radioactive cesium more than 2 times. The bentonite, used at a dose of 200–500 g / day, reduced the amount of radioactive cesium in milk and muscle tissue of cows by 50 %. Such sorbent as humolite at a dose of 100 g / day decreases in 1,6–2,8 times the amount of radioactive cesium in the milk of cows on the 11th day [3].

It was also revealed a positive effect of natural sorbents in diets of cow-heifers on the reproductive qualities, as well as the growth and development of young stock. Thus, animals of the 1st experimental group have the best conception rate, which equals to 1,4, and it is significantly lower than in the control group by 0,5 ($P > 0,001$) and in the 2nd experimental group by 0,3 ($P > 0,001$). Average daily gains show the high energy and growth rate of cow calves of the experimental groups: in group I – 840 g, and in group II – 830 g [4].

Nowadays manufacturing of the clean livestock products takes on national, social and political significance, and it is impossible without various ways of reducing the radionuclides intake in the organism of animals. The most effective and simple way, preventing the entry of ecotoxicants into livestock products, is the use of sorbents. In conditions of technogenic pollution of the environment, the study of the effectiveness of natural sorbents for removing radionuclides from the animal organism is becoming increasingly important. It determines the need to carry out radioecological and toxicologic investigations in zones of the environmental risk.

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ECOLOGICAL FEATURES OF THE COMMUNITY STRUCTURE OF WATERBIRDS AND SHOREBIRDS OF THE WATER RESERVOIR "DROZDY" MINSK

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The paper presents data on the structure of the community of water-marsh and waterbirds in the Drozdy reservoir in Minsk. Ecological groups, ecological status with respect to migration, and bird density were also determined. 39 species of birds belonging to 7 orders were identified. The greatest variety is characterized by water-swamp and waterbirds.

Keywords: avifauna, ecological status, birds, environmental groups, biodiversity, the water reservoir "Drozdy"

In connection with the rapid urban development, the interest of zoologists to animals in the city has increased, birds among them are most noticeable and important [1]. Nowadays there are almost no territories left untouched by human activity, but the forms and extent of this impact are different. In the city, the influence of human activity on nature is expressed particularly clearly [3].

The purpose of the study was to study the structure of the community of water-marsh and waterbirds in the reservoir "Drozdy" in Minsk.

The research site is the reservoir "Drozdy", located at the north-western margin of Minsk, on the river Svisloch. On the banks there are artificial sandy beaches. On the west bank, residential complexes are being built. On the east side, the forest adjoins the reservoir.

When studying the structure of avifauna, it was revealed that 39 species of birds belonging to seven orders inhabit the Drozdy reservoir: Podicipediformes, Anseriformes, Gruiformes, Charadriiformes, Columbiformes, Apodiformes, Passeriformes (Passeriformes).

On the territory of the reservoir, species belonging to three groups have been identified according to the status of migration: nesting migratory and in a limited number of wintering – 7 species, nesting migratory – 17 species, nesting sedentary – 15 species [4].

Birds of the reservoir Drozdy by ecological groups are divided into waterfowl, water, synanthropic, forest, airships, birds of open landscapes. 33 % of the recorded species are waterfowl, 31 % are waterfalls, 13 % are cynanthropic, 10 % forestalled, 8 % airships, and 5 % birds of open landscapes [2].

The bird population density was 557,14 individuals / km2. The largest density is in the lake gull – 53,81 individuals / km2. The white stork has the lowest density – 1,90 individuals / km2.

Thus, the territory of the Drozdy reservoir plays a huge role in preserving the species diversity of birds. The reservoir is an important stopping point for birds on the migration route.

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STORAGE OF RADIOACTIVE WASTES AS A WAY TO ENSURE RADIATION SAFETY

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Radioactive waste is dangerous to most forms of life and the environment, and is regulated by government agencies in order to protect human health and the environment.

Keywords: radioactive wastes, isotopes, NPP

Radioactive wastes are wastes that contain radioactive material. Radioactive wastes are usually by-products of nuclear power generation and other applications of nuclear fission or nuclear technology, such as research and medicine.

Radioactivity naturally decays over time, so radioactive waste has to be isolated and confined in appropriate disposal facilities for a sufficient period until it no longer poses a threat. The time radioactive waste must be stored for depends on the type of waste and radioactive isotopes. It can range from a few days for very short-lived isotopes to millions of years. Current major approaches to managing radioactive waste have been segregation and storage for short-lived waste, near-surface disposal for low and some intermediate level waste, and deep burial or transmutation for the high-level waste.

In Belarus, solid waste will be collected, sorted, processed, packaged, temporarily stored and removed from the nuclear power plant. At the same time, very low-level, low-level and medium-level waste will be crushed and placed in 200-liter metal barrels, pressed directly in barrels, sealed and, after certification, sent for storage.

Highly active solid waste is intended to be collected in special metal capsules, loaded into protective containers and transported to the storage compartment of solid waste. Storage of drums with solid waste and reinforced concrete irretrievable protective containers with cured liquid waste is planned for nuclear power plants in specially equipped ground-level storage facilities, one for each power unit. Highly active waste will be stored at the plant for the entire life of the plant, and very low-level, low-active and medium-active waste – for ten years of its operation.

Taking into account the expected volumes of radioactive waste generation, there is an objective need to create a burial site to ensure the safe storage of very low active, low active and intermediate level radioactive waste after the NPP is put into operation. The construction of this burial site is expedient to be carried out using a near-surface method of waste localization with the possibility of its expansion to ensure the disposal of waste generated during the decommissioning of the nuclear power plant.

According to the NPP project, the station will operate a radioactive waste management system. For ten years, the waste will be stored in the substation storage, after which they are planned to be moved to the burial site.

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BACTERIOSIS IN THE PATHOLOGY OF WATERFOWL AND THE ROLE OF THEIR DISTRIBUTION IN THE TERRITORY OF THE REPUBLIC OF BELARUS

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The material is about importance of bacteriosis in the pathology of waterfowl, the need to study their infectious diseases due to the widespread development of industrial poultry farming in the Republic of Belarus.

Keywords: bacteriosis, bacteria carrying, pathologies, waterfowl, reservoirs.

There is a large number of rivers and lakes in the territory of the Republic of Belarus. In addition to the aesthetic component, it also has commercial value. Reservoirs give the possibility to achieve such important forms of

the activity of human's life as hunting, fisheries, to carry out irrigation, and also they serve as the transport way and the principal source of water supply.

However, reservoirs serve as a habitat for not only representatives of the class of the fishes, amphibians and other fauna, but also such a widespread group as birds.

Waterfowl populate different types of reservoirs in our Republic. Actively operating structure of hunting farms in Belarus allows to use this resource productively enough in terms of catching waterfowl.

It is necessary to note that the waterfowl, besides its value as the object of hunting, are the carriers of many diseases of different etiology, including of the diseases of bacterial nature. Among the diseases of the bacterial etiology of the waterfowl, whose agents are capable of passing by the mechanism of transfer from one organism of another, separate such, as salmonellosis, streptococcosis, influenza of ducks, pasteurellosis, listeriosis, leptospirosis, botulism, colibacteriosis and others. In general they are more than 20. All these diseases have a negative effect on the waterfowl, causing the mechanisms of the chain reaction of infection.

Many birds die from various diseases and infections, transmission and distribution of which occurs especially easily in the wintering area, where a lot of birds accumulate. More than five thousand waterfowl remain winter on the reservoirs of Belarus. Analyzing the sources, it is established that there is a number of the largest wintering sites in Belarus, where annual wintering bird counts are conducted at least since 2009. These include: Brest; Grodno (including the cleaning "of nitrogen"); Minsk; Novolukoml (Lake. Lukomlskoe and urban cleaning); beginning with 2012 g. calculations are conducted on municipal waste water treatment plants in Soligorsk (as one of most important places of winterings in the south of Belarus) and others. The list of these wintering points is about 50 % of the total number of wintering birds on the territory of Belarus (by mallard) and more than 70 % of swan-swish, large fish duck, goldeneye and coot. According to the data on the monitoring areas, 27 species of waterbirds are taken into account, mallards is the absolute dominant that is 12857 mallards (79 % of the total number of registered birds).

It is known that these infectious diseases pose a great danger to human beings and other animals. Practically all agents, under specific conditions, can call infectious pathology in man. The threat is also presented to animals of private and public agriculture in Belarus. Infectious diseases are transmitted by wild and domestic birds, rodents, through feed and equipment. The causative agents of many of them have a complex development cycleand are widely distributed in nature.

It is obvious that there are no borders for birds, including waterfowl. In a short time, they can transfer the infectious agent to any part of the country. Thus, there is a constant threat of the formation of a focus of any of the infectious diseases.

The study of the bacteriocarriage situation among farm animals, wild animals and birds helps prevent the occurrence of dangerous diseases.

Considering the fact that industrial poultry farming is widely developed in Belarus, the prospect of occurrence of especially dangerous infections among birds remains relevant.

MENTAL HEALTH AND THE ENVIRONMENT

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One of the most difficult and actual problems of the modern world and society is the problem of the relationship between society and the environment. In the process of his life, a person constantly interacts with the environment, with all the variety of factors that characterize the environment. Scientific and technological progress brought with it the greatest blessings for mankind and at the same time has a negative impact on the biosphere and human health.

Keywords: human ecology, environment, mental health, psychology, environmental psychology.

The instability of the socioeconomic and political conditions of life, the increase in the number of natural disasters and man-made disasters, the growth of crime, uncertainty in the future, the lack of psychological preparation for life in extreme conditions, characteristic of the past decades, are all the most characteristic in the last decade, problems of psychological preparation and readiness for life in complex, stressful socio-psychological conditions, as well as the provision of psychological assistance to children and adults in extreme and post-extreme situations [1].

Among the many types and forms of human interaction with the environment, two aspects are usually most clearly revealed. The most studied and constantly supplemented aspect is the influence of the surrounding nature on a person, on his physical and mental functions, his health and well-being. An important aspect is the influence of a person on the environment and the reflection of this influence, that is, the comprehension and comprehension of anthropogenic impact. Both these aspects are closely related to human behavior.

The study and research of the problem of changing mental reactions and human processes under various conditions is carried out by "ecological psychology", which was formed in the 1960s and 1970s and is in the making.

The term "environmental psychology" is an generalizing concept S. D. Deryabo and V. A. Yasvin offer denote them four research areas – close, but not identical in content: psychological environment, psychology of the environment, ecological approach to psychology and the psychology of ecological consciousness.They all have an independent subject of the research, its objectives and methodology [2].

From the impact of the environment, the most vulnerable system of the body, the nervous system, the perception system, the soul suffers, and all the other systems of the body, from the immune and reproductive ones, suffer first of all. The body responds with stresses, neuroses, depression. The World Health Organization called neurosis one of the diseases of the 20th century [3].

At present, conducting extensive research on the environmental direction, namely the impact of the environment on the psyche is more relevant than ever in the world.

The pathogenesis of environmentally conditioned mental disorders is usually associated with the concept of stress H. Selye. Stress is seen as a nonspecific reaction of the human body, arising in response to the increased demands of the environment, and defines it as an "adaptation syndrome".

Thus, man, the environment, nature as a whole form a single system, without regard to which it is impossible to consider mental processes, states and consciousness, mental development, learning and behavior, as well as mental health of the individual.

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SPECIFIC FEATURES OF THE TOXIC EFFECT OF DIISONONYL PHTHALATE ON REPRODUCTIVE FUNCTIONS OF WHITE RATS

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In toxicological study was conducted to study the effect of diisononyl phthalate (DINP) on the reproductive system of white rats. In the experiment we used the scheme A. A. Dinerman, which allows recording embryotropic and teratogenic effects taking into account the dynamics of development of offspring in the postnatal period. The presence of anomalies in the development of internal organs of embryos was determined by the sagittal section method according to W. Wilson. It was found that intragastric administration of the test compound to females during the pregnancy period at doses of 100, 1000 and 10,000 mg/kg initiated external and internal malformations of embryos. The exposure level of 10,000 mg/kg is characterized by an increase in total postimplantation and embryonic mortality, the presence of multiple embryonic developmental defects. At the same time, there were no significant changes in the postnatal development of the offspring compared to the control. The most inactive dose of 10 mg/kg of DINP was established in the experiment, in which there were no signs of teratogenic and embryotropic action.

Keywords: diisononyl phthalate; toxicity; embryotoxicity; teratogenicity.

Intensive development of chemical production leads to the emergence of a wide range of consumer products on a polymer basis. To give the polymer soft and flexible properties, manufacturers use phthalic acid ester – diisononyl phthalate (DINP), whose dangerous properties have not been studied for humans. It is known that phthalates are endocrine effectors and, in particular, are able to exhibit antiandrogenic properties. One of the components of the study of the negative effect of the chemical factor is the identification of the hazard in experiments on laboratory animals. The results of the study are necessary for the development of a hygienic standard for the allowable amount of migration of DINP from medical devices for the purpose of assessing their safe use when conducting the procedure for state registration by sanitary inspection bodies.

A study of the influence of DINP on the reproductive function of white rats, taking into account the changes occurring in postnatal development and the determination of inactive dose levels.

The experiments were carried out on 105 randomly-mature adult female rats (160–180 g) according to a combined scheme for studying embryotoxic and teratogenic effects, taking into account the state of offspring in the postnatal period. Selected females, distributed in 5 groups of 21 individuals, from the first day of pregnancy, were intravenously injected with DINP at fixed doses of 10, 100, 1000 and 10,000 mg / kg throughout the gestation period (2 ml of distilled water were administered to the control group). At the end of organogenesis on the 20th day of pregnancy, 11 of 21 females in each group were sacrificed. The presence of anomalies in the development of the internal organs of embryos was determined using the sagittal section method. The remaining females brought offspring, in males whose weight and body length were determined upon reaching the age of three months, the relative coefficients of mass of appendages and testes, the mobility and concentration of spermatozoa were examined.

The study found that intragastric administration of DINP to females during the pregnancy period at doses of 100, 1000 and 10,000 mg / kg initiated a dose-dependent formation of external and internal malformations of embryos such as microphthalmia, anencephaly, hydrocephalus, akronia, micrognathia, hypoplasia of the lung, absence an interventricular septum of the heart, an intestinal and / or liver event. The exposure level of 10,000 mg/kg is characterized by an increase in total postimplantation and embryonic mortality, the presence of multiple (combined) malformations of embryo development. At the same time, there were no significant changes in the postnatal development of the offspring.

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DVANTAGES OF USING LINEAR ACCELERATORS OF NEW GENERATION FOR RADIATION THERAPY OF TUMORS

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Nowadays, radiation therapy along with chemotherapy and surgical treatment, takes a leading role in the fight against cancer. Modern radiation oncologists have a wide range of possibilities to save many lives using linear accelerators, and in cases where this is not possible, significantly extend and improve the quality of life of patients. Medical linear accelerators of the new generation have become the main type of apparatus used in radiotherapy of oncological diseases, gradually replacing not only gamma therapeutic devices with cobalt 60 sources, but older electron accelerators as well. Such a widespread distribution of the new generation linacs, despite the high cost, can only happens because of the high quality of ongoing treatment for cancer patients.

Keywords: radiation therapy, stereotactic treatment, radiosurgery, linear accelerator, quality control.

Nowadays, the clinical effect of radiotherapy is largely determined by using of modern and high-technic medical radiotherapy equipment. One of such equipment is the medical stereotaxic linear electron accelerator of the new generation of TrueBeam STx, which was installed in 2017 in N. N. Alexandrov National Cancer Center of Belarus. This linear accelerator is equipped with a system of integrated visualization of anatomical structures of the patient position, including computed tomography technology in a conical beam; robotic therapeutic table allows automatic patient positioning with six degrees of freedom; system of dynamic synchronization of the radiation mode of the accelerator with the respiratory cycle of the patient. The main feature of TrueBeam STx is the ability to deliver high values of absorbed dose in the shortest time.

This is achieved by using FFF (Flattening Filter Free photon beam) technology with a dose rate of 24 Gy/min. Due to this option, the patient's irradiation time is greatly reduced, which not only makes the procedure of radiation therapy more comfortable for them, but also significantly reduces the probability of changing the position of the tumor during irradiation, which is the main mark of the efficiency of this technology. Also, the design feature of this device is a multi-leaf collimator (MLC) with a high resolution in the formation of an individual irradiation field. This MLC represents a new generation of devices with a minimum plate thickness of 2,5 mm, which makes it possible to apply the stereotactic and radio surgical irradiation technique without using an additional tubes, compensators and contributes to the most comfortable course of the radiotherapy session.

Along with expanding services of therapeutic procedures for radiotherapy in patients with cancer, TrueBeam STx also provides a wide range of quality control technologies for accelerators' systems. One of the advanced technology is «Machine Performance Check», which automatically performs the quality control of the main parameters of the system and significantly reduces the time for daily and weekly quality control and calibration procedures both the output parameters of the radiation beam and the geometric characteristics of the accelerator.

Thus, the new-generation medical accelerator TrueBeam STx in N.N. Alexandrov National Cancer Center of Belarus is used and provides quality medical care to cancer patients according the most modern methods of stereotactic and adaptive radiotherapy in the world.

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RADIATION MONITORING FOR DOSE ASSESSMENT OF REPRESENTATIVE PERSON

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Currently the ICRP recommends using the dose of representative person for radiation protection purposes. However, there are still no strict methodological approaches for the dose assessment of the representative person all over the world. The purpose of this research is to analyze some methodological approaches for the assessment of population doses for radiation protection based on modern international recommendations and adapting international approaches to the conditions of the Republic of Belarus, taking into account the situations of existing and planned exposures. The focus should be on the environmental radiation monitoring for the assessment of external and internal (with food) population doses.

Keywords: representative person, dose assessment, environmental radiation monitoring.

Population dose cannot be measured directly without a considerable difficulty. In most cases, it cannot be measured at all. Therefore, for the purpose of protection of the public, it is necessary to characterize an individual receiving a dose that is representative of the most highly exposed individuals in the population.

The International Commission of Radiological Protection (ICRP) has previously used the concept of the critical group for defining those people who receive the highest exposures from a particular source or set of sources of radiation for the purposes of applying its recommendations [1]. Dose restrictions have been applied to the mean dose in the appropriate critical group. Over the past decades, a considerable body of experience has been gained in the application of the critical group concept. There have also been developments in the techniques used to assess doses to members of the public, notably the increasing use of probabilistic techniques. The adjective 'critical' has

the connotation of a crisis, which was never intended by the ICRP. Furthermore, the word 'group' may be confusing in the context where the assessed dose is to an individual [3].

The ICRP now recommends the use of the 'Representative Person' for the purpose of radiological protection of the public instead of the earlier critical group concept. This term is the equivalent of, and replaces, 'average member of the critical group' described in previous ICRP recommendations [1]. In addition, the International Atomic Energy Agency in the main Radiation Safety Document [2] has used the term representative person to compare with the reference levels of exposure.

In considering dose to the representative person, a number of factors should be taken into account: (1) the dose assessment must address all relevant pathways of exposure; (2) the dose assessment must consider spatial distribution of radionuclides to ensure that the individuals receiving the higher exposures are included in the assessment; (3) habit data should be based on the population exposed and must be reasonable, sustainable, and homogeneous; and (4) appropriate dose coefficients have to be applied to specific age categories. Once these factors are taken into account, and depending on the assessment approach employed (deterministic, probabilistic, or a mixture of these), the representative person is identified and used to determine compliance. Additional elaboration follows on each of these factors.

Table

Summary of methods used for determining dose to the representative person

	Calculation method	
	Probabilistic	Deterministic
Environmental concentration data	Distribution of estimated or measured concentration (activities in environmental objects and foods)	Single values for parameters
Habit data	Range or fixed values for habit data	Average value for the highly exposed group or 95th percentile of appropriate national or regional data
Dose coefficient	Fixed value based on age	Fixed value based on age
Dose to the representative person	Method selected by operator or regulator. Representative person is identified that the probability is less than 5 % that a person taken at random from the population will receive a greater dose	Product of above values

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MODERN ENVIRONMENTAL PROBLEMS – THEIR CAUSES AND MANAGEMENT

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The modern environmental problems previously are result of anthropogenic impact to environment. Gas emissions, wastewater and waste are polluted environment and has effect to as biodiversity as human wellbeing. Landscape change and intensification in industrial and agricultural soil treatment also has influence to environmental quality. Environmental management tools are the main means for environmental problems control.

Keywords: environmental problems, anthropogenic impact, emissions, wastewater, biodiversity, waste, environmental management.

Modern world has a lot of environmental problems which are result of natural and artificial impacts. Some of them are caused by the influence of solar activity, which is cyclical in nature. Extreme weather events are often the result of it's impact. Another are result of volcanic activity.

Anthropogenic activity is the cause of most environmental problems in the modern world. Developed industry, transport, agriculture and the energy industry cause excessive consumption of natural resources and environmental pollution. As a result, the habitat of plants and animals is destroyed, the natural cycles of substances are disrupted, and substances appear in them that are toxic to living organisms.

Environmental management is a systematic approach to managing anthropogenic impact on the environment. At the state level, it consists of administrative, economic and information tools. Administrative tools in the use of natural resources imply the existence of environmental legislation, environmental regulation, environmental permits, licenses for environmental management, restrictions on the environmental impact from anthropogenic activity, environmental certification and standartisation [1].

Environmental management's economic instruments are represented by environmental taxes, fines, environmental insurance, quota markets and other market instruments that make it possible to financially interest businessmen to reduce the impact on the environment and rationally use natural resources and energy [1].

Scientific research ecological interaction in environment and implementation this knowledge to practice also allowed decrease anthropogenic impact to environment. For example Integrated Pest Management system allowed to permits high yields of ecologically safe products to be obtained and decrease environmental pressure in agriculture [2].

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CALCULATION OF COEFFICIENT OF HIDDEN LEAKAGE IN THE WATER SUPPLY NETWORKS OF SUBSCRIBERS

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The algorithm and software for calculating the coefficient of hidden leakage in the water supply networks of subscribers, which takes into account the water supply networks of sub-subscribers, has been developed, which generates cost estimates for additional agreements with subscribers of the UE Minskvodokanal.

Keywords: UE "Minskvodokanal", water supply networks, hidden leakage factor, algorithm, ASP.NET, MS SQL SERVER, C #, JAVASCRIPT.

The relevance of this work is that it proposes software to improve the efficiency and accuracy of the work of the organization that still uses methods and means to calculate leakage elimination that do not include software.

The aim of the work is to develop a system for calculating the coefficient of hidden leakage in the water supply networks of subscribers, taking into account the water networks of sub-consumers.

When developing the software, ASP.NET, CSS, C #, JavaScript have been used. The system includes a database, which is accessed through Microsoft SQL Server Database File. Uninterrupted migration of data on the coefficient of hidden leakage in the water supply networks of subscribers from the implemented system to the directory on leakages and unaccounted water expenditures has been developed. The application provides for logging the history of operations of each user with data: entering, changing, deleting, and formatting the report.

The application calculates and provides data on the coefficient of hidden leakage in the water supply networks of subscribers, and also allows the printing of an additional agreement to the contract for the provision of water supply services with the calculation of data on leakages and unaccounted water costs in accordance with the data of the water supply networks of subscribers. The system generates forms of additional agreements with calculation calculations for the entered templates and printing them for the subscribers of the enterprise. The main reporting form is the calculation of the coefficient of hidden leakage values in the water supply networks for each selected subscriber.

PROBABILISTIC SAFETY ASSESSMENT ON NUCLEAR POWER PLANTS

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Probabilistic safety assessment is one of the most effective tools of qualitative research and a quantitative assessment of the level of safety of the operating nuclear power plants. PSA needs to combine the proven effectiveness of mathematics and a deep knowledge of the technological characteristics of the investigated blocks.

Keywords: nuclear power plant (NPP), risk, probabilistic safety assessment (PSA).

Nuclear power plant (NPP) is a source of potential danger or radiation impact on staff, population and the environment due to the accumulation in the process of exploitation of significant quantities of radioactive products and the availability of basic possibilities of output in case of accidents behind provided boundaries. The degree of radiation risk is directly dependent on the level of NPP safety, which is one of the main properties of the NPP, determining the possibility of their use as sources of thermal and electric energy.

Ensuring safe operation of nuclear power plants is a priority as organizations designing and operating nuclear power plants and the bodies of state management of the use of atomic energy and state regulation of safety at use of atomic energy [1].

Requirements for carrying out studies on comprehensive assessment of safety level of NPP units are included in a number of Federal and regulatory documents and are mandatory for the operating organizations at obtaining licenses for operation of nuclear power plants, including the lifetime extension of nuclear power plants.

Probabilistic safety assessment (PSA) is a tool which gives opportunity to assess integrally current level of security and, if necessary, to identify ways to improve it.

PSA allows systematically and comprehensively analyze all sorts of emergencies and identify the major sources of accidents at the facility, and identify what features of the project and/or operation of nuclear power plants are the most significant from the point of view of risk of undesirable consequences. Thus, the results of the probabilistic assessment provide the basis for decision-making on implementation of activities with the purpose of increase of level of security, allowing quantitatively "weigh" events for their impact on risk reduction[2].

PSA can be performed at different stages of the life cycle of the NPP, including design, construction, commissioning, operation and decommissioning. Most effectively and cheaper PSA can be used in the design phase where the results can be a basis for the development of technical solutions aimed at improving safety and implemented directly in the project of NPP. The use of PSA at the design stage allows to create NPP with the specified security level.

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THE ASSESSMENT OF THE EFFICIENCY OF WASTEWATER TREATMENT AT THE MINSK SEWAGE TREATMENT STATION

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In this paper, the efficiency of wastewater treatment is estimated from the data of local monitoring. The calculation of the efficiency of wastewater treatment at the Minsk sewage treatment station showed that the degree of water purification at this enterprise is high and, on average, is 86,2 %.

Keywords: wastewater, efficiency assessment, wastewater treatment, treatment facilities, local monitoring, chemical and technological control.

Minsk sewage treatment station is the most complicated industrial complex for cleaning domestic and industrial wastewater consisting of two production complexes: MSTS-1 and STP. The station collects and purifies wastewater generated in the city, as well as realizes collection and transfer for storage, burial, use and disposal of waste generated in the production activities of the enterprise.

Of the total volume of wastewater, there are approximately 30 % of industrial waters from more than 300 enterprises in Minsk. Currently, 500 thousand m^3 of sewage are generated daily, which are sent to Minsk sewage treatment station through the system of domestic sewerage. At the same time, the capacity of the enterprise can reach 800 thousand m^3/day [1].

During the local monitoring at the enterprise, the efficiency of wastewater treatment is evaluated. Local monitoring is carried out in accordance with the Regulation on the procedure for the local monitoring of the environment and use of its data as a part of the National Environmental Monitoring System in the Republic of Belarus, approved by the Resolution of the Council of Ministers of the Republic of Belarus on April 28, 2004, № 482 "On Approval of the Regulations on the Procedure as part of the National System for Monitoring the Environment in the Republic of Belarus monitoring surface water, groundwater, atmospheric air, local monitoring environmental monitoring and use of these monitoring data" [2].

To assess the effectiveness of wastewater treatment, a chemical and technological control of the sewage treatment plant is carried out. Chemical and technological control of the sewage treatment plant is carried out in the course of water movement at all stages of purification. Waste water is analyzed before the treatment facilities, after passing each treatment facilities and at the outlet to the pond. At the same time, the qualitative composition of incoming wastewater to the station is determined. Evaluation of sewage treatment efficiency is carried out according to 25 indicators [3].

The efficiency of wastewater treatment at the Minsk sewage treatment station for the period from 2012 to 2016 is estimated. Analysis of local monitoring data showed that there is a tendency in increasing the amount of ammonia nitrogen, phosphates, nitrites, nitrates, chlorides, sulfates, iron, copper, cadmium, lead and phosphorus in the wastewater that enter to the treatment plant. At the same time, there was a tendency in reducing the amount of suspended solids, dry residue, oil products and zinc in wastewater.

The calculation of the efficiency of wastewater treatment at the Minsk sewage treatment station showed that the degree of water purification at this enterprise is high and, on average, is 86,2 % [4].

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ECOLOGICAL PROBLEMS OF NON-IONIZING RADIATIONS

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The effects of non-ionizing electromagnetic fields on living organisms, sources of increasing electromagnetic background, as well as problems of ensuring electromagnetic safety of man are discussed.

Keywords: non-ionizing radiation, electromagnetic field, electromagnetic smog, electromagnetic pollution, electric field, magnetic field, field strength.

Life on Earth was created many years ago, and for a long time proceeded in the conditions of relatively weak electromagnetic fields (EMF), which created only natural sources. These include the electric and magnetic fields of the planet, processes, which occurring in its atmosphere (lightning discharges, vibrations in the ionosphere), cosmic sources of radio waves (the Sun and other stars).

Only in the 19th century appears to base the approval on the relationship of electrical and magnetic phenomena. In 1887 H. Gertz fully confirms the theory of the electromagnetic field, created in 1864, without assuming that

soon this event will become a milestone not only in science and technology, but will also serve as the beginning of a fundamentally new situation on the Earth. The first radiogram of A. S. Popov with the word " GERTZ " practically became the starting point for the growth of the electromagnetic background of our planet.

The spectrum of electromagnetic radiations (EMR), mastered by mankind at the present time, is unusually wide – from extreme low frequencies (less than 1Hz) to gamma-ray and cosmic-ray frequencies (more than $3 \cdot 10^{21}$ Hz). As a result of the increase in the number of sources and the increase in the total power of EMF, a new term has appeared – "electromagnetic smog". EMRs with a frequency of less than 300 GHz are considered non-ionizing.

The active component of the Earth's own natural electromagnetic fields are their changes caused by the swinging of the magnetosphere by the ejections of the solar matter, the so-called magnetic storms. They cause a whole complex of changes in the parameters of the environment, up to the change in atmospheric circulation. In the process of evolution, biological objects have adapted to the presence of constant variations of the Earth's magnetic field, and the changes caused by them in the human body are within the limits of its adaptive capabilities.

Sources EMF, as a rule, are sources of complex electromagnetic radiation, which has an impact, in the territory of its influence, both on human and on ecology. Electromagnetic radiation occupies large areas and often violates the integrity of the range of distribution and migration routes of many animals.

Instead of traditional natural fabrics, which practically do not change the distribution of surface charges, synthetic products appear on the body, increasing the electric field strength by orders of magnitude. Tensions on the body surface vary from 20 to 200 V/m, reaching on top of 1000 V/m. If natural clothing practically does not change these values, the clothes of synthetic materials in motion create electric field intensity up to 14000 V/m.

Electromagnetic contamination of anthropogenic origin is extremely insidious. It remains unnoticed by the senses organs, although modern man is actually almost constantly exposed to artificial electromagnetic fields (AEMF). According to recent findings it electromagnetic smog is the main reason the so-called "chronic fatigue syndrome".

The problem of electromagnetic safety and protection of the environment from the effects of AEMF in recent decades, the relevance and social importance, including at the international level.The term "global electromagnetic pollution of the environment" was officially introduced in 1995 by the World Health Organization (WHO), and a number of international projects on this issue are currently being implemented under the auspices of WHO.

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ANALYSIS OF WATER CONSUMPTION AND WATER DISPOSAL OF JSC "MINSK PLANT OF WHEEL TENDERS"

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In this paper, an analysis of water consumption and water disposal at OJSC "MZKT" was carried out. The sources of water consumption and types of sewerage networks have been determined. The analysis of the documentation and data of water use accounting for 2016 is considered. The analysis of the discharge of pollutants with wastewater and measures for their reduction are carried out.

Keywords: water consumption and water disposal, pollutants, discharge of pollutants, wastewater treatment.

The paper considers the water consumption of the enterprise OJSC Minsk Wheeled Tractor Plant which produces special multi-wheeled vehicles, road trains, crane chassis and wheel chassis of high cross-country capacity and carrying capacity, trailers for oil, gas, timber, construction, geological exploration, municipal services, military industrial complex, as well as the release of spare parts for their products.

Water supply is provided from several sources:

- drinking – from 29 inputs fed from the networks of the managing company of the holding "BELAVTOMAZ";
- technical – their input, fed from the networks of the managing company of the holding "BELAVTOMAZ".

At the enterprise the source of hot water supply is its own boiler room.

The collection of rain and industrial wastewater is carried out by three issues in the network of the managing company of the holding BELAVTOMAZ. The domestic waste water is transferred to the management company of the holding company BELAVTOMAZ.

The volume of water consumption in 2016 amounted to 931,1 thousand m3, which is 34,0 % less compared to 2012 (1411,6 thousand m3). Reducing the volume of water consumption with increasing production volumes indicates an improvement in water use in the enterprise.

In 2016, the quality of drinking water was monitored for compliance with organoleptic microbiological indicators. Laboratory studies have confirmed that the quality of drinking water meets the requirements of SanPin 10-124 RB 99 "Drinking water. Hygienic requirements for water quality of centralized drinking water supply systems. Quality control".[1]

Accounting for water consumption and sanitation. Presentation of state statistical reporting 1-water (MNRE). Accounting for the number of water, wastewater and wastewater taken out is carried out in accordance with the agreement on the provision of services for the reception of drains into the rain water drain of JSC "MAZ" and their water disposal from the organization.

The organization with the participation of the managing company of the holding "BELAVTOMAZ" compiled an act of the boundary of the balance and operational belonging between OJSC "MZKT" and the management company of the holding "BELAVTOMAZ" for water supply and sanitation.

Based on the forms of the primary accounting documentation for the use of water, the main power engineering department compiles the "Report on the use of water" in the form of the state statistical reporting 1-water (MNRE) and until January 20 of the next year it is presented by the report of the Ministry of Natural Resources. [2]

The total gross discharge of pollutants was carried out within the established limits. The amount of pollutants allowed to discharge is: permanganate oxidation – 3,76 mg / dm3, suspended substances – 7,88 mg/dm3, petroleum products – 0,04 mg/dm3, BOD-5 – 2,95 mg/dm3.

Discharge of pollutants, exceeding the maximum permissible concentration, was eliminated through the implementation of the following measures: cleaning of wastewater discharge pipelines, grease traps and sedimentation tanks for catching fats and suspended solids.

For purification of the water withdrawn at the enterprise, a gas oil separator with an integrated sand catcher WMOK 20 DN 200 is installed. It is designed for sewage treatment from suspended solids and petroleum products. The oil and gas separator is installed underground.

For underground installation, technical wells and manholes are used. To improve the quality of wastewater treatment in 2017 an oil trap for the primary purification of oil emulsion effluents is planned. [3]

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SELECTION OF MODEL TREES OF SCOTS PINE TO OBTAIN DENDROCHRONOLOGICAL INFORMATION

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The paper discusses the rules that must be followed while selecting a planting model trees for the purpose of subsequent removal of dendrochronological samples (drill cores).

Keywords: Scots pine, dendrochronology, model trees, the annual ring width, radial growth

The individual characteristics of the growth of individual trees are caused by a wide range of micro-climatic, phytocenotic, forest pathology, forestry, recreational impacts on local plants and their habitat. In this way, radial

growth of individual trees, for example, that are affected by pests and diseases during their growth, or experienced severe oppression under the canopy of the forest, may significantly differ from the growth of the whole plantations. For example, cutting trees for forest care different, sometimes even opposite reactions of the growth of trees of different classes of Kraft, and the cutting of technological corridors affects only trees directly adjacent to the roads. [1] Obtaining exact dendrochronological series from growing trees is achieved by averaging the parameters of the annual layer of 10 – 30 trees that is a sufficient sample size in different literary data. Naturally, with the increase of the number of trees increases the sampling accuracy, but increase labor costs, therefore, many researchers propose to differentiate the sample size in specified range according to the variation of the width of the annual ring.

In the selection of model planting trees for getting dendrochronological information you should choose well developed plants of the first tier of the upper classes of Kraft (the dominant and co-ruled).

In order to reduce the variation of the width of the annual layer in the sample and to increase the accuracy of dendrochronological information, you have to refuse the selection of the material from the following trees:

- that having signs of chronic diseases on the trunk and branches (cancer sores, growths, hollow, dry tops of trees, dry branches in the middle and upper parts of the crown, etc.);
- with open or overgrown mechanical damage on the trunk, broken branches and top, or traces of such breaks in the past;
- that tilted, deformed in cross section or curved in the area available for sampling;
- which trunks rotten;
- located on the peculiarities of the microrelief (lowlands and hills, slopes, mounds, trenches, etc.) or close to them;
- close to which there are large stumps, deadwood;
- that are located closer than 25 m to the forest edges and large gaps (power lines, major highways, etc.);

That are located closer than 10 m to the forest roads, clearings, fire prevention breaks. Considering the width of the annual ring in cross section, it is recommended to measure the current annual growth on the radius of each tree in two directions, which are oriented on the sides of the world. Samples of wood were selected perpendicular to the longitudinal axis of the tree trunk on the height of 1,0–1,3 m from the ground surface.

Thus, careful observance of all these rules on the selection of model trees of Scots pine will allow to avoid many mistakes in obtaining and using dendrochronological information.

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RADIATION PROTECTION IN RADIATION THERAPY

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The issues of radiation protection of personnel and patients during radiotherapy in oncological institutions are considered. The appearance of new high-tech linear electron accelerators in radiological clinics posed new tasks for the radiation protection of patients and personnel. At the present time pre-radial preparation of patients has been substantially complicated, aimed at selecting conditions for irradiation of tumors with reduced absorbed doses in the surrounding normal tissues and critical organs. It was required a high accuracy of dose adjustment to tumor sites, verification of dose distributions. Complicated quality control procedures for accelerators used to irradiate patients. Correspondingly, the procedures for radiation control of patient exposure were complicated.

Keywords: radiation therapy, medical exposure, radiation protection, personal, patient, dose.

Medical exposure makes the main contribution to the collective dose of all anthropogenic exposure of the population of all countries. It is a complex kind of medical activity in which, along with physicians, medical physicists, engineers and technicians and specialists in the field of radiation safety participate.

Radiation therapy differs from other types of medical exposure with high values of absorbed dose received by the patients, the most complicated technique for preparation and implementation of irradiation, a more developed system of quality assurance and quality control for gamma-therapeutic devices, medical electron accelerators, simulators and tomographs. Very high requirements are imposed on the accuracy of dose dispensing to patients. More

complex in radiotherapy compared with the radiation diagnosis is the radiation protection of personnel and patients. It is a system of protective measures that relate not only and not so much the measured doses received by personnel and patients, but also timely and correct regulatory sanitary and technical documents, guidelines for guaranteeing the quality of the entire technological process of radiotherapy, the timely creation of guidelines for quality control of the equipment used, which is rapidly improving. The training and subsequent professional development of personnel working in radiation therapy is also an important element of the radiation protection system for personnel and patients.

An important aspect of the functioning of this system is the prevention of radiation accidents in radiation therapy, the consequences of which can be very difficult. Complicating the design of new radiotherapy devices and methods of high-tech irradiation of patients led to the increase in the number of radiation accidents. In no small part, this factor has influenced the increased attention to the issues of radiation protection of patients. As a result, more attention was paid not only to the quality control of equipment, but also to the quality of the training material in the postgraduate improvement of physicians, physicists, technologists, engineers.

The basic principles and requirements for radiation protection in radiation therapy are an integral part and with their specificity in the requirements for radiation protection in medical radiation in general. In addition, it is necessary to distinguish between the radiation protection of personnel employed in radiation therapy and the protection of irradiated patients. If the same requirements can be applied to the protection of personnel as in other branches of human activity, then in respect of patients exposed to radiation treatment, radiation protection differs in principle from the protection of patients in diagnostic irradiation

Radiation protection in radiation therapy is based on new International standards and recommendations, as well as national regulatory documents. Among them are the Recommendations of the International Commission on Radiological Protection ICRP No. 103, 2007; No. 105, 2011, which summarizes the latest scientific data on all aspects of radiation protection of personnel and the world population in all types of irradiation. The last recommendations are devoted to radiation protection of patients during medical exposure.

It includes:

1. Justification of medical procedures.
• Justification of a specific radiological procedure (level 2).
• Rationale for the specific patient (level 3).
2. Optimization of protection during medical exposure.
• Diagnostic reference levels.
• Radiotherapy.
3. Effective dose and medical exposure.
4. Irradiation of patients in a state of pregnancy.
5. Prevention of accidents with remote and contact radiotherapy.

In the implementation of radiation protection, the legal aspects of radiotherapy are also important. These aspects also concern the responsibility for the mistakes made by medical personnel, the relationship between the doctor and the patient, and the protection of medical and technical personnel from unreasonable charges.

EVALUATION OF MEASUREMENT UNCERTAINTY IN THE CONTROL OF MICROBIOLOGICAL PURITY OF PURIFIED WATER

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The subject of the study is the evaluation of measurement uncertainty in the control of microbiological purity of purified water.

The purpose of the course work is to study the sources of literature describing methods for estimating the uncertainty of measurements, to make an uncertainty assessment using the example of controlling the microbiological purity of purified water, to determine the range of values within which the true value of the microbiological purity of the water is purified within a certain range.

The paper gives the main terms and concepts related to measurement uncertainty, gives the results of tests to evaluate the repeatability and reproducibility of tests for the microbiological purity of purified water, and also calculations of the extended uncertainty that allowed determining the range of values within which the true value of the microbiological purity of water is purified In a certain range.

Keywords: uncertainty of measurements, entrance sizes, result of measurements, standard uncertainty, expanded un-certainty, analysis of correlations.

Nowadays the development of science and production, international cooperation is a prerequisite for further development, as well as the exchange of experience, methods and data. Before the international society arose the question about the need to compare, compare the methods of conducting tests and measurements. Moreover, today any testing area needs to evaluate the accuracy and accuracy of the measurements.

The concept of "uncertainty" in measurements, as quantified in terms of the measurement accuracy, is relatively new in the history of measurements, in contrast to the terms, error and error analysis, which have long been used in the practice of metrology.

With the adoption of the international standard ISO / IEC 17025: 1999, requiring the competence of testing and calibration laboratories, the requirements for uncertainty assessment in accredited laboratories have become international.

In order to facilitate cooperation between laboratories and agencies on accreditation, mutual recognition of measurement results and harmonization of national requirements and procedures with international ones in the Republic of Belarus, the national standard STB ISO / IEC 17025-2002 was introduced from 01.01.2002, which is an authentic text of the international standard mentioned above.

The purpose of this work is to study the sources of literature describing methods for estimating the uncertainty of measurements, calculating the uncertainty estimate for the example of monitoring the microbiological purity of purified water, determining the range of values within which the true value lies, i.e. the true value of the microbiological purity of the water purified in a certain range.

Next the procedure for estimating uncertainty by the example of the control of microbiological purity of purified water for the production of solid dosage forms No. 3 (production site No. 3) of JSC Borisov Medical Products Plant was performed.

The total standard uncertainty u_c was determined by the experimental standard deviation of the intra-laboratory reproducibility and the repeatability of the final test result. The extended uncertainty U is derived from the total standard uncertainty u_c with a coverage factor of k in the value of 2 to approximately correspond to a confidence level of 95 %. It was found that the expanded uncertainty U is equal 4.7.

GEOREACTOR AND ITS IMPACT ON THE ENVIRONMENT

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Considering the hypothesis of the existence of a nuclear reactor in the bowels of the Earth, the method of search of georeactor, as well as considering the effects of georeactor on the environment

Keyword: georeactor, inversion of the magnetic field, neutrino, geoneutrino, a radioactive element, a nuclear chain reaction, isotopic composition, neutrino detector, liquid and solid core nucleuses.

What prompted the person to think about the existence of a powerful energy source inside the Earth? One of the answers to this question can be associated with the inversion of Earth's magnetic field, with the occurrence of volcanic activity or with a gradual increase in temperature with depth observed at drilling ultradeep wells.

The geophysicist J. Marvin Herndon has hypothesized about the existence of georeactor in the bowels of the Earth, which proves that the accumulation of uranium and thorium, can occur a nuclear chain reaction .

One of the methods for finding a georeactor is the analysis of fission products migrating from the reaction zone and reaching the earth's surface. In particular, this is the isotopic composition of helium. In the air per million atoms of 4He there is only one and a half atoms of 3He. But in the basalts of the mid-ocean ridges, the isotope 3He is more than 8 times larger. In ordinary radioactive decay only 4He is produced. When the reactor is operating, heavy nuclei, absorbing the neutron, become unstable and can be divided into two large fragments with the emission of light charged particles and 2–3 neutrons. This reaction can be written as: $^{235}U + n \rightarrow {}^{131}Xe + {}^{99}Tc + {}^{4}He + 2n$. In reactions of a somewhat different type, tritium is formed: $^{235}U + n \rightarrow {}^{132}Cs + {}^{99}Tc + {}^{3}H + 2n$. Radioactive tritium, in turn, decays, emitting an electron (β decay) and antineutrinos, with the formation of 3He:

$$^{3}H \rightarrow {}^{3}He + e^{-} + \nu e.$$

In 2005, scientists from the Institute of Hydrodynamics of the SB RAS (Novosibirsk) and the Institute of Physics and Power (Obninsk) numerically simulated various models of operation of georeactors. The time of the beginning of the simulated processes is 4 billion years ago. The calculations were different. The probabilities of both the existence of a georeactor to the present time and the cessation of its activity are equal.

Studies on the neutrino detector KamLAND (Japan) led to the detection of antineutrinos from the interior of the Earth – geoneutrinos. Lack of experiments on KamLAND: they cannot determine the distance to the source of particles, but only the direction. The solution of the problem was the project of integration of four neutrino detectors on four continents – in Japan, Canada, Italy and Antarctica. A network of neutrino detectors will allow to establish the exact location of antineutrino sources (georeactors) inside the Earth.

When considering the impact of a georeactor on the environment, it is important to consider three factors: cosmic rays, the Sun and Earth itself. The nucleus of the Earth is divided into a solid internal and external liquid. On the boundary between the liquid and solid nuclei, according to the hypothesis of Professor Rusov, a chain nuclear reaction takes place, which is accompanied by the release of enormous energy. Angular rotation speeds of nuclei and lithosphere are different. This difference affects the climate processes. As the nucleus velocity changes, the lithosphere begins to accelerate the rotation. As a result, friction with the atmosphere occurs, it is accompanied by the release of heat. The power of the georeactor will increase with increasing temperature in the zone of its operation.

At the current level of development of methods for detecting antineutrino allows to talk about georeactor still premature. However, with the improvement of experimental techniques and the creation of more accurate detectors to allow timely warn of imminent planetary danger.

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CHRONIC IRRADIATION OF SCOTTISH PINE TREES (PINUS SYLVESTRIS) IN THE NAROVLYANSKY AND VETKOVSKY PHYTOCENOSES: DOSIMETRY AND RADIOBIOLOGICAL EFFECTS

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The purpose of the research is to identify the effects of chronic internal and external radiation exposure for components of terrestrial ecosystems, a comprehensive study of Scottish pine trees. The experimental plan included over 30 young trees (up to 20 years old) selected from areas with varying levels of radioactive contamination. These pine trees were planted after the 1986 Chernobyl disaster mainly to prevent radionuclide resuspension and soil erosion. For each tree, the major morphological parameters and radioactive contamination values were identified. Cytological analyses were carried on for the selected trees representing all dose rate ranges. Dose rate/effect relationships for morphological changes and cytogenetic defects were identified and correlations for radiation effects occurring on the morphological and cellular level were established.

Keywords: Chernobyl, plant uptake, dosimetry, radiation effects.

In this research, quantitative dose rate/effect correlations were analysed for morphological and cytogenetic changes in Scottish pine trees exposed to chronic irradiation. Dose rates of 0,8 μGy $h^{-1}$and 39 μGy h^{-1} caused disappearance of the apical dominance in 10 % and 50 % of the sampled trees,respectively. This morphological effect and related to suppression of development can affect evolution of specific ecosystems in the experimental region, which probably has to be taken into consideration for the establishment of the predicted, no effect dose rate values and similar values for terrestrial ecosystems. Morphological changes are displayed to originally occur when the trees are 4 –8 years old, with a weak correlation between dynamics of their occurrence and the dose rate. Moreover, a connection was established between cytogenetic changes in cells of the seed germs and the upper meristem and morphological changes in trees. A possible mechanism explaining the influence of radiation induced morphoses was proposed based on the major empirical data obtained Chronic irradiation of Scottish Pine Trees (*Pinus Sylvestris*) in the experimental region during the researches, which support the assumption that the observed morphological changes result in certain genetic changes in cells of the apical meristem of the Scottish pine trees.

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SEWAGE TREATMENT AT LUNINETS COMMUNAL UNITARY ENTERPRISE WATER SUPPLY SEWERAGE "VODOKANAL" WITH THE APPLICATION OF THE BIOLOGICAL TREATMENT METHOD

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Despite the noted shortcomings, biological treatment of municipal wastewater and drains of many industries are widespread. In the Republic of Belarus there are more than 140 biological treatment facilities, including 72 facilities with a capacity of more than 1 million m^3 purified water per year, where 90 % of the total runoff in the Republic is treated.

Keywords: wastewater, biological cleaning, aerotenks, contaminants,activated sludge.

The purification facilities in Luninets were built in 1970 and the technological project provides for mechanical and biological wastewater treatment. The project is made up of:

- mechanical cleaning: a receiving chamber, a sand trap with a circular movement of sewage Ø 4 m – 2 pcs., primary two-level settling tanks Ø 12 m – 8 pcs. (3 of them were set out of operation at the time of reconstruction);
- biological cleaning: highly loaded filters Ø18 m – 4 pcs. (2 of them standby), secondary horizontal sedimentation tanks of two corridors 12 × 27 m – 2 pcs.

Combination of pollutants in the increasing wastewater is determined by characteristic of wastewater municipal, from the population and industrial effluents of enterprises. Biological wastewater treatment is based on the ability of microorganisms to use many organic and non-organic substances contained in wastewater as nutrients. Biological purification can be carried out in natural conditions in bioponds on the filtration and irrigation fields and in artificial treatment plants. In these structures, aerobic conditions can be created, with the use of technical oxygen, anaerobic conditions, or the process takes place in several stages with alternation of aerobic, anaerobic and anoxic conditions, when oxygen is contained only in a bound state. Microorganisms in such structures are either free or immobilized. Biological cleaning has the following advantages, due to peculiarities vital activity of microorganisms:

- a wide range of organic and inorganic compounds, including toxic ones;
- the formation of simple final products (carbon dioxide, nitrates, sulfates – under aerobic conditions and methane, ammonia, hydrogen sulfide – under anaerobic conditions). In both cases, biomass of microorganisms accumulates;
- no secondary water pollution.

Great problems in the operation of aerobic treatment facilities are caused by a high increase in the biomass of activated sludge. The costs for dehydration and disposal of excess activated sludge account for up to 40 % of the total cost of water treatment.

Average daily wastewater passes through water disposal facilities of the city and district is 17700 m^3 per day. The production capacity of treatment facilities is 5,5 thousand m^3 per day.

Table

Wastewater Characteristics at the entrance and exit after of sewage treatment plants in the city of Luninets

Pollution index	Concentration of pollutants in wastewater entering treatment, mg/dm^3		Concentration of pollutants in waste water discharged after treatment facilities, mg/dm^3		Efficiency purification, %	
	medium	maximum	medium	maximum	actual	project*
COD	280,0	780,4	89,58	135,0	68	**
BOD5	148,3	546,4	22,1	33,6	85	90
suspended solids	181,0	321,0	30,2	38,2	83	90
Ammonium ion, mgN/dm^3	37,3	63,9	17,6	24,7	53	
Oil and oil products	1,07	1,71	0,29	0,47	73	–
Synthetic surfactants (anionic)	1,18	1,98	0,42	0,76	64	–
total iron	2,44	4,57	0,88	1,52	64	–
Zinc	0,026	0,066	0,013	0,025	50	–

Despite the noted shortcomings, biological treatment of municipal wastewater and drains of many industries are widespread. In the Republic of Belarus there are more than 140 biological treatment facilities, including 72 facilities with a capacity of more than 1 million m3 purified water per year, where 90 % of the total runoff in the Republic is treated.

ONE-DIMENSIONAL MODEL OF NON-ISOTHERMAL MOISTURE TRANSFER IN ENCLOSING CONSTRUCTION

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In modern construction multilayered enclosing structures with effective heat-insulating materials are applied. Such constructions increase the requirements for the quality of their design because the heterogeneity of used materials exacerbates possible design errors and leads to decrease in heat-shielding properties and durability of structures. It is associated with a sharp change in their moisture regime. Therefore, it determines the requirements of improving reliability in forecasting of moisture regime and the level of thermal protection of enclosing structures. In the work, one-dimensional model of non-isothermal moisture transfer is created for the enclosing construction.

Keywords: non-isothermal moisture transfer, enclosing construction, software package «SPS», equation of moisture transfer, adapted equation.

Moisture content in building structures has a significant effect on both the thermal insulation and the operational properties of building structures. Moisture causes or accelerates the following processes: electrochemical corrosion of metal products and details, chemical damage of materials, destruction of concrete, stone and brickwork during freezing and thawing, change the color of architectural details of buildings, change in the volume of construction materials (swelling, buckling, shrinkage). It can lead to deterioration in appearance, the appearance of cracks and deformation of structures, biological damage. Increasing the moisture content also leads to a decrease of thermal resistance of enclosing structures.

Nowadays biological damage caused by moisture is given special importance because these phenomena can affect the health of people, condition of structures and appearance of buildings. Therefore, at present much attention is paid to modeling of moisture transfer in enclosing structures.

To analyze the processes of moisture transfer in building structures a software package «SPS» (Simulation Processes in Soil) was adapted [1].

The equation of non-isothermal moisture transfer which is built in the software package «SPS» was obtained using thermodynamic laws, moisture sorption isotherms, and two-phase filtration equations. Unlike the two-phase filtration equations in the modified equation for determining the dependence of the fluid pressure on the moisture content and temperature, there is no need to experimentally determine the Leverett function. In the proposed model, the equation of non-isothermal moisture transfer is obtained in the form, in which the intensity of mass transfer does not include explicitly. First, the intensity of mass exchange can not be determined experimentally. Secondly, it is a highly nonlinear function of moisture content and temperature, which has an order comparable to the values of flows. It often leads to the divergence of difference scheme in numerical solution.

In deriving the equation of non-isothermal moisture transfer that motion of fluid and water vapor occurs in the field of gravity. In enclosing structures it can be neglected.

In the work, one-dimensional model of non-isothermal moisture transfer for the enclosing construction of building is created.

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ANALYSIS OF TECHNOLOGICAL CONSUMPTION OF WATER IN THE MUNICIPAL WATER SUPPLY AND USE WASTE WATER TREATMENT BY THE EXAMPLE OF CITY GRODNO

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Currently RUE "CRICUWR"(Central Research Institute for Complex Use of Water Resources) is a specialized state scientific-research organization in the sphere of integrated water resources management of the Ministry of natural resources and environmental protection of the Republic of Belarus. It was established in accordance to the resolution of the Council of Ministers of the USSR on April 22nd, 1960, № 425 "On measures on streamlining of use and increased protection of water resources of the USSR" and the decree of the Presidium of the Academy of Sciences of BSSR on February 14, 1961, No. 10.

A comprehensive assessment of the impact of housing and communal services has been conducted on the model of Grodno on the environment, regulation of water use (rationing of water use and sanitation, the development of scientifically based suggestions for the regulation of wastewater discharges), calculation of norms of process water in the municipal water supply, the calculations of the rate of losses and unaccounted for water from the municipal water supply, environmental and feasibility study comprehensive solution to the problem of surface runoff (rain and meltwater) with a built-up area of the settlement. Were considered the main legal acts and technical normative legal acts in the sphere of use and protection of waters, studied and systematized data in 2012–2013 and the prediction of water flow in the municipal water supply in 2014 on the model of the regional enterprise the necessary calculations have been made.

Keywords: environmental protection, water protection, integrated impact assessment.

Work in RUE "*CRICUWR*" was held at the Department of regulation impacts on the environment and was carried out in two main areas:

- gathering information about the legislation and methodological approaches to calculating technological losses of water in the municipal water supply;
- analysis of the use of waste water treatment in the Republic of Belarus.

Our main purpose was to calculate the norms of process water consumption based on data from 2012 to 2013 and prediction for 2014. The Main document on the basis of which the calculations were made is the decree of the Ministry of housing and communal services of the Republic of Belarus we from December 29, 2004 № 39 "On approval of the instruction on assessment and calculation of the standard technological losses of water in the municipal water supply of settlements of the Republic of Belarus".

This instruction establishes the structure, definition and assessment of technological water consumption for operators of municipal (city, town) drinking water supply systems of settlements of the Republic of Belarus, reglementary of the collection and processing of initial information in tabular form for assessment of technological water

consumption, contains a mechanism for such assessment and valuation on the basis of implementation of necessary measures to achieve quality standards of drinking water as well as recommendations for systematic gathering of information on the process of water consumption and frequency of review of the established standards. The results of the evaluation and regulation of technological expenditure of water are used to calculate the limits of water intake from water sources, issuing permits for special water use, development of measures on rational use and reduction of water losses.

The result of the calculations of the standard process of water flow in the municipal water supply of the city of Grodno in 2014 showed that the total amount of the technological costs amounted to approximately 2089 thousand m^3, the volume of submitted network of water is equal to 29725 thousand m^3, and the standard of technological losses of water in the system is about 7 % of the volume served in network water.

TECHNO-ECONOMIC ANALYSIS OF WASTE MANAGEMENT AT THE ENTERPRISES OF THE REPUBLIC OF BELARUS

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In this work the analysis of the data of the state waste cadastre, which is maintained according to the state statistical reporting 1-waste (Minprirody). The analysis allowed us to systematize the data, including quantitative and qualitative characteristics of wastes, the formation and movement of waste, including the use, treatment, storage, and disposal, to identify the dynamics of volumes of production waste, and develop activities aimed at the prevention or reduction of waste generation volumes.

Keywords: state waste cadastre, state statistical reporting form 1-waste (Minprirody), waste production.

Form 1-waste allows you to enter accounting of formation and movement of wastes at the enterprises carrying out activities associated with the circulation of waste in the Republic of Belarus. [1; 2]

According to the 2015 in the Republic of Belarus was formed about of 49,9 million tonnes of waste. Of the total amount are the most significant large-capacity waste: halite wastes and halite slimes clay-salt – approximately 33,7 million tons of phosphogypsum and – 660,1 thousand tons.

However, due to the increase in production of potash fertilizers the amount of halite wastes and halite slimes clay-salt increased compared with the previous year by 0,81 million tonnes (the waste in 2015 accounted for 68 % of the total mass of generated waste in Belarus). The level of use halite waste remains low and in 2015 amounted to only 2 %; halite slimes clay-salt were not used. In the dumps were taken about 29,85 million tons of halite wastes generated and their accumulation was 932,72 million tons, halite slimes, and the accumulation of halite slimes clay-salt – approximately 110,5 million t

Given the large-capacity waste in 2015 used 12164 tonnes of waste and use of waste products amounted to 24,4 %. Excluding large waste volume usage made in 2015 11452,12 kt, and the level of use of production waste was 74 %.Found that 54,5 % of the total quantity of waste used is used for needs of the enterprises themselves, and a 45,5 % transferred to other enterprises, implemented or exported for further use.

The volume of accumulated waste in storage facilities (in the departmental storage locations and facilities) increased for 2015. 3,4 % and amounted at the end of the year about 1094,2 million tons of the total volume formed in 2015, the number of buried waste amounted to 1278 thousand [3; 4]

Currently, the solution of problems of utilization and recycling is not only environmental, but also technological challenge. The properties of most waste do not allow with sufficient efficiency to return them in the sphere of production or safe disposal. In this regard, required the application of different methods of waste disposal. In 2015, Belarus neutralized 210тыс.t waste production. The most used method is thermal decontamination (this method neutralized with 64,6 % of the total volume of neutralized waste 135,7 thousand tons).

It is established that in 2015 enterprises of the Republic of Belarus 805 made efforts to reduce the amounts of education and (or) accumulation of waste products, including:

- 153 measures to improve technological processes leading to a reduction of waste production;
- 146 – on creation of storage facilities, temporary storage of waste;
- 12 – for the construction, reconstruction, modernization of facilities for the use of waste;
- 6 – for the construction, reconstruction, modernization of facilities for the disposal of waste;
- 10 – for the construction, reconstruction, modernization of facilities for the disposal of waste;

- 283 – purchasing and manufacturing of containers for collection of waste and VMR;
- 195 – other.

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THE TRACHEID FEATURES OF PINE TREES FROM DIFFERENT GROWING

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In the article the features of the anatomical structure of the tree layers of Scots pine wood from dif-ferent growing conditions are considered, the significance of the investigated cellular parameters is estimated.

Keywords: annual layers, Scots pine, wood anatomy; tracheid dimensions; early wood; late wood.

Although layers width is widely used in research on dendrochronology, the range of parameters characterizing annual layers and their use as environmental indicators has notably increased in the last decades (for example, content of macro and microelements, stable isotope ratio, anatomical features) [1].

Differences in tracheid dimensions reflect the changes occurring in the environment.

The objects of the research were pine plantations in different part of the Berezinsky biosphere reserve. The trees used as samples are relatively old trees, 95–150 years old, 16–27 meters high. Wood samples were taken in six plots. Forest types are Pinetum pieridiosum (sampling area № 1), polytrichosum (sampling area № 2), Pinetum sphagnosum (sampling area № 3).

The anatomical parameters of the annual layers of earlywood (EW) and late latewood (LW) tracheids were studied in the direction from the bark to the core using a scanning electron microscope of high resolution "MIRA3" from the firm "Tescan" at an increase of x100, x200, x500, x1000.

For this purpose, the number of tracheids in the last 80-year layers of each wood sample was counted, the cavity size and wall thickness were measured separately for EW and LW, and the diameter of the vertical resin courses. Statistical software (Statistica 10) was used for estimating descriptive statistics.

From the work, it is shown that an increase in the number of early tracheids is observed for trees on sampling area №2 (50,2±2,96), late – sampling area №3 (42,4±3,11). The measurements showed that all the pine trees are characterized by wider early tracheids with thin walls and wide cavities and narrower late tracheids with thick walls and narrow cavities. At the same time, it should be noted that the tracheid size in the radial direction is less than in the tangential direction.

Comparative anatomical study of tracheids of annual layers on sampling area revealed significant differences. Thus, the largest radial and tangential dimensions of the tracheid cavities of both EW and LW are characteristic for pine trees from sampling area №1 (107,6±6,21; 29,9±5,99), and tracheids with narrower cavities are characteristic for Pinetum sphagnosum (107,4±5,34;21,5±3,44). The thickness of the walls of the late tracheids varies from 5,2 to 6,9 microns, maximum on the sampling area № 3 . The thickness of tangent walls of early tracheids varies from 1,8 to 2,6 μm, maximum on sampling area № 2. Both the radial and tangential diameters of the vertical resin pitch are relatively stable and vary slightly depending on the degree of moisture. For the specified reason, in the future it is possible to refuse measurements of this parameter.

As a result of the study, depending on soil moisture some features of the anatomical structure of the annual layers of Scots pine have been revealed. All the above differences in the anatomical structure of the annual layers can serve as an illustrative example of the effect of environmental factors on the stand and are important distinctive

features for homogeneous growth conditions. They are probably adaptive in nature and are largely determined by the local growth conditions in which they develop.

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CHARACTERISTIC OF THE WATER DEIRONING STATION RUE VALOSIN HOUSING AND UTILITIES INFRASTRUCTURE

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This work describes a method for purification of groundwater with a high content of dissolved iron and manganese compounds RUE Valosin housing and utilities infrastructure.

Keywords: geochemical province, the deironing station, groundwater, water supply, purification system.

The use of fresh groundwater for drinking water supply is often complicated by a high content of dissolved iron and manganese compounds. As a result of natural geochemical processes changing the chemical composition of the groundwater over a long geological period on the territory of Belarus, Russia and other countries have formed a regional geochemical province with high content of iron, manganese and other elements. The use of such underground waters for household-drinking and industrial needs is possible only after cleaning. Concentrations of iron in groundwater range from 1–2 to 30 mg/l (MAC 0,3 mg/l) and manganese up to 1–4 mg/l (MAC 0,1 mg/l).

Excessive content of iron and manganese in water gives it a brownish color, an unpleasant metallic taste, causes clogging of water mains and hydrant valves due to the development of ferrous and manganese bacteria that cause defective products to enterprises.

The iron removal station applies the method of simplified aeration and filtration. When using this method of iron removal, water enriched with oxygen as a result of aeration, heads straight to the filter, and the oxidation reaction of bivalent iron takes place directly in the thickness of the filter material. The iron concentration in the water entering the station of deferrization reaches 1,4 mg/dm^3.

In the process of aeration is achieved by the reaction processes of oxidation and hydrolysis. The oxidation of 1 mg of iron stands out 1.6 mg of free carbon dioxide and 0,043 mg-EQ reduces the overall alkalinity of the water.

The method of simplified aeration is based on the oxidation of ions of bivalent iron and the detention compounds formed in the thickness of the filter. In this case, the grains of the filtering layer take place simultaneously oxidation and hydrolysis.

Between the formed hydroxides and grains of the filtering layer there is a very strong and constant communication, which increases the stability of the filtration process and increases its independence from the hydrodynamic conditions. Filtering via download for a certain time leads to the formation on the surface of the grains download film iron compounds, playing the role of a catalyst. The formation of such a film occurs gradually, as her education as a filter is improved.

The deironing of water in the boot, covered with film, is a heterogeneous autocatalytic process, which provides continuous update of the film during operation of the filter. A necessary condition for the formation and action of the film is the presence of oxygen in the water.

The efficiency of the filters is mainly determined by the quality of the regeneration of filter loading.

In the iron removal system at the company comprises the following main blocks:

1. Water metering metering source water
2. Compressor station
3. The valve of flow of raw water
4. Bactericidal installation
5. Water metering metering water wash

Modular water treatment system is designed for drinking water purification from compounds of iron, manganese, removing color, turbidity, degassing gases CO_2, H_2S.

In the course of cleaning are achieved sanitary-hygienic requirements of water quality for consumers (iron concentration < 0,1 mg/dm^3).

MONITORING OF FLOODPLAIN VEGETATION ON THE R. WESTERN DVINA

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The paper describes the importance of flood meadows, their species composition and productivity in selected areas near the Western Dvina River in Polotsk in 2017.

Keywords: floodplain meadows, floodplain phytocenosis, net productivity.

Floodplain meadows are an important source of cheap and biologically complete feed. Usually it located in the river valleys and along the coasts of lakes. A distinctive feature of this type of meadow is that in the spring period they are flooded with flood waters, after the recession of which there is silt enriching the soil with nutrients that create favorable conditions for the growth of meadow vegetation, often possessing medicinal properties or including species listed in the Red Book.

The aim of the work is studying the species composition and productivity of microgroups of plant communities as elements of the horizontal structure of the flood plain of the Polotsk District.

To carry out the research in 2017 at two selected sites the species composition was monitored, the productivity of floodplain phytocenosis was analyzed, and the net production of photosynthesis was calculated.

As a result of the study it became known that 34 species of higher vascular plants were registered in the two studied areas, which belong to 13 families. The most numerous in number of species were the families Cereals (Poaceae) – 20,5 %.

It was established that, in relation to soil trophicity, the dominant group was mesotrophic plants throughout the study period (56,4 %). With respect to the soil moisture in the phytocenosis, mesophytes predominated (54 %). Proceeding from the definitions of eutrophic and mesotrophic, it can be concluded that the soil of the studied area is quite fertile.

An analysis of the economic-botanical composition of the floodplain phytocenosis showed that forage value was dominated by plants with a medium and low fodder value (33 %).

The maximum productivity of phytocenoses at the first and second test sites of 2017 was registered in July (2,9 and 2,4 kg / m^2, respectively).

Net productivity of photosynthesis in the growing season of cereals in 2017 was maximal in May-June and amounted to 2,01 grams per day / m2 (on the first test site) and 2,21 g / day / m2 (at the second site).

THE METHODS OF LABORATORY DIAGNOSTICS AND EPIZOOTIC SITUATION ON TRICHINOSIS IN THE CITY OF GOMEL

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Material about the value of a trichinosis, the methods of laboratory diagnostics and its distribution in the territory of the city of Gomel is presented.

Keywords: Trichinosis, laboratory diagnostic, compressor trichinoscopy, biochemical study, Express- test.

Trichinosis is a biogelmintosis caused by Trichinellaspiralis from the family Trichinellidae. Despite the fact that trichinosis has been known since 1860, and the causative agent of Trichinellaspiralis was discovered more than 160 years ago, this helminthiasis is still an actual problem; therefore, the main method of the research is laboratory diagnostics, which includes three main methods: compressor trichinoscopy , biochemical, and serological studies. A special method is the an express test..

We conducted the research on the territory of the "Gomel Municipal Veterinary Station", where two main methods of diagnosing trichinosis were used: compressor trichinelloscopy and biochemical research.

The results of using the serological method for diagnosing trichinosis have made it possible to conclude that this method is the main one, as the most effective, especially in the case of mass study of the material. So, the initial stage for any diagnosis of trichinosis is the collection and transfer of material for the study, so there is no difference at the initial stage , as for the rest all methods have differences, as well as their positive and negative sides.

The results of using the serological method of diagnostics of trichinosis made it possible to draw a conclusion about the isolation of this method as the basic as most effective, especially with mass materials research.

Compressor trichinoscopy is the simplest well-known microscopic examination. The reliability of trichinelloscopy largely depends on both the choice of muscle groups for sample preparation and the correctness of the production of point cuts. In spite of the relatively low diagnostic effectiveness of compressor trichinoscopy, it remains one of the leading methods of trichinoscopy control. Moreover, this method is convenient for the individual study of corpse or small batches of meat raw materials or meat products.

A biochemical study is the method of the group for study of pork. Method is recommended to use also with the inspection control of the meat products, prepared from the pork: sausages, meat semifinished products, hams, since in these cases trichinoscopy by compressor method isn't so effective. This method uses as rechecking of compressor trichinoscopy, since with the weak invasion by trichinae of pig flourish can give sometimes negative results.

Biochemical research is a method of group research of pork for trichinosis. The method is recommended for use in the inspection control of meat products made from pork: a sausage, meat semi-finished products, hams, as in these cases trichinoscopy by the compressor method is ineffective. That is, this method is used as a check of compressor trichinoscopy, since with a weak trichinella invasion of pigs, carcases can sometimes give negative results.

Express test is the most commonly used method, which has spread in the private sector and during hunting for wild animals. It is worrying that almost all those who participate in the distribution of these kits emphasize that these kits are sensitive enough and reveal the presence of trichinella from the 12th day after infection In addition, as an argument, distributors use the fact that this method allows you to abandon expensive equipment, reagents and does not require special skills. However, they forget that specially trained veterinarians, in the process of carrying out studies on trichinosis, constantly pay attention to other factors, namely, epizootic well-being of the terrain, the degree of animal damage, morphological changes, and much more. And, nevertheless, the anonymity of using test strips is fundamental.

This fact can be formulated as a study of trichinosis corpses during poaching of animals. In the analysis of the results of corpses research for three years from 2013–2015 at the veterinary station of the city of Gomel the following regularity was observed: the peaks of delivery of corpses of domestic pigs and the carrying out of studies depended on the slaughter season animals and this is usually an autumn-winter period.

Reducing the number of studies conducted on trichinosis in 2013 is associated with measures to reduce the number of wild boars throughout Belarus.

In spite of the reduction in the number of block in the hunting land both the Gomel region, and as a whole in Belarus the cases of the appearance of trichinosis among the people are recorded.

THE DESTRUCTION OF THE OZONE LAYER AND THE PROBLEMS OF ECOLOGY

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Ozone absorbs part of the ultraviolet radiation from the sun. The concentration of ozone in the atmosphere is very small, and small changes in the amount of ozone lead to sudden changes in the intensity of ultraviolet reaching the earth's surface.

Keywords: ozone hole, Freon and halocarbon, photochemical processes, catalytic cycle, polar vortex, solar radiation, ultraviolet, stratosphere, turbulence.

The Earth's atmosphere is known to contain 21 % oxygen in the form of one-and diatomic molecules O2 and trihydric O3, called ozone. This an allotropic modification of oxygen was discovered in the middle of the last century, and scientists had long drawn the attention to its unique chemical and physical properties. Interest in gaseous ozone has increased significantly, following the determination of its prevalence in the Earth's atmosphere and

the special role it plays in protecting all living organisms from the effects of the dangerous ultraviolet (UV) radiation from the sun. In the same way, its wide absorption range also includes the lethal radiation of 240–280 nanometers for all life on Earth. Atmospheric ozone has been particularly active in recent decades.

For the first time, a rupture in the ozone layer of the Earth's atmosphere (more than 1000 km) emerged in the 1980s over Antarctica, where a slow but steady decline in stratospheric ozone from year to year is occurring. In this context, this phenomenon has been called the "ozone hole".

The main mechanism for ozone depletion that results in ozone holes is expected to be a catalytic cycle involving nitrogen oxides.

There are two main types of nitrogen oxide sources in the stratosphere: natural and man-made. The first is caused by bacteria (in nature, nitrogen oxides are formed in the form of N2O oxide during the bacteria living), and the second source, various kinds of man-made gases, as well as gases generated by nuclear explosions.

Ozone are also represented by Freon and halocarbon (saturated fluorocarbons or polytherapeutic, often containing chlorine or bromine atoms). These substances are not formed naturally, not toxic, not volatile, and, in small doses, even harmless for humans. But at the expense of turbulence in the atmosphere, they end up in the stratosphere, where the ultraviolet sun is disrupted by the formation of chlorine, which can interact with ozone to obtain chlorine monoxide and, in turn, with an atomic Oxygen, resulting in atomic chlorine and diatomic oxygen. As a result, atomic chlorine is regenerated and acts as a catalyst for the basic reaction of ozone depletion. In this case, one chlorine atom can participate up to 105 times in reaction of the dissimilation of the ozone molecule. This catalytic cycle is expected to include not two as previously thought, but about 40 reactions involving CL, SLO, HCL, NOSL, Hclno2, and many other chlorine compounds.

In Antarctica, this process takes place in special conditions, the isolated polar vortex, where there is no air mass exchange during the entire polar winter and spring. When sunlight is appearing in the stratosphere, photochemical processes of impurities are beginning to occur and, as a result, ozone molecules are being destroyed in response to the reactions discussed above. By the middle of spring, the polar vortex is crumbling and the hole begins to "tighten".

The thing is that the weakening of the ozone layer increases the flow of solar radiation to the earth and causes the risks of cancer, as well as the loss of plants and animals.

While mankind has taken measures to limit the emission of chlorine and bromine-containing CFCs by switching to other substances, such as fluorinated Freon (Vienna Convention on the Protection of the Ozone Layer, adopted on 22 March 1985), the process of recovery of the ozone layer will take several decades. But science never knows what processes are exactly destroying the ozone layer, so where the ozone hole will lead to, the further research will show it.

Science has not yet fully established what the main processes that violating the ozone layer are. Searching for an accurate response to a given nature the issue gave rise to a wide range of views on the mechanism for the creation of the ozone hole and its impact on our planet, from full complacency to the prediction of the ozone catastrophe. What is true between these extreme points of view: the truth or a new issue – will be shown by further research.

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LACCASE INDUCED WATER PURIFICATION TO REMOVE 3,3’- DIMETHYLBENZIDINE (O-TOLUIDINE)

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The object of the study was enzyme laccase from the mycelium Pleurotus ostreatus. At the first stage of the study, the optimal conditions for the oxidation of 3,3'-dimethylbenzidine by the enzyme laccase were determined. At the second stage, the removal of the products of the enzymatic reaction from water was carried out.

Keywords: benzidine, carcinogenic, toxic, laccases, enzymes destruction.

Benzidine is an artificially produced chemical compound that was broadly used in industry and agriculture. It is known as a dangerous chemical for human health mostly because of causing cancer. In the environment benzidine could be transformed into several other chemical compounds such as 3,3'- dimethylbenzidine (o-toluidine) that is highly carcinogenic and toxic [1]. However the products of 3,3'- dimethylbenzidine degradation could be more toxic than the original substance that demands their urgent inactivation.

Despite the fact that benzidine and 3,3'- dimethylbenzidine are not highly water soluble there is a necessity of water purification in case of contamination. Enzymatic method is one of the most effective for this purpose and laccases (E.C.1.10.3.2, p-benzenediol:oxygen oxidoreductase) could be an appropriate enzymes for 3,3'- dimethylbenzidine destruction [2].

We investigated the effectiveness of intracellular laccase isolated from mycelium of *Plerotus ostreatus* [3] for the purpose of 3,3'- dimethylbenzidine degradation in water. During the first stage of the study the optimal conditions for 3,3'- dimethylbenzidine oxidation such as pH within the range 4.5–5.0; temperature 50–60^0 C and concentration of compound 1-1.5 mM were determined.

During the second stage elimination of the enzymatic reaction products was done using an absorption chromatography which allowed the level of specified water purification within the range of 97–99 %.

Our results demonstrate a good ability of proposed method for benzidine compounds removal from water.

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PROTECTION OF PEOPLE LIVING IN LONG-TERM CONTAMINATED AREAS AFTER A NUCLEAR ACCIDENT OR A RADIATION EMERGENCY

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The International Commission on Radiological Protection (ICRP) is the main agency for protection from radiation ionization. The commission considers the impact of ionizing radiation on the people living in long-term contaminated areas, as well as practical aspects of the protection strategy both the authorities and the affected communities.

*Keywords:*Post-accident; Rehabilitation; Optimisation; Reference level; Effective residual dose; Radiation emergency; Contaminated sites; Contaminated foodstuffs.

The International Commission on Radiological Protection (ICRP) Publication 111 "Application of the Commission's Recommendations to the Protection of People Living in Long-term Contaminated Areas after a Nuclear Accident or a Radiation Emergency"provides guidance for the protection of people that living in long-term contaminated areas after a nuclear accident or radiation emergency. Also this Publication considers the effects of such events on the affected population, for example the pathways of human exposure, the types of exposed populations, and the characteristics of exposures. Although the focus is on radiation protection considerations, the report also recognizes the complexity of post-accident situations, which cannot be managed without addressing all the affected domains of daily life, i.e. environmental, health, economic, social, psychological, cultural, ethical, political, etc. The report explains how the 2007 Recommendations apply to this type of existing exposure situation, including consideration of the justification and optimisation of protection strategies, and the introduction and application of a reference level to drive the optimisation process [1].

At its meeting in Paris in March 2005, the Main Commission of the ICRP approved the formation of a new Task Group, reporting to Committee 4, to develop guidance on the implementation of its new Recommendations (ICRP, 2007) for the protection of people living in long-term contaminated areas after a nuclear accident or a radiation emergency. The terms of reference of the Task Group were to provide guidance on:

- setting reference levels for planning long-term protection strategies;
- implementing optimised protective actions;
- involving stakeholders in radiological protection;
- developing radiation monitoring and health surveillance; and
- managing contaminated commodities.

In developing its guidance, the Task Group was encouraged to co-ordinate with the concurrently approved Task Group in charge of elaborating recommendations on the application of the Commission's Recommendations for the protection of people in emergency exposure situations [1]. The report takes into account past experience of the protection of populations living in contaminated areas, particularly in the Commonwealth of Independent States countries affected by the Chernobyl accident, and to a lesser extent to other past accidents and events that resulted in the contamination of large areas. It takes also into account recent methodological and practical developments at international and national levels: the International Nuclear Exercises (INEX) programme of the Committee of Radiation Protection and Public Health of the Nuclear Energy Agency/Organisation for Economic Co-operation and Development (Network Energy Accumulator (NEA)/Organisation for Economic Co-operation and Development (OECD)), the European approach to nuclear and radiological emergency management and rehabilitation strategies (EURANOS) Project of the European Commission, the French Committee for the Management of the Accident Phase(CODIRPA) exercise, the Instituto Ethos De Empresas e Responsabilidade Social(ETHOS) Project, and the CORE Programme on post-Chernobyl rehabilitation in Belarus [1].

The guidance offered by the Task Group is generic, providing a basic framework that can be tailored for specific circumstances. The detailed implementation of the Commission's Recommendations is a matter for the relevant national authorities [1].

The resolution of this publication requires study and development of recommendations for its implementation in the program to post- remedial action the consequences of the Chernobyl disaster in Belarus, first of all the recognition of the current situation of existing exposure and the use of recommendations for assessment of performance of attempted countermeasures.

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HELMINTHS OF HOOFED INHABITANTS OF MINSK ZOO

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The article is devoted to the infection of the hoofed of Minsk zoo helminths and the preventive maintenance of helminthiases is.

Keywords: helminth, parasitofauna, parasite cenosis, infection, invasion.

A whole series of special features has conditions of inhabiting for the hoofed organisms in the zoos. One of them is the congestion of animals, which creates conditions for the formation of parasite cenosis of hoofed animals. Under the conditions of limiting the will of animals and their denser, and more prolonged accumulation in the specific territory infection and reinfection of animals by helminths is more intensive and is more dynamic.

The subject of a study is hoofed and their parasites in Minsk zoo. 19 species have been examined on the presence of parasites, the representatives of solid-hoofed and cloven-hoofed orders. It is established that parasitofauna of hoofed inhabitants of Minsk zoo is helminths, that belong to 5 the kinds: Trichocephalus, Capilaria, Fasciola, Strongylata and Nematodirus. Species composition of parasite cenosis of hoofed includes from 1 to 3 forms. Richest parasitofauna is revealed for the form the deer of David (*Elaphurusdavidianus*). In the deer of David there are 3 kinds of the helminths (Fasciola, Strongylata, Nematodirus). But in others hoofed there is one form: collared peccary (*Tayassutajacu*) – Capilaria; the vietnamese pig (*S. bucculentus*), european roe is (*Capreoluscapreolus*), aurochs (*Bison bonasus*), cameroon goat (*Copragircus*), cameroon sheep (*Ovisammonaries*), the domestic horse (*Equuscaballus*), of the pony (*Equuscaballus*) – Strongylata.

The indices of infection vary from 0,33 and to 93,8. The smallest extensiveness of invasion is noted for the form the deer of David and comprised 0,33 to one individual. The greatest extensiveness of invasion is noted for the form of markhoor and comprised 93,8 to one individual.

The preventive maintenance of helminthiases requires systematic character. To secure animals is possible and it is necessary by regular preventive measures for by worming. It is important to use preparations with the wide spectrum of action.

THE ORIGIN OF THE ADVENTIVE FLORA OF PRYPIACKAJE PALIESSIE

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Presents materials related to the origins of adventive flora of Prypiackaje Paliesse, which is presented 1986 plant species. Is considered the primary habitats of alien species, their time and method of introduction and degree of naturalization, in natural ecosystems the southern part of Belarus.

Keywords: Belarus, alien flora, adventitious species, primary habitat, naturalization of plants

At the present time are becoming increasingly relevant issues for the study species of adventive origin, which is directly related to the problem of the loss of native floors of their natural identity. According to the latest estimates on the territory of Prypiackaje Paliesse (physico-geographical district in the southern part of Belarus) well established growing 1986 species of vascular plants belonging to 807 genera and 163 families. This list includes all the wild, runs wild and cultivated plant species. Native component of the flora is represented 866 views (372 genera and 116 families), and are the origin of adventive species 1120 (575 genera and 120 families). Consequently, the proportion of adventive component (including cultivated species) currently represents more than 56 %.

Considering the origin of alien species it should be noted that the most numerous (383 taxon or 34,2 %) is the group whose home are different regions of Europe: *Asplenium scolopendrium*, *Satureja hortensis*, *Tilia tomentosa* etc. Almost 20 % of adventive species were recorded from North America: *Amaranthus blitum*, *Amorpha fruticosa*, *Melothria scabra* etc. Asia is the home of 207 taxa (18,5 %): *Salix integra*, *Cannabis sativa*, *Persicaria orientalis* etc. Home to 108 species (*Lavandula angustifolia*, *Iberis sempervirens*, *Nepeta cataria* etc.) is the Mediterranean, and from the nearby Mediterranean-Iran-Turanian region were recorded only 41 species: *Bryonia alba*, *Papaver rhoeas* etc. From South America to the territory of the Prypiackaje Paliesse included 35 (3,1 %), mainly cultivated species: *Phaseolus coccineus*, *Salpiglossis sinuata* etc. The Caucasus is home to 25 species (*Melilotus albus*, *Medicago denticulata* etc.), and the Iran-Turanian region – 23: *Portulaca oleracea*, *Salix fragilis* etc. All African (*Linum grandiflorum*, *Delosperma cooperi* etc.) and Australian (*Craspedia globosa*, *Rhodanthe manglesii* etc.) taxa are cultivated ornamental plants. They represented 21 and 8 species, respectively. It should be noted that 50 species (4,5 %) are of anthropogenic origin (hybrid or cultigenic): *Cerasus vulgaris*, *Gladiolus × hybridus*, *×Triticosecale rimpaui* etc.

In the knowledge of the Genesis of the adventive flora is important to ascertain the time of introduction into the territory of Paliesse alien species. The vast majority (902 species or 80,5 %) were neophytes – species of the XVI century (*Buxus sempervirens*, *Phytolacca acinosa*, *Populus balsamifera*, *Echinacea purpurea* etc.). Group archaeophytes (old immigrants) smaller (a total of 218 species or 19,5 %) and represented by the taxa listed until the end of the XV century: *Allium cepa*, *Ballota nigra*, *Camelina sativa* etc. Adventive species also have different method of introduction into the territory. Among them, 352 taxon (31,4 %) form a group ksenophyte, inadvertently recorded by a man (*Avena strigosa*, *Centaurea cyanus*, *Viola arvensis* etc.). More numerous (768 species or 68,6 %) is the group of ergasiaphyte – intentionally listed the man as a potential economically valuable plants: *Celosia cristata*, *Hyssopus officinalis*, *Senecio cineraria* etc. The degree of naturalization of alien species in natural ecosystems different. Ephemerophytes (Casual alien plants) not have the ability to naturalization and held in the composition of the flora temporarily. These include 288 species (25,7 %): *Gomphrena globosa*, *Gilia capitata*, *Nicotiana × sanderae* etc. Kolonophytes Group (Naturalized plants) consists of 438 species (39,1 %) are able to resist in the composition of the flora in their places of introduction (*Crocus speciosus*, *Hesperis pycnotricha*, *Nicandra physalodes* etc.) without showing a tendency to further spread. To apply epecophytes (Invasive plants) 299 species (or 26,7 %) were able to be naturalized in semi-natural phytocenoses: *Alyssum calycinum*, *Papaver dubium*, *Gypsophila paniculata* etc. The highest degree of naturalization are apriophytes (Transformers) included in the composition of natural plant communities: *Euphorbia cyparissias*, *Coronilla varia*, *Vinca minor* etc. In total, the composition of the flora of such species 95 (8,5 %), however, they have the greatest impact on natural vegetation. Many of them referred to the group of invasive: *Asclepias syriaca*, *Aster × salignus*, *Elodea canadensis*, *Heracleum sosnowskyi*, *Impatiens glandulifera*, *Quercus rubra*, *Populus alba*, *Solidago canadensis*, *×Sorbaronia mitschurinii*, *Zizania latifolia* etc.

The results show that the formation of adventive component of flora of Prypiackaje Paliesse most important types of cultural flora of European, Asian and North American origin. Many of them have successfully naturalized in natural phytocenoses of the southern part of Belarus and have a negative impact on natural ecosystems.

ARCHITECTURE OF INTEGRATED INFORMATION SYSTEM FOR ANALYSIS OF POTENTIAL OF RENEWABLE ENERGY SOURCES

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Some characteristics and features of architecture of integrated information system for analysis of potential of renewable energy sources are considered, that is opened for enhancement and realization of appropriate functionality, in particular development of special algorithms and program modules of interaction with database and graphical user interface within it.

Keywords: architecture, integrated information system, analysis of potential, renewable energy sources.

In the Republic of Belarus the efficient use of renewable (alternative or non-conventional) energy sources is largely dependent on the correct assessment of the resource potential of the region, the availability of appropriate technology and equipment, the required infrastructure and the regulatory framework.

For the design and development of Web-based integrated information system for analysis of potential of renewable energy sources that is creating in the Belarusian National Technical University, as well as any other structurally and functionally complex software for working with cartographic information, corresponding technologies were chosen in such a way as to minimize the time spent on development, to make the software product maintenance more simple, and also to provide high productivity of the application.

In particular, the selected technologies should solve the following tasks and problems:

- work with dynamically changing content of client Web-pages without its' reloading;
- implementation of the software user interface on the side of the Web-server;
- creation of a level of access to information stored in the database for use in the software user interface and others.

The architecture of the module for working with cartographic information includes:

- client part containing a graphical user interface and a level for working with the server API;
- server part containing the levels of interaction with the database and the views and relationships between the levels of the application.

Developed modules for working with cartographic information are modules for a Web-application developed in accordance with the technology of Microsoft ASP.NET MVC. The developed system uses Microsoft .NET technology on the server side and AJAX technology for background communication between the client and the server.

When developing in a Microsoft Visual Studio environment, the application was divided into 2 projects for software implementation:

- level of access to the database;
- graphical user interface.

Such a partition simplifies development and also reduces the time required to replace a data source.

The architecture of the integrated information system includes the following components:

- the object model of the database – is a set of classes corresponding to the database tables. Stored procedures are represented by functions;
- repositories – isolate heterogeneous data from each other and include mechanisms for managing this data. For example, the repository of wind generators includes functions for selection, editing, deleting and assortment of appropriate equipment for objects, as well as calculating of the energy efficiency of the equipment;
- Web API-controllers – return and receive data in a "raw" form (JSON is used). The client application processes and displays the data (JavaScript is used). The controllers of the specified type are used, because the cartographic interface requires operation without reloading the Web-page;
- MVC-controllers – form finished Web-pages and return them to the user.

Thus, a selection of modern technologies and tools for the optimal technical implementation of integrated information system for analysis of potential of renewable energy sources was made. Also, the architecture of this

system is developed, which is open for the expansion and realization of the corresponding functionality, in particular, the development of appropriate algorithms and software modules for interaction with the database and graphical user interface within the system.

CALCULATED STUDY OF DROPLET ENTRAINMENT PROCESSES OF BORIC ACID

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The processes of droplet entrainment of soluble substances with steam during the operation of nuclear power plants have a significant impact on the ecological situation. This effect can be expressed in increasing the humidity of the ambient air by using evaporative cooling towers or influencing the possibility of cooling the core of the reactor in the event of an accident. To study these processes in the IPPE, the calculated simulation of the droplet entrainment of boric acid was carried out, the results of which are presented in this paper.

Keywords: boric acid, droplet entrainment, reactor, accident, environment

Ensuring the safety of modern NPP projects in order to prevent accidents that can have a negative ecological impact on the environment is one of the most urgent tasks facing modern nuclear energy. Within the framework of the WWER-TOI project, special attention is paid to ensuring reactor safety in case of beyond-design accidents with a break in the main circulation circuit and loss of all AC sources within 72 hours. This task is solved by the functioning of passive safety systems that provide cooling of the core due to the consecutive supply of a solution of boric acid in the reactor with a concentration of 16 g / kg from the system of hydraulic tanks. As is known, the reactor core is at this time in a boiling state, correspondingly, taking into account the low acid concentration in the vapor phase, it is possible to increase the amount of boric acid in the core coolant and to achieve the conditions for its crystallization on the outer surface of the fuel rods, which may lead to a deterioration of the heat sink. The limiting concentration of a solution of boric acid, corresponding to the onset of crystallization, depends on the temperature.

To estimate the possibility of this process in the core of WWER, a calculation was made of the accumulation of boric acid in the reactor in the emergency mode. When carrying out the calculation, the following conservative assumptions were made: boric acid is considered as the only form of boron accumulation, boron drift of boric acid is absent. The results of the calculation analysis show that in the event of an accident, a sufficiently intensive accumulation of boric acid in the core of the reactor takes place. The maximum concentration of boric acid by the end of 72 hours significantly exceeds the limiting concentration [1], and, accordingly, can lead to its crystallization on the fuel element surface. The process of crystallization of boric acid in the core can be slowed down or even completely eliminated due to the removal of a part of boric acid with the vapor leaving the core. Therefore, in the future, in order to reduce the conservativeness of calculations, experimental studies of the processes of droplet entrainment processes of boric entrainment are necessary.

The results obtained will help to justify the safety of new NPP projects and ensure reliable operation of passive safety systems to guarantee that the accident does not transform to a serious stage, with the possible release of radioactive fission products into the environment and causing great environmental damage.

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THE DYNAMIC MODEL OF THE FORECASTING THE POLLUTANTS ACCUMULATION IN SOILS

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The principles of the mathematical simulation based on the experimental data for forecasting the accumulation of the pollutants in soils are described. Such data is necessary for the evaluation of the ecosystem load.

Keywords: ecosystems, pollution, computerized simulation, accumulation, differential equations.

The critical load is defined as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge". Now it is one of the most important ecological problems. It can be proved by the fact that UNESCO founded special organization called Coordination Centre for Effects (CCE) to explore this problem. Despite of importance of a critical load problem, it is not explored in Belarus.

The mathematical dynamic model for contaminant deposition in a soil based on experimental data is represented in the article.

Contaminants are deposed in soil via two ways. One is an income of pollutants from external sources, another one is an uptake of contaminants via physical, chemical and biological processes. It is assumed that pollutants enter the soil with gravity precipitation, climate precipitation and background income. Background income includes processes that are difficult to consider separately. For example contaminant income with leaves and other biomaterial, that strongly depends on plant species, or chemical processes in soils and others. General equation for pollutant income is:

$$\frac{dC_{N,\,inc}}{dt} = \alpha_{pre} C_{N,pre} + \alpha_{grav} C_{N,atm} + C_{back,\,inc}, \quad (1)$$

where $C_{N,inc}$ – contaminant income in soil; α_{pre}– coefficient that determines income rates of contaminant via atmosphere precipitation ; $C_{N,pre}$ – contaminant concentration in atmosphere precipitation; α_{grav} – coefficient that determines income rates of contaminant via atmosphere precipitation; $C_{N,atm}$ – contaminant concentration in an atmosphere; $C_{back,inc}$ – background contaminant income in soil.

Uptake of contaminants is determined by next processes: leaching from soil, evaporation and backdrop pollutants uptake. These processes can be written by the next equation:

$$\frac{dC_{N,\,upt}}{dt} = -\left(\alpha_{le}(C_N - C_{N,pre}\right) + \alpha_{evap}\left(C_N - C_{N,atm}\right) + C_{back,\,upt}), \quad (2)$$

where $C_{N,upt}$ – contaminant output from soil; α_{le} – coefficient that determines leeching rates (for average annual precipitation and evaporation); C_N – contaminant concentration in soil; $\alpha_{исп}$ – evaporation coefficient (for average annual evaporation rates); $C_{back,output}$ – background contaminant output from soil.

Total contaminant change can be determined as difference between contaminant input and output:

$$\frac{dC_N}{dt} = \alpha_{pre} C_{N,pre} + \alpha_{grav} C_{N,atm} + C_{back,input} - \alpha_{le}(C_N - C_{N,pre}) + \alpha_{evap}\left(C_N - C_{N,atm}\right) + C_{back,\,output}, \quad (3)$$

This equation can be transformed to the next one by grouping respective concentrations:

$$\frac{dC_N}{dt} = \alpha_N C_N + \alpha_{ос} C_{N,ос} + \alpha_{возд} C_{N,возд} + C_{фон}, \quad (4)$$

where α_N, α_{pre}, α_{atm}, C_{back} – are generalized coefficient, that determines the rates of contaminant concentration change in soil and contaminant concentration change in atmosphere and background contaminant concentration change.

Given equation (4) is a linear differential equation of a first order, that has the next solution:

$$C_N(t) = C[1]e^{t\cdot\alpha_N} - \frac{\alpha_{ос} C_{N,ос} + \alpha_{возд} C_{N,возд} + C_{фон}}{\alpha_N} = C[1]e^{t\cdot\alpha_N} + \alpha^*_{ос} C_{N,ос} + \alpha^*_{водз} C_{N,возд} + C^*_{фон}, \quad (5)$$

where C_N – contaminant concentration in soil at time t; C[1] – coefficient, determined by boundary conditions.

The last equation can be used to calculate contaminant concentration in soil depending on time and contaminant concentration in air, as well as to determine background change of pollutant in the ecosystem using experimental data.

There are five different coefficients in the equation (5). They can be calculated using experimental data from five different years. National environmental monitoring system gives necessary data to use the equation (5) to simulate the critical load.

ECOLOGICAL ASPECTS OF RATIONAL USE OF RAW MATERIALS OF THE FACTORY "STROYFARFOR" JSC "KERAMIN"

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The factory "Stroyfarfor" JSC "Keramin" is specialized in the production of sanitary ceramic products. A significant part of the raw materials used in production are imported from outside the Republic: The Ukraine, Russia, etc. Waste water generated in the production, represent a multi-component, resistant to segmentation of the slurry, the treatment efficiency does not exceed 60 %, which allows the reuse. The formed sediment containing a significant amount of valuable raw materials is shipped and transported to landfills. Separate discharge and treatment of qualitatively different wastewater will reduce the share of waste to reduce the environmental tax for the disposal of precipitation in landfills, and therefore reduce the cost of production.

Keywords: plant "Stroyfarfor", clay materials, zircon concentrate, kaolin, slip, glazes, waste water, precipitation JSC "Keramin" unites three divisions: manufacture of ceramic tiles; the factory "Stroyfarfor"; Minsk ceramic factory.

The factory "Stroyfarfor" was organized in 1985 on the basis of pilot production of sanitary ceramic and by the end of the year produced 73 thousand sanitary ceramic ware – toilets, sinks, flushing cisterns. Currently the plant produces over 1,8 million products per year.

The main raw materials used in production are: raw materials are clay, alumina, kaolin, emaciated materials (sand, feldspar, pegmatite, and gypsum), zircon, nepheline and datolite concentrates, dyes, other chemical products and ancillary materials. A significant part of the raw materials used in the manufacture of products and imported from outside the Republic of Belarus, does not contain refractory clays, feldspars and kaolins. In the total volume of purchased raw material resources, the share of the Ukraine accounted for over 60 %, Russia – more than 30 % and 5 % – Belarusian raw materials. Imports are purchased for a small share of high-quality dyes and auxiliary materials. Thus, the main supply of high-quality clay, kaolin, zircon concentrate (used in production of glazes and enamels, providing product desired thermal and chemical resistance, abrasion resistance and gloss) are made from oil fields in the Ukraine.

For the production of sanitary ceramics two kinds of technology are used: with the use of plaster molds and machines for pressure casting in polymer form. Mechanized stands casting in plaster molds is the traditional equipment for the production of sanitary ceramics. Automated test benches pressure casting in polymer form (Italian SACMI equipment) installed in 2009 are the latest achievement in the production of sanitary ware, which allows to reduce the production time significantly and to improve the quality of the product. In addition, the company has introduced automatic glazing installation robot spraying (manufactured by SACMI). This equipment allows to cover the entire surface with the glaze evenly and ensures the high whiteness of products.

JSC "Keramin" pays great attention not only to the introduction of new innovative technologies, but also to the protection of the environment. There is the reverse system of water supply and sewage water. With the exception of the wastewater of "Stroyfarfor", the cleaning efficiency does not exceed 60 %, which allows it to be reused. Wastewater represent a multi-component, resistant to segmentation of a suspension. It contains particles of quartz sand with a size of 50–100 microns, the particles of kaolin with a size of about 10 microns, and colloidal suspended matter, which represents the remains of a Frit with a particle size of less than 0,1 microns. The sediment containing a significant amount of valuable raw materials is shipped and transported to landfills.

The technological process of production of sanitary products can be divided into the following stages: preparation of the slip, glaze preparation, casting on the mechanized stands, injection moulding, enrobing products and their firing. It is possible to distinguish three types of wastewater of fundamentally different composition. The first is wastewater generated after washing of the mixer for the preparation of the slip and mechanized forms that contain relatively inexpensive components. The second wastewater is generated after washing of the mixer for preparation

of glazes and glazing installations containing the remains of the most expensive raw materials. The third is the wastewater from automated booths molding, composed of detergents containing chlorides and phosphates. All three types of wastewater are currently mixed at the enterprise, which greatly complicates their composition, and, consequently, the ability to clean and reuse the wastewater, and precipitation.

Thus, a separate diversion of qualitatively different waste waters, their monitoring, and analysis of oxide composition of precipitation will allow to offer optimal technology for reagent-free precipitates with the subsequent return into production. These activities will reduce the share of waste to reduce the environmental tax for the disposal of precipitation in landfills, and therefore reduce the cost of production.

ISOLATION AND PHYSICO-CHEMICAL CHARACTERISTICS OF EXTRACELLULAR LACCASE FROM THE FUNGUS GANODERMA LUCIDUM

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The object of the study was enzyme laccase from the basidiomycete Ganoderma lucidum. The purpose of this study was to develop a method for obtaining highly active and stable intracellular laccase from the mycelium of Ganoderma lucidum. It is shown that intracellular laccase from the mycelium of Ganoderma lucidum is a highly active and stable enzyme and can find wide practical application.

Keywords: biocatalytic technologies, remediation, laccase, phenol-containing xenobiotics, basidiomycete Ganoderma lucidum.

In connection with the growing technogenic burden on the environment, the use of biocatalytic technologies in industry and the remediation of contaminated natural resources, such as water and soil, has become increasingly important in recent times, because of their environmental safety [1]. Promising techniques of environmental remediation include "enzymatic purification", based on the use of natural enzymes (lipases, xylanases, oxidoreductases) to activate the processes of irreversible degradation of various pollutants [1].

Laccases (p-diphenol: oxygen oxidoreductase, EC 1.10.3.2) can oxidize a wide range of phenol-containing xenobiotics and catalyze the reduction of molecular oxygen to water, bypassing the stage of hydrogen peroxide formation [2].

The urgent task of modern ecobiotechnology is to search the new sources of highly active and stable forms of laccase, study the properties of these enzymes and develop methods for their effective use.

In this study, intracellular laccase from the mycelium of deep cultivation of Basidiomycete *Ganoderma lucidum* was isolated and characterized.

The purpose of this study was to develop a method for obtaining highly active and stable intracellular laccase from the mycelium of *Ganoderma lucidum*. The method is based on monitoring of the growth of mycelium and enzymatic activity of laccase, as well as on comparing the catalytic characteristics of intracellular and extracellular phenoloxidases of this fungus.

The mycelial growth was monitored from the second to the tenth day. The activity of intracellular and extracellular oxidoreductase was determined spectrophotometrically, by oxidation of the specific substrate of ABTS. Catalytic properties (Km, optimal pH and temperature, inhibitors effect) were determined with various mono- and di-phenolic compounds. All the values obtained for laccase were recalculated per 1 gram of dry mycelium and compared.

As a result of the study, the optimal time for cultivation of the mycelium of the mushroom *Ganoderma lucidum* was established for obtaining intracellular laccase – 7 days. It is shown that intracellular laccase has a high enzymatic activity to the phenol-containing substrate, similar to the activity of extracellular laccase from *Ganoderma lucidum*. For the isolated enzymes, the kinetic parameters of oxidation reactions of phenolic compounds, the optimum pH of laccase activity, the effect of temperature on the enzymatic activity, and the sensitivity of the isolated enzymes to a number of inhibitors were compared. It is shown that intracellular laccase from the mycelium of *Ganoderma lucidum* is a highly active and stable enzyme and can find wide practical application.

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MONITORING OF THE TERRITORY OF BELARUSIAN NPP UNDER CONSTRUCTION WITH THE USE OF FLUCTUATING ASYMMETRY OF LEAF BLADE OF BETULA PENDULA

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The research gives the assessment of the ecological state of the Belarusian nuclear power station locations as a result of using the method of fluctuating asymmetry of leaf blade of *Betula pendula*. During the research, the morphometric features of leaf blade of *Betula pendula* were revealed with the help of the coefficient of fluctuating asymmetry, as well as the data evaluation of the study of the fluctuating asymmetry of the leaf blade of *Betula pendula* was conducted. The theoretical bases of bioindication, the phenomenon of fluctuating asymmetry and the pollution factors of the territories under study are taken into consideration.

Keywords: Betula pendula, fluctuating asymmetry, leaf blade, bioindication.

One of the perspective approaches to the integral quality characteristic of the environment is the assessment of the state of living organisms based on the stability of development, which is characterized by the level of fluctuating asymmetry of morphological structures. Leaf blades of *Betula pendula* Roth were chosen as the research object for determining the degree of disruption in the stability of development. Studies have shown that the level of fluctuating asymmetry is sensitive and increases with increasing anthropogenic pressure. Increasing the degree of impact leads to an increase in the variability of indicators and a decrease in the stability of development [1].

The material was collected in the summer of 2015 and July 2016. To obtain reliable data, trees growing at a small distance from the NPP under construction were selected. To analyze the morphological features of the asymmetry of the leaves of *Betula pendula*, the material was scanned with the help of computer software "Pendula", with each sheet taken in five main measurements on the left and right side. According to the five-point scale developed by Zakharov (2000), the state of the birch population was assessed at different places [2].

The analysis of the elemental composition of soils shows that the area under investigation at the time of the construction is rather favourable regarding the content of microelements. Collection points are characterized by a normal distribution of various chemical elements. For most points, a deviation from the normal content is only by 2–3 elements.

According to the data of the study of the level of fluctuating asymmetry, morphometric features of a leaf blade of *Betula pendula*, which grows on the territory near the construction of Belarusian NPP, is revealed. The increase in the coefficient of fluctuating asymmetry for the current period is shown. If in 2015 the level of the integral indicator was 0,048, which corresponds to the average level of deviation from the norm, in 2016 it increased to 0,63, which corresponds to severe pollution. The obtained data testify the instability of development (there are statistically significant differences at $p > 0,05$). As it can be seen from the obtained data, there are visible changes in the state of the environment on the territory of the construction of Ostrovets NPP.

Thus, the study shows the significance of anthropogenic influence on the formation of morphological structures of birch leaves. As a result of transporting of a great number of different cargos, the load on the roads has increased, which enhanced the pollution of the roads themselves [3].

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MANAGEMENT OF RUBBER-CONTAINING WASTE IN THE REPUBLIC OF BELARUS

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In recent years, in many countries considerable attention has been given to the problem of using a wide range of generated rubber-containing waste. Rubber-containing wastes are composed of a large number of harmful to the environment components. Storage and disposal of rubber is undesirable from an environmental point of view. Therefore the recycling of rubber-containing waste is the most appropriate solution.

Keywords: problem, using, waste, rubber-containing, recycling.

The amount of accumulated and annually generated rubber-containing industrial waste in the Republic of Belarus is estimated at tens of thousands of tons, and only 23 % of this waste can be used for any purpose. For instance, it is possible to recycle this kind of waste for energy by pyrolysis, to use as the component of the road surface. There are special sites for shredding rubber, areas for the production of rubber crumb, installations for processing used automobile tires and other rubber-containing products by pyrolysis in vacuum, and tire processing workshops, but most of the rubber-containing waste is stored or, more often, simply discarded with municipal waste.

The management of rubber-containing waste in the Republic of Belarus during the period from 2011 to 2016 have been analyzed. It has been found, that the major part of the generated waste is still represented by used automobile tires with a metal cord and with a textile cord. According to the state statistical report in 2011 the highest number of generated waste was represented by used tires with a metal cord, rubber-fabric waste and used tires with a textile cord. In 2016 the highest number of generated waste was composed of used tires with a metal cord, unvulcanized rubber waste and used tires with a textile cord.

In 2016 the total amount of rubber-containing waste, taking into account the generated and accumulated at the enterprises at the beginning of the year, was found to be 103,000 tons. The highest amount of generated rubber-containing waste in the Republic of Belarus is referred to used tires with a metal cord, which accounted for about 57 % of the annual output of rubber-containing production waste in the country. The percentage of utilization of this type of waste has increased from 87 % to 91 % during the period from 2011 to 2016. However, the number of used tires with a metal cord, taking into account the accumulated ones at the enterprises, increases every year.

Unvulcanized rubber waste compounds ranked second in 2016 in the terms of the formation, while in 2011 this number was 33 times less. In 2016 100 % of this waste was utilized, not only generated waste, but also waste accumulated at the enterprises was used. The third place in 2016 was taken by used tires with a textile cord, the percentage of utilization of which was also equal to 100 % in 2011 and 2016. At the same time, in 2016 the waste was utilized by 2,5 thousand more. Rubber-coated fabric wastes ranked second in 2011 and fourth in 2016. Their utilization in 2011 was about 99 %, and in 2016 it exceeded 100 %. With regard to the total amount of rubber-containing waste, from 2011 to 2016 it has increased by 4,000 tons, and the percentage of their utilize has increased from 86 % to 98 %.

The enterprises that generate the largest amount of rubber-containing waste are OJSC «Belshina», PUE «Regeneratnyzavod», RUE «Granit» and OJSC «Belarusrezinotechnika».

Currently, more than 16 tire recyclers are represented in the Waste Management Register, the largest of which are OJSC «Belarusian Cement Plant», OJSC «Krasnoselstroymaterialy», OJSC «Krichevcementnoshifer», LLC «Shinstroy». The main directions of processing rubber-containing waste in our country are still the production of energy and rubber crumb.

RADIOLOGICAL PROTECTION FROM COSMIC RADIATION IN AVIATION

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The principles of protection and the choice of the reference persons in aviation and space flights.

Keywords: cosmic radiation, cosmic radiation in aviation.

After take-off, as the aircraft climbs to cruising altitude, exposure to cosmic radiation increases. At typical cruising altitude (>10,000 m), the dose rate can reach 7 mSv h1 (more than 150 times the level of exposure to cosmic radiation at sea level). Future use of new ultra-long-range jets that fly at higher altitudes and for longer durations is estimated to increase total doses by 30–50 % compared with current flight practices. The personnel involved in the operation of commercial jet aircraft be treated as occupationally exposed. As doses are not likely to exceed a pre-defined value because of the limitations of flight duration, the use of dosimeters for individual monitoring was not considered to be necessary. Attention should also be paid to groups such as frequent flyers and couriers who fly more often than other passengers. The only group occupationally exposed to elevated levels of cosmic radiation was aircraft crew. The annual effective doses to aircraft crew should be derived from the flying time and typical effective dose rates for the relevant routes and that the control of exposure is mainly ensured by restrictions on flying time and route selection.

ENVIRONMENTAL MANAGEMENT AS A KEY ISSUE IN SUSTAINABLE DEVELOPMENT AND AS THE HIGHEST PRIORITY OF INDUSTRIAL ACTIVITIES AND ENTREPRENEURSHIP

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One of the modern trends of ecologization of production is a way of improving the system of administrative control through the introduction of standards of series ISO 14000. Environmental management is used as a tool to help enterprises achieve and demonstrate consistent improvement in all environmental aspects of the activities where it is practically achievable.

Keywords: industry, environmental management system, environmental management.

Modern industrial production in the Republic of Belarus is characterized by a high level of impact on the environment, the assessment of which is the relationship between production and environmental factors. Namely, when output growth by 1 % and permanent technical level the growth of emissions of polluting substances in atmosphere is more than 1,3 %, discharges to water bodies 0,9 %, waste generation of 1,7 %. The calculations show that the need for cost recovery and environmental protection are constantly increasing. Currently, the main source of environmental financing is the payment for the use of natural resources and negative impacts on the environment. Despite the steady growth of these payments, the costs of environmental activities in the Republic of Belarus are clearly insufficient to constitute about 1,1 % of GDP, according to the National statistical Committee of the Republic of Belarus for 2016, whereas in developed countries it is 3–4 %.

In the opinion of heads of enterprises in the period of development of the industry, it is highly competitive. Taking into account the increasing interest in the high level of ecological safety, more and more enterprises are adopting and developing environmental management. Primarily, it considers those companies whose activities are having negative impact on the environment. Managing the environmental protection and rational use of natural resources contributes to the formation of a favorable image of the organization, improves relations with the state bodies, and strengthens the positions on internal and external markets. However, to maintain and increase benefits and thus ensure the efficiency and sustainability of industrial enterprises constant improvement of the management of their environmental activities is needed.

The solution to the environmental problems associated with industrial activity is impossible without ecologization of the economy and production. Only in this case the expert is able to organize the production activities and the work of his unit, taking into account environmental requirements and restrictions. The knowledge and use of economic instruments, legal entities can solve not only technical problems of nature, but also of economic effect. It can also improve the environmental situation in the zone of influence of the enterprise.

One of the modern trends of ecologization of production is a way of improving the system of administrative control through the introduction of standards of series ISO 14000 (Environmental Management System) [1]. Environmental management is used as a tool to help enterprises achieve and demonstrate consistent improvement in all environmental aspects of the activities where it is practically achievable, i.e., the use of environmental management systems to improve economic efficiency of production activities, demonstrating interest in ensuring the protection of the environment in the impact zone of production.

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STIMULATING EFFECT OF LASER RADIATION ON THE INITIAL STAGES OF ONTOGENESIS OF TRITICUM L.

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It was established thatan increased growth effect of winter wheat seedlings from 17,1mm (of 11,03 %) to 38,1 mm (39,42 %) was caused by irradiating of air dried seeds using a combined laser radiation dose of 2,7 J. It was discovered that a dose of 2,7 J reduced the content of calcium by 19,54 % , the contentphosphorus by 5,97 % and the content of iron by 32,27 % in the phytomass of the seedlings. The hypothesis of the mechanism of action of the combined low-energy laser radiation was proposed.

Keywords: Laser irradiation; frost-resistant winter wheat; stimulating effect; biogenic elements; ontogenesis.

Radiation is a powerful and little studied phenomenon, under the influence of which a variety of changes occur in plants; by knowing the patterns of these changes, it is possible to control the growth and development of plants. Studying the factors that modify the stimulating effect of radiation, and taking into account the influence of these factors, it was possible to increase the repetition of the effects of the optimal stimulating doses.

The scientific literature emphasizes that the stimulating effect of optimal doses of laser radiationon pre-sown plant seeds is one of the topical issues of modern radiobiology. Currently, there has been no clear correlation between frequency, radiation exposure and bioactivation in plants. The mechanism of action of a low-intensity laser for living organisms remains inadequately clarified [1; 2].

The purpose of the work is to determine the stimulating effect of the combined laser and magnetic influences and to clarify the mechanism of its action at the initial stages of wheat's winter ontogenesis.

Seeds of winter wheat were irradiated with a quantum therapy device, "Vityaz" (The Republic of Belarus). The effective physical factors of the apparatus are as follows: constant red laser radiation (650 nm) with a power of 5 mW; pulse radiation (12500 Hz); infrared (850 nm); laser radiation with a power of 5 mW; magnetic field from 5 to 50 mT. The seeds were irradiated in an aluminum container: 24 seeds with a total mass of ~ 1,2 g were placed at the bottom of a container (S = 6,15 cm^2). The radiation power was 10 mJ/s at a distance of 1 cm from the seeds.

On the basis of the obtained results the following conclusions were made:

1. It was established that the increased growth effect of winter wheat seedlings, which were grown from presoaked seeds and irradiated with a dose of 2,7J of combined laser radiation, was of 13,7 mm (9,33 %). A similar dose of irradiation of 2,7 Jwas delivered to air dried seeds, which caused an increase in the length of the seedlingsby 17,1 mm (11,03 %) in the first experiment andby 38,1 mm (39,42 %) in the second experiment.

2. The influence of laser radiation on the dynamics of the supply of biogenic elements was detected. Irradiation reduced the calcium content by 19,54 %, decreased phosphorus by 5,97 % and increased the iron content by 37,27 %. An increase of 37,27 % of theiron in the phytomass of the seedlingspotentially activates photosynthesis as an anti-stress reaction, which gives an advantage to irradiated plants in the initial stages of ontogeny.

3. A hypothesis is proposed that explains the mechanism of low-intensity combined laser irradiation at the initial stage of the ontogeny of wheat. According to the hypothesis, laser radiationacting on hydrogen bondsdisrupts the hierarchy of the most important biomolecules, and changes the dynamics of the supply of biogenic elements to the phytomass, which leads to an acceleration of the growth of plants in the initial stage of ontogenesis.

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AVIAN INFLUENZA AND ORNITHOSIS :ORIGIN, TRANSMISSION AND PREVENTION

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Modern preventive measures for the prevention of avian influenza are considered. Were suggested the most effective methods of protecting the population from ornithosis.

Keywords: Avian influenza, ornithosis, viral infection, prevention, symptoms, reservoir, bacteria.

The number of important environmental problems of the 21st century which require preventive protective measures is constantly increasing. At present, the problems of animal and human diseases from birds migrating during spring and autumn periods, contributing to the transfer of dangerous diseases from southern and central latitudes, to urbanized areas have also been implicated.

The aim of the work is to offer methods of protection to the population against avian influenza and ornithosis on the basis of literature analysis.

The source of the infection is infected birds, whose excreta and excretions contain large amounts of active virus. The mechanism of infection is airborne. Factors of transmission of the virus include infected exchange containers (trays for meat and eggs), feed, and commercial products (carcasses of birds, eggs, feathers) obtained druing the incubation period or from clinically ill poultry. A certain role in spreading the disease could also be played by wild birds (pigeons, sparrows, jackdaws and crows), as well as rodents and cats. Avian influenza occurs in the form of enzootic and epizootic. [1]

Avian influenza is an acute respiratory viral infection, transmitted mainly by wild ducks, doves and jackdaws. Ornithosis is caused by the bacteria Chlamydophila psittaci. City pigeons, sick parrots, canaries and domestic birds are the main natural source of the infection. Humans usually inhale the bacteria with dust. The symptoms of both diseases are similar – fever, headaches, loss of appetite and muscle pain. Ornithosis is treated with antibiotics, whereas atients with avian influenza receive supportive therapy.

Preventive measures include vaccination (avian flu), regulating the population of pigeons in cities, avoiding contact with wild birds, appropriate sanitary regimens on poultry farms, maintaining personal hygiene and avoiding crowded places during flu seasons. [2]

Currently, vaccine prevention remains the most promising and effective measure for the prevention of avian influenzaas well as variants of the disease caused by the pandemic strain of the virus.

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THE CONTENT OF PHOTOSYNTHETIC PIGMENTS IN LEAVES OF BETULA PENDULA AND THE EAGLES PINUS SYLVESTRIS IN A ZONE OF INFLUENCE OF THE ENTERPRISE OF THE CEMENT INDUSTRY

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The purpose of the study was to analyze the photosynthetic pigment content in leaves of *Betula pendula Roth* and *Pinus sylvestris L.*, which grow on the territory of a cement plant. The pigment content in leaves was determined by spectophotometry. The influence of the atmospheric emissions of the OJSC «Krasnoselskstroymaterialy» on the presence of the pigments photosynthesis (chlorophyll *a*, chlorophyll *b*, summarized chlorophyll, carotenoids) in the leaves of the *Betula pendula* and the needles of *Pinus sylvestris* have been investigated. The true decrease

($p < 0,05$) in the presence of all groups of the pigments, which have more pronounced character while approaching near the cement enterprise, have been shown.

Keywords: air pollution, chlorophyll *a* and *b*, carotenoids, Betula pendula, Pinus sylvestris.

The harmful anthropogenic anomalies (with increased concentration of toxic substances) worsen the conditions for the existence of humans, plants, animals. In the presence of a constant source of pollution, the existence of anthropogenic anomalies is constantly not only maintained, but is also increasing. The danger of constant anomalies lies in the fact that even with a low level of contamination they act gradually and do not have a significant effect on the state of the biota. But the effect on the organisms for a long time of increased concentrations of biochemically active substances can have a cumulative character, manifested not only in disturbance of vital functions of the living generation, but also changing subsequent ones through the genetic code.

According to the CPCB (*Central Pollution Control Board*), the cement industry is one of the 17 most environmentally harmful industries. OJSC «Krasnoselskstroymaterialy» is one of the largest manufacturer of building materials in Belarus. It is located in the Grodno region, the village of Krasnoselsky. The activity of a cement enterprise has a significant impact on the environment, since during its operation, a mass ejection of volatile (gaseous) production waste occurs.

Plants are very sensitive to the state of the natural environment and therefore play an important indicator role in determining the contamination of the atmosphere by some impurities. Possessing different sensitivity to the influence of certain pollutants or their complex effects, indicator plants can be used both to detect individual air pollutants and to assess the overall qualitative state of the natural environment. Coniferous rocks are less resistant to the effect of industrial emissions.

The first link on the biochemical level, which is affected by toxicants, are chloroplasts. Accumulation of toxic gases in them leads to their destruction and decomposition of pigments. The changes in the content of pigments, in particular, chlorophylls, are often used as an indicator reaction of damage occurring under the influence of air pollutants.

The purpose of the our study was to study the influence of volatile (gaseous and dust) wastes of the enterprise on the state of the pigment complex (the content of chlorophyll a and *b*, carotenoids) in the leaves of *Betula pendula* and needles of *Pinus sylvestris*, depending on the degree of approach to the enterprise.

For sampling, experimental sites were determined in the gradient of the distance to the source of contamination. The vector of research was determined, if possible, by the prevailing wind directions and the relative homogeneity of the soil, climatic and water regimes. The selection of birch and pine needles was carried out on experimental sites with a fivefold repetition and at the same distance from the surface of the earth (2 m) in plants of the same age. As a control, plants grown in a relatively clean area, not less than 2 km from the enterprise, were used. The content of pigment complex (total chlorophyll, carotenoids) were determined spectrophotometrically. Chlorophylls were determined in the alcohol extract of pigments.

Determination of chlorophyll content in leaves of *B. pendula* and needles of *P. sylvestris* showed that the closer to the object of pollution it significantly decreases the range of 1500 m ($P = 0,0462$) and 2000 m ($P = 0,0364$). Near the plant, at a distance of 500–1000 m, the chlorophyll content reaches its maximum values.

Thus, there is a natural depression in the content of pigments of photosynthesis in the leaves of *B.pendula* and needles of *P.sylvestris*, caused by the influence of gas-dust emissions of the plant, which increases as you get closer to the object. The most sensitive to contaminant exposure is the photosynthetic apparatus. There is a tendency to reduction of content of all types of photosynthetic pigments. The high chlorophyll content in leaves of *Betula pendula* at a distance of 500–1000m is probably due to the adaptation to the lack of solar radiation due to heavy dust the surface of the leaves. This could indicate a compensatory mechanism aimed at reducing negative impacts of pollution.

ASSESSMENT OF ENVIRONMENTAL AWARENESS OF THE POPULATION ABOUT THE PARASITOLOGICAL SITUATION IN THE CITY

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The paper assesses the awareness of the city's population in relation to the ecological and parasitological situation in the distribution of acarines in rest areas.

Keywords: ticks, acarines, tick-borne infections, environmental awareness.

The problem of tick-borne infections is relevant for Belarus: according to sanitary and epidemiological observations, 76 % of the area of Belarus is unfit for tick-borne encephalitis, 92 % – according to Lyme-borreliosis. Over the past 15 years, 10421 cases of Lyme-borreliosis among adults and 969 among children, 1262 and 95 cases of tick-borne encephalitis, respectively, have been diagnosed in the country. The relevance of our research is to assess the degree of awareness of the population of the city of Minsk on the issues of the ecological and parasitological situation of tick-borne infections.

We have developed a questionnaire to address the issues of environmental literacy of the population of the city of Minsk regarding the ecological and parasitological situation. The questionnaire includes eighteen questions and touches upon the main points that allow to determine the level of awareness of the population about mites and infections that they suffer. In the course of the survey, 100 people were interviewed. The respondents were people who had a rest in three different biotopes in Minsk (Komsomolskoye Lake, Chelyuskintsev Park, the park of the 60th anniversary of October).

As a result of the questionnaire, it was revealed that 58 % of respondents don't know what the tick looks like, but they know the value of the tick as a carrier of diseases. It is established that 58 % of the respondents believe that only tick-borne encephalitis can be transmitted through the tick bite and only 10 % of the respondents know that the mites are carriers of other diseases. Very few respondents (14 %) know that tick-borne encephalitis can be infected not only through the tick bite. At the same time, 83 % of respondents are aware of the symptoms that occur when tick-borne encephalitis is infected. Almost all of the respondents know that 89 % of people correctly answered how to act in the bite of a tick and 96 % of the people correctly answered where the inability to remove the tick should be handled in-house.

Regarding the protection against the attack of ticks, the knowledge of respondents is distributed as follows: 49 % believe that clothing to protect against tick bite should not cover the head and can be any color, 48 % know that clothing to protect against tick bites should cover the body and head as much as possible.

Regarding the occurrence of ticks, 55 % of respondents noted that they were bitten by tick (people themselves or their relatives and pets). The main contact points were forest (63,7 %), park (18,2 %), field (5,5 %).

An analysis of the population's awareness of the ecological and parasitological situation in the city showed that the main (22 %) source of information about ticks for people is familiar or relatives. Source for 19 % was the Internet. 94 % of respondents believe that they need alerts in places of rest.

As a result of our sociological research, it can be concluded that the level of knowledge of the majority of respondents, the ticks and the infections they are suffering, is not complete enough. It is required to implement a number of measures to improve the enviromental awareness of the population, paying special attention to the prevention of tick bites.

THE CONCEPT OF USED NUCLEAR FUEL MANAGEMENT AT THE BELARUSIAN NPP

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Safety in handling spent nuclear fuel is one of the components of national safety, therefore the main guarantor of its safety is the state. According to the norms of international law and international practice, the Republic of Belarus assumes responsibility for ensuring safety in the management of spent nuclear fuel, and has undertaken for comply with the fundamental principles of international nuclear legislation on the organization of activities in the area under consideration.

Keywords: used nuclear fuel, safety, source, storage.

The Republic of Belarus is constructing a nuclear power plant under a Russian NPP-2006 project comprising two power units with a total capacity of about 2,400 MW.

The project of the Belarusian NPP provides the management of spent nuclear fuel (SNF). The spent fuel assemblies are unloaded from the reactor to the soak pool, to here they are stored 10 years in order to reduce the activity and residual heat of fuel assemblies to acceptable values permissible for their transportation. At the next stage, there is a need to resolve the issue of further treatment of SNF of the Belarusian NPP.

Until now, in the world practice there is no single concept of handling spent nuclear fuel. Currently used technologies provide two ways of handling:

1) deferred solution – storage for several decades after the pool of aging;

2) reprocessing (regeneration) of SNF with the separation of uranium and plutonium, as well as valuable radionuclides.

Today SNF in most countries is seen as a useful resource, and not as waste. The country-supplier of fresh fuel readily takes SNF for storage, since in the future it can potentially become a source of radionuclides required in various fields of science and technology.

Some countries choose storage or direct disposal without processing in specially constructed storage facilities (deferred solution) as a way of handling SNF. This is due to the fact that the establishment of plants for reprocessing spent nuclear fuel is very costly.

Therefore, the task of developing an independent concept for SNF management is an urgent task for the Republic of Belarus.

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MONITORING OF EMISSIONS TO ATMOSPHERIC AIR AT THE MINSK WHEEL TRACTOR PLANT

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In this research, the activity of the Minsk Wheel Tractor Plant was analyzed to reduce the negative impact on the environment, in particular, on the atmospheric air.

Keywords: emissions of pollutants, sources of pollutants, measures to reduce emissions of pollutants.

The main products manufactured by OJSC “MWTP” are the production of special multi-wheeled vehicles, autotrains, crane chassis and wheel chassis of high cross-country capacity and haulage, trailers for oil, gas, timber, construction, geological exploration, utilities, military-industrial complex, and release of spare parts for their products.

All activities of the enterprise are regulated by regulatory legal acts, technical regulations and technical documents, as well as requirements for products that guarantee the prevention of negative impacts on the environment and the population of Minsk.

The Minsk city committee of natural resources and environmental protection for the main industrial site of OJSC "MWTP" received permission to release pollutants into the air for five years. The number of names of pollutants allowed for emission is 50 units. The permissible emission standards set by the resolution are 93, 583 tons per year.

According to the construction of the sanitary protection zone, the main production site belongs to the 3-rd class of danger according to the sanitary classification with a sanitary protection zone makes 500 meters.

Emissions of pollutants into the air are carried out from 647 emission sources. The most significant sources of emissions are flares, stacks of process units, treatment facilities. The main pollutants are nitrogen dioxide, carbon oxide, particulate matter and inorganic dust containing less than 70 % silicon dioxide.

At the enterprise the ecological passport, which defines the basic kinds of influences on an environment and their sources is developed. To control the emission of pollutants into the atmosphere, the enterprise carries out the emission inventory, identifies constant sources of emissions and on this basis standards for the formation of emissions into the atmosphere are developed and discussed.

Ventilation is provided in all production and supplementary premises of the enterprise (natural, mechanical, mixed). Sources of pollutants release into the atmospheric air (machines, equipment, vehicles) are equipped with a gas cleaning unit, which allows to reduce the emission of pollutants (wood dust) by 0,286 tons per year. Emissions of pollutants into the atmosphere by mobile sources of emissions are a subject to verification using instrumental methods to make sure that the actual content of pollutants meets the standards for the content of pollutants in the exhaust gases of mobile emission sources. The main measure to reduce air pollution is the gradual transfer of

mobile emission sources on the use of alternative fuels with improved environmental characteristics (natural gas, liquefied hydrocarbon gases for road transport).

At the enterprise there is an accredited laboratory in which necessary analyzes of air, water and other parameters characterizing pollution of the environment are made. In accordance with the program of industrial laboratory control over atmospheric air pollution and noise in the area in the impact zone, in all samples tested the concentration of pollutants does not exceed the maximum permissible concentrations.

Currently, a number of measures were taken to reduce pollutant emissions into the atmosphere: the introduction of mechanized dip galvanizing lines, modernization of the automated chroming line, modernization of high-temperature paint line.

Thus, OJSC "MWTP" takes all necessary measures to comply with environmental standards at all stages of production activities in order to reduce environmental damage.

MANTIS ORDINARY (MANTIS RELIGIOSA) IN BELARUS: FINDINGS AND OBSERVATIONS

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The material on the distribution, reproduction and trophic relations of the mantis ordinary has been presented.

Keywords: mantises, invasive species, distribution, polymorphism, biological struggle.

The natural environment and the processes occurring in it, under the conditions of rapidly developing technical progress are undergoing such significant changes, which affect on the plant and animal world not in the best way. In particular, this concerns the emergence and spread of alien or invasive species under the influence of anthropogenic factors of different nature and strength. Moreover, invasive species can replace, but even displace aboriginal species. The analysis of literature on this problem has shown that in recent years the mantis ordinary (Mantis religiosa) has settled throughout Belarus. Its emergence is caused (with a high degree of probability) by climate change and the drainage melioration of the Belarusian Polesie (Sergeeva, 2011). This was facilitated by transformation process in the course of lowland bogs drainage melioration. These bogs previously served as a barrier to the penetration of alien species. A significant role in the mantis resettlement belongs to ground transport.

The purpose of our study is to trace the dynamics of the mantis ordinary resettlement in Belarus and the peculiarities of its biology under laboratory conditions.

We have analyzed literary and own data on the distribution of a mantis on the territory of the republic. For the first time the mantis ordinary was found in the late 90s of the last century in the Polessky Radiation and Ecological Reserve (near Babchin) by I. Evdokimov (an oral report). Then it was discovered by T. P. Sergeeva (2004, 2011) on the same territory. The appearance of a mantis as single specimens was also recorded on the territory of the Berezinsky Biosphere Reserve (Lukashuk, 2008). Currently, single specimens are found in all regions of Belarus. The end point of mantis detection is registered in the north of Belarus (near Barkovichi). The greatest numbers of findings fall on 2015–2017, i. e. the tendency of an increase in the speed of its propagation is observed. It should be noted that mantises dwelling in natural and anthropogenically altered territories have phenotypic differences in body color: green, yellow and brown.

In addition, within three years the members of the biological class of the Minsk Gymnasium School No. 43 have found mantises in the vicinity of the gymnasium. They are adults of different sex and color. There have been also indirect evidences that a mantis in Belarus reproduces: a mantis larva has been found by ornithologists during the counting of water birds in the territory of the reserve "Grodno Svisloch" (https://news.tut.by/culture/552730.html.).

In order to study the nature of the trophic relations of this species, an experiment is being conducted on the basis of the Minsk Gymnasium School No. 43, during which the offspring has been obtained and the range of mantis fodder objects has been determined. Thus, adults feed on dipterans (Diptera): flies and their larvae, beetles from the Chrysomelidae family; and mantis nymphs feed on fruit flies (Drosophilidae) and aphids (Aphidodea), thereby bringing benefit.

Thus, mantis ordinary can be attributed to the neutral species, the existence of which on the territory of Belarus is connected with the occupation of free ecological niches without significant damage to the natural flora and fauna.

It is possible, even that it is one of the components of biological struggle, capable to restrain the number of other invasive insects such as a locust, which is a favorite food for a mantis.

This allows making an assumption about a possible role of mantises in a complex of measures on the biological methods of a control in enclosed spaces, including greenhouses.

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THE APPLICATION OF A NEW SOFTWARE FOR 3D MODELING OF THE NONISOTHERMAL HEAT AND MOISTURE TRANSFER IN NATURAL DISPERSE ENVIRONMENT

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With the help of the developed software tools on the basis of modern parallel computing technologies and computer graphics, the results of 3D modeling of nonisothermal heat and moisture transfer [1] in natural disperse media were obtained using the example of simulation of temperature changes in the soil.

Keywords: 3D Modeling, Heat Transfer, Heat and Moisture Transfer, Pollutants Migration, Parallel Computing, Software Application, FEM, Tetrahedral Finite Elements

To apply the new software the simulation of temperature changes [2] in the soil layers with the following initial parameters will be held:

- dimensions of the calculation area are: 10000×10000×2000 mm;
- number of soil layers: 3 (from top to bottom: loam – layer thickness 800 mm, silty loam – layer thickness 400 mm, sand – layer thickness 800 mm);
- upper layer temperature is 15 °C;
- the temperature of the lower layer is 20 °C;
- the simulation period is 30 days in 6-day increments [3].

To perform the task we should first construct a finite element model of the computational domain (*Figure 1*) with the tetrahedron as the final element [4].

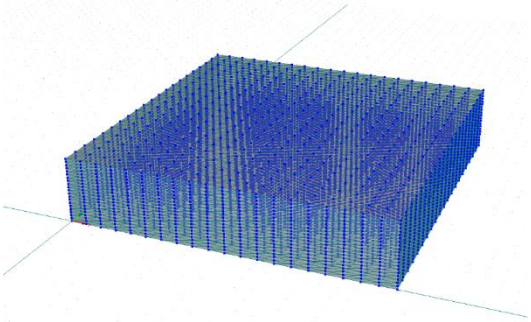

Figure 1 – Finite element tetrahedral grid

After the input data is entered into the program calculations should be performed. The results are shown [5] on *Figure 2*.

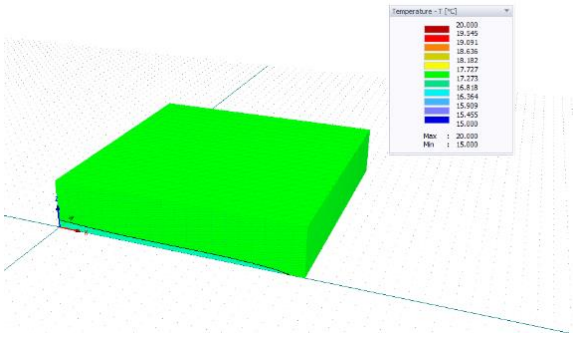

Figure 2 – Results of 3D modeling of temperature changes in soil after 30 days

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ENVIRONMENTAL IMPACT ASSESSMENT AS ENVIRONMENTAL SAFETY ASSURANCE

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In the modern world, the need to prevent negative impact on the environment increases. The main prevention mechanism is the environmental impact assessment. The purpose of the study is to substantiate proposals for improving the legal regulation of environmental anthropogenic impact assessment, which is based on sustainability and environmental security.

Keywords: environmental impact assessment, ecological safety, environmental protection

The negative impact on the environment ensures environmental safety is one of the most pressing problems of our time. Obviously, in order to ensure environmental security is a component of national security, the state

should have coordination of all kinds of economic activity, in the process of which harmful impact on the environment is carried out. The state should use legal means to achieve the necessary level of environmental protection, ensuring favorable environmental conditions.

Environmental safety is a state of protection of the environment, life and health of citizens from threats arising from anthropogenic influences, as well as factors, processes and phenomena of a natural and a man-made nature.

In the National Security Concept of the Republic of Belarus, the creation of a national environmental protection system, which includes, along with other lines, an economic mechanism.

The main economic and environmental legal instrument for sustainable development is environmental impact assessment (EIA) and state environmental expertise as interrelated elements of the national procedure for assessing the possible impact of planned economic and other activities on the environment in the Republic of Belarus. But the most significant event, contributing to a preventive solution to the problem of nature conservation, was the conduct of the EIA.

Carrying it out at the design stage of the planned activity allows minimizing the negative impact on the environment even before the start of the economic activity. The EIA also aims to determine the types of environmental impact resulting from the planned economic and other activities, as well as the corresponding changes in the environment and the forecasting of its condition. As one of the basic principles of the EIA, as publically stated, is the right of stakeholders to directly participate in the decision-making process during the project discussion.

Modern state regulation of the use and protection of natural resources should be based on fundamentally new approaches to the environmental management system. Market relations cannot fulfill the function of developing optimal relations between society and the environment. The relationship of society to the use of natural resources must be built on the basis of recognition of the idea of sustainable development, conservation and reproduction of natural resources, since it is difficult to overestimate their enormous influence on the vital activity of all mankind.

It seems that, to date, there is a need, along with the improvement of legislation, the development of a long-term state strategy in the field of reducing the negative anthropogenic impact on the environment of the planned economic and other activities.

THE CONTENT OF TRITIUM IN SURFACE WATER TESTS ROUND THE CONSTRUCTION AREA OF THE BELARUSIAN NPP

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From the beginning of construction of the Belarusian NPP there was a need for carrying out monitoring researches of a surface water on the content of tritium. The presented results show that specific activity of tritium in water of open reservoirs around the construction of the Belarusian NPP corresponds to the consequences of bombe fallouts for these latitudes.

Keywords: tritium, average value of specific activity of tritium.

Tritium can be referred to most radiation-hazardous long-living nuclides which are capable to pollute the biosphere around direct placement of a source. During the work of the NPP tritium comes to surrounding environment with liquid discharges at normal operation, and also in gaseous emissions, and quickly migrates from places of primary contamination [1].

In connection with the construction of the Belarusian NPP, monitoring researches of a surface water on the content of tritium are being conducted now. In the first half of the year 2017 more than 40 direct measurements lasting 300–500 minutes with liquid scintillation radiometer of series TRI-CARB using МВИ. МИ 4143-2011 technique were executed.

The results of statistical data processing showed that for the data obtained on the TRI-CARB 2910TR radiometer a standard deviation of repeatability was 0,24%, and a standard deviation of an intermediate precision was 0,45 %. The received results confirm the accuracy and reliability of the obtained experimental data [2].

During this period the tests of water from the main water objects of the area of the site of the Belarusian NPP, namely the river Viliya (settlement Malyye Sviryanki, settlement Mikhalishki); the river Gozovka (settlement Goza); the river Losha (settlement Hierviaty); the river Polpa (settlement Chekhi); the river Stracha (settlement Olkhovka); the well (settlement Markuna) were investigated.

In conclusion, it can be stated that the average value of specific activity of tritium for water reservoirs in 30 kilometer zone of construction of the Belarusian NPP is equal to 2,3±1,9 of Bq/l, what corresponds to global fallouts in these latitudes.

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CALCULATION OF CONCENTRATIONS OF POLLUTANTS IN THE ENVIRONMENT

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The execution of works on the production areas of enterprises is accompanied by the release of polluting substances into the atmospheric air. To the enterprises that are located near the residential zone, special environmental safety requirements are imposed. The method for calculating the concentrations of harmful substances in the air from industrial emissions is used in the design of enterprises, as well as in the regulation of emissions into the atmosphere of the reconstructed and operating enterprises.

Keywords: industrial enterprises, pollution sources, Calculation method of concentrations of emitted hazardous substances in atmospheric air OND-86, sanitary protective zone, the zone of pollution, the zone of influence, MatLab, computerized simulation.

Enterprises that are the sources of environmental and human health effects must be separated from residential buildings by sanitary protection zones. The size and the boundary of the zone of exposure to harmful substances are determined on the basis of calculations of the dispersion of pollutants in the atmosphere, taking into account that outside these zones the content of pollutants in the atmosphere should not exceed the air quality standards.

Standards of maximum permissible emissions (MPE) of enterprises for objects of environmental management facilities are established for each pollution source of the atmosphere, provided that emissions of harmful substances from this source, taking into account nearby sources, do not create a surface concentration of pollutants exceeding the maximum permissible values in the air of populated areas.

At designing of the enterprises, calculations of expected pollution of the atmosphere by industrial emissions are used. These calculations are carried out according to the "Calculation method of concentrations of emitted hazardous substances in atmospheric air (OND-86)", developed by the A.Voejkov Main Geophysical Observatory.

At present, all calculations of atmospheric pollution are carried out with the use of special software only – unified programs of calculation of air pollution (UPCAP), which are an annex to the methodology OND-86 (Leningrad, Gidrometeoizdat, 1987).

The disadvantage of such programs is that such tasks are solved as a "black box"; that is, the researcher-ecologist has to rely on the correctness of calculation and on what parameters and models are "hardcoded" in the programs. The calculation methods in such programs are not open completely, and the ecologist can’t verify the algorithms of computation.

The above disadvantages can be overcome using mathematical packages for computations in strict accordance with the requirements of OND-86.

The report presents the results of calculations and forecasts of the concentration of pollutants distribution in the atmosphere of the sanitary protection zone of industrial site No. 2 of the Rechitsa Metalware Plant with the method OND-86 using mathematical package Matlab. The distributions of all pollutants controlled at the enterprise are determined within the sanitary protective zone. The results of our calculations with the data given by the UPCAP "Ecologist" 4 are supposed to be compared in the future.

ECOLOGICAL STRUCTURE OF AVIFAUNA IN THE CHELYUSKINTSEV PARK AND THE CENTRAL BOTANICAL GARDEN IN MINSK

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The article presents data on the ecological characteristics of the avifauna of the Park Chelyuskintsev and Botanical garden in Minsk. The identified environmental group, the ecological status and population density of birds. The biggest variety of different Passerine. Dominant are forest birds, found that most nesting birds are migratory.

Keywords: avifauna, ecological status, birds, environmental groups, density.

The territory of the city creates new habitats for animals, the features of which is due to the increase of urban buildings, construction of roads and modification of suburban zones. Birds are an essential component of all natural ecosystems and are the most visible group of vertebrates in the urban landscape. The presence of certain types and the nature of their stay in the city can serve as an indicator of the state of the urban environment – the extent of landscaping, sanitary conditions, and intensity of technogenic load [4].

The purpose of this work is to study the structure of the avifauna of the Park Chelyuskintsev and the Central Botanical garden in Minsk. Scientific novelty of the research lies in the fact that for the first time in the Park Chelyuskintsev and Botanical garden were studied contemporary species composition and structure of bird population.

Place research Park Chelyuskintsev and the Central Botanical garden, located in the city center of Minsk. North side restricts intensive Avenue of the city, on the other sides of industry. Therefore, this area is subjected to intensive anthropogenic load and, consequently, environmental pollution.

The studies revealed that the Park Chelyuskintsev and Botanical garden in summer inhabits 33 species of birds. The vast majority belongs to the Passerine – 82 %. Followed by a detachment of Columbiform, and Anseriformes at 6 %, Charadriiformes and Piciformes at 3 % [3].

Environmental status in the study area was selected birds: nestling non-migratory species – 13 species breeding migratory, 11 species and nesting migratory and limited numbers of wintering birds – 9 species [2].

In the Park and garden community of birds is divided into 4 ecological groups. The dominant species are forest birds – 52 %, synanthropic– 33 %, wetland and wading birds – 9 %, and birds of open landscapes – 6 % [1]. This distribution of birds according to ecological groups associated with different types of plantings, well-defined layering and the presence of shrubs in the undergrowth where the birds find favorable places for nesting, and can also hide from people. The presence of representatives of synanthropic avifauna due to the fact that the study area is located in the city, where people feed birds. The presence of wetland and wading birds due to the presence of the pond at the Botanical garden.

The population density of birds amounted to 352,756 individuals/km^2. The highest density has a great tit – 38 individuals/km^2. The lowest density has an eurasian wren 0,59 animals/km^2.

Thus, it is established that the Park Chelyuskintsev and Botanical gardens play a significant role in maintaining the species diversity in the condition of anthropogenic load.

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PRACTICAL RECOMMENDATIONS FOR SUMMER RESIDENTS ON THE REDUCTION OF HEAVY METALS IN CROP PRODUCTION, GROWN IN SUBURBAN AREAS IN THE BREST REGION

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The article provides recommendations intended for owners of holiday homes and household plots to reduce the accumulation of heavy metals in crop production.

Keywords: heavy metals, soils, crop, pollution.

The toxic effect of heavy metals in soils leads both to a decrease in yields and contamination of the product. To reduce these negative consequences, it is necessary to carry out the following measures:

1. Cultivation of special resistant and weakly accumulating plant species on the lands contaminated with heavy metals. The weakest heavy metals accumulate tomatoes, potatoes. When it is impossible to obtain products with the permissible content of heavy metals in the plant parts of the plant, it is possible to grow technical crops, as well as for processing (potatoes for starch, alcohol, sugar beet for sugar, etc.). In various tissues the plant accumulates a different amount of heavy metals. In general, the most contaminated roots, then leaves, stems, grass or grain.

2. The content of heavy metals in potatoes and vegetables is significantly reduced due to their cleaning and cooking. So, as a result of cleaning, washing, peeling, rubbing and blanching, the content of lead and mercury is reduced by 50 % in vegetables and 80–85 % in potatoes, and cadmium by 20 %. Reduction of lead content with a single wash of salad can reach 30–40 %. According to Yu.V. Alekseeva, the content of zinc in peeled tubers is reduced to 1,5 times, lead – 2–6 times, cadmium – 1,4–3,5 times.

3. Growing of agricultural crops (primarily vegetable) in protected soil (greenhouses), since the main pollution of TM soil occurs as a result of precipitation of polluted precipitation and dust emissions.

4. Removal and binding of heavy metals in the root layer of soil. The phytotoxicity of heavy metals largely depends on their mobility in the soil, and it, in turn, depends on the soil properties, the type of metal salts, and also on their shape (anions, cations, amphoteric elements, which, depending on soil pH, can be Are charged positively or negatively, neutral forms of metals). Therefore, it is possible to apply such agrotechnical methods as liming, application of organic and mineral fertilizers, application of natural zeolites, and use of biological methods.

5. Investigation affects the mobility of heavy metals as a result of a complex of changes in the soil system at different levels (physical, chemical and biological). When the acidity of the soil solution decreases, the solubility and mobility of heavy metals decreases, and their consumption by plants decreases. This is due to the fact that liming promotes the formation of complex compounds of soil organic compounds with heavy metals, with increasing pH, heavy metals (except As, Cd, Cr, Sr) precipitate in the form of carbonates, phosphates; With increasing pH and increasing calcium content in the soil, the activity of plant root systems decreases with respect to the absorption of a number of heavy metals. The accumulation of heavy metals in plants and the use of mineral fertilizers is reduced. Zinc and lead form poorly soluble, inaccessible compounds with phosphates.

6. The introduction of organic matter into the soil increases the fertility of the soil, the organic matter acts as a good adsorbent of cations and anions, increases the soil buffering and reduces the concentration of salts in the soil solution.

7. Using the antagonism of ions of chemical analogs is based on the fact that when the concentration of one ion in the nutrient solution increases, the absorption of the plant by another plant, an "antagonist", is reduced. Usually, antagonism of light and heavy metals (calcium – strontium, potassium – cesium, etc.) is used. The method is effective only for certain, relatively small ion concentrations.

8. The movement of the contaminated soil layer into soil layers that underlie the root layer is made by deep plowing with plant plows. The implementation of this method also leads to a significant loss of the fertile layer.

ASSESSMENT OF ABSORBED DOSE RATE FROM IONIZING RADIATION FOR THE GAMMA-KNIFE STEREOTACTIC GAMMA UNIT

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The Gamma Knife is a radio surgical gamma radiation teletherapy device, designed to treat pathological formations (benign and malignant tumors and vascular malformations) in the cranial cavity with high-absorbed dose values delivered during one procedure. To ensure the radiation safety of cancer patients, it is critically important to strictly follow the quality control procedures for the stereotaxic gamma device, the most important of which is undoubtedly measuring the absorbed dose rate, since it directly affects the amount of the dose delivered to the patient. The development of a new quality control program that included the procedure for the assessment of absorbed dose rate from ionizing radiation for the Gamma-knife will allow more accurately calculate of the planned dose to the patient and thus increase the level of its radiation safety.

Keywords: Radiation therapy, gamma-knife, medical physics, dose measurements, quality control.

The Gamma Knife is a radio surgical device manufactured by the Swedish company Elekta, designed to treat pathological formations (benign and malignant tumors and vascular malformations) in the cranial cavity with high-absorbed dose values delivered during one procedure [1]. On the gamma knife "PERFEXION", installed in the N. N. Alexandrov National Cancer Centre of Belarus in 2017 uses radiation sources with radionuclide Co-60 (cobalt-60) in the amount of 192 pieces. Each of the 192 radiation sources located in the radiation device consists of cobalt-60 beads sealed in a double shell of stainless steel. The maximum radioactivity of cobalt-60 at a loading of 6600 Ci (approximately 244 TBq) for the treatment of patients with tumors of various locations.

Since high-absorbed dose values are delivered in one fraction, to ensure the radiation safety of cancer patients, it is critically important to strictly follow the quality control procedures for the stereotaxic gamma device, the most important of which is undoubtedly measuring the absorbed dose rate, since it directly affects the amount of the dose delivered to the patient [2]. The medical physicists and engineers of the N. N. Alexandrov National Cancer Centre of Belarus developed this procedure.

Measurement of the absorbed dose rate according to the international recommendations is carried out at least once in three months, as well as after preventive works or elimination of the accident, which can affect the formation of radiation beams and the dose rate of gamma radiation. The equipment necessary for the measurement is a clinical dosimeter (such as UNIDOS); ionization chamber (type PTW 31010 with a volume of 0,125 cm3 or similar); specialized water phantom ABS, thermometer, barometer. Clinical dosimeter, thermometer, barometer should be calibrated it the national laboratory of secondary standard.The ionization chamber, the ABS phantom and the thermometer must be in the treatment room for at least 2 hours before starting the measurement [3].

Measurement of the absorbed dose rate is made as follows: the ABS phantom is installed and centered in the isocenter of the device's irradiation using a special adapter; an ionization chamber is located in the phantom, so that the center of its sensitive volume is located directly in the radiation isocenter; the clinical dosimeter is warmed up in the time set in the operating instructions; measurements of in the air temperature and the atmospheric pressure in the treatment room are performed; the value of the correction factor from the verification certificate is entered in the clinical dosimeter and the absorbed dose measurement mode in water is selected; in the "Gamma Knife" all the collimators are installed with a diameter of 16 mm; At least 3 times the amount of absorbed dose is measured for an interval of 2 minutes. The average value of the absorbed dose rate and measurement uncertainty is calculated.

The obtained dose rate value is compared with the value established in the computer planning system used to calculate the dose distributions for irradiation of cancer patients. The deviation of the measured value from the reference value should not exceed ±3 %.

The development of a new quality control program for the stereotactic gamma apparatus "Gamma-knife" will allow more accurately assessment of the planned dose to the patient and thus increase the level of its radiation safety. Regular quality control of radiotherapy equipment is a prerequisite for the provision of quality medical care to oncological patients in the Republic of Belarus.

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PARASITIC SITUATION ON HORSE HELMINTHOSES ON THE TERRITORY OF THE POLESSKY RADIATION AND ECOLOGICAL RESERVE

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The conducted researches have allowed to reveal high intensity of intestinal strongylatosis, parascaridosis and oxyuris invasions at different species of horse in the reserve. Among helminthoses of horses the most occurred one is intestinal strongylatosis. The eggs of strongylata are found in 95,2 % of fecal specimen of domestic horses and in 84,1 % of fecal specimen of wild horses. Parasitizing of Anoplocephala perfoliata is revealed at 9,5 % of the studied fecal specimen of Przewalski's horses.

Keywords: domestic horses, Przewalski's horses, helmintoscatoscopic researches.

There are two types of ecospecies in the Polessky state radiation and ecological reserve (Gomel region, Belarus): domestic horses and wild Przewalski's horses (Equus ferus Przewalskii Poljakov, 1881):

Comparative study of a species diversity of helmints communities at different types of horse ecospecies, contained together on one territory was carried out by a number of authors [1–3]. For the territory of the Polessky radiation and ecological reserve such researches are performed for the first time.

Helmintoscatoscopic researches by the Fyulleborna flotation method for detection of parasites eggs have allowed to reveal only a nematodosis invasion at the horses who are contained on the horse-breeding farm. Parasites eggs of the families are found: Strongylidae, Trichonematidae, Ascaridae, Oxyuridae, Rhabdiasidae. During the study of 84 fecal specimen of the horses selected before carrying out a worming, all the specimen were infected (% EI-100). At 95,2 % of the studied specimen trichostrongylidae eggs were revealed. At 70,2 % of cases of the studied tests the combination of helmints was revealed – helmintoses (from 2 to 3 species for an animal). Parasitizing only of one species is registered at 32,1 % of horses. At the same time at the majority of animals there were two (63,2 %), more rare three (36,8 %) types of helmints.

From 63 of fecal specimen tests collected from the unrestricted living Przewalski's horses on the territory of the reserve there were 55 specimen of helmints infected by eggs (% EI-87,3). Except of a a nematodosis invasion tapeworms are found in wild horses. As well as at domestic horses, at wild horses there were found helminthes of Strongylidae/Trichonematidae, Ascaridae, Oxyuridae and Rhabdiasidae. Eggs of tape parasites (Anoplocephalidae) are revealed at 6 of 63 surveyed tests (9,5 %). In 74,6 % of cases the combination of helminths – helmintoses is revealed (from 2 to 3 species for an animal). Parasitizing only of one species is registered at 12,7 % of horses. At the majority of animals there a simultaneously found two (57,4 %), more rare – three (40,4 %) species of helminths. Four parasites (2,1 %) are found in one horse.

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ECOLOGICAL CONSCIOUSNESS IN THE MODERN WORLD

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In the modern world, the problem of the relationship between man and nature is especially acute, and the influence of the society on the environment is urgent and is very urgent. This problem is increasing every day in its scale. This is due primarily to the growing environmental problems associated with the development of the industry, an increase in the population and, consequently, an increase in the need for food, clean water, clean air. Society in the modern world will not survive without environmental consciousness.

Keywords: ecological consciousness, society, nature, environment.

Ecological consciousness is the ability to understand the inseparable connection between human society and nature, the dependence of people's well-being on integrity and comparative immutability of the natural environment and the use of this understanding in practical activities. That is, by ecological consciousness we mean a form of consciousness of the society that includes a set of ideas, views and theories that reflect the ecological side of the relationship between society and nature. Ecological consciousness should include norms and rules of behavior, the purpose of which is to balance human-nature relations. [1].

The most important characteristic of ecological consciousness is subjective perception of natural objects. Formation of the subjective attitude to nature in the adult population is fraught with certain difficulties, and some believe that in the prevailing conditions for a limited time, this is almost impossible. Therefore, the strategic work in this area must begin with a younger generation, whose consciousness is not burdened as much as in adults, anthropocentric and technocratic attitudes. In modern society, there is a contradiction between the need for the formation of environmental consciousness among the younger generation, capable of implementing an eco-centered approach in relations with other members of the society and natural objects, and the lack of a sufficiently effective approach to the organization of such education and upbringing. [2].

However, despite the extensive legal basis available, school environmental education is currently not compulsory, since the educational discipline “Ecology” is not included in the federal component of the Basic Curriculum of the State General Education Standard, but is in the regional competence. The situation is aggravated by the fact that there is still no single approach to how environmental education should be implemented in general education institutions. The goal of environmental education in the school is the formation of a system of scientific knowledge, attitudes and beliefs that ensure the development of a responsible attitude of schoolchildren to the environment in all types of activities. The process of education and upbringing is focused on the development of the trainee's personal qualities, the formation of ecologically meaningful stereotypes of behavior and skills in them to assess their impact on the environment from the standpoint of not only their own well-being, but also the harmony of the relationships between nature and society, the awareness of environmental values [3].

Environmental disasters have recently made people think about their attitude to nature. The consequences of human activities are often disastrous for nature.

That is why the ecological consciousness must penetrate into all fields of science, technology and production and become a part of them. Its formation contributes to the survival of mankind, and not its death. The essence of ecological consciousness is a reflection of really practical relations of society. The society needs to know the ecological norms, rules of behavior, have a high level of ecological culture [4].

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THE PROBLEM OF USING WASTE AUTOMOBILE AND INDUSTRIAL OILS IN THE REPUBLIC OF BELARUS

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Our work contains materials on the protection of the environment, waste and industrial oils. And we also found out how many tons of lubricating automotive and industrial oils are consumed annually in the Republic of Belarus. Currently there is no effective system for accounting for used oils. And as a result, significant volumes of hazardous waste either go to the shadow market, or are thoughtlessly thrown away, causing environmental damage and not doing any good to the state. Thus, we concluded that the correct processing of waste oil products makes it possible to protect the environment from harmful effects.

Keywords: used oils- hydrocarbon, ecology, economic ecology.

Both waste automobile and waste industrial oils pose a serious environmental problem, the solution to it should be one of the priority tasks of the "green economy" development. Waste oils are dangerous pollutants of practically all components of the environment including ground water and surface water, soil and vegetation cover, the atmosphere. Scientists have determined that 1 liter of waste engine oil, poured into the soil, makes impotable from 100 to 1000 tons of ground water. According to environmentalists, water is polluted with only waste oil by 20 % of the total technogenic pollution or it is polluted with oil products by 60 %. In the world more than 100 billion dollars are spent annually to remediate environment, contaminated with waste oil. The most serious problem is the burning of waste oils, which harm human health. Clinical studies have shown that vapors of burned petroleum products affect the cardiovascular and central nervous system, cause acute and chronic poisonings, sometimes they can be fatal.

There are several methods for purification of waste engine oil: burning without pretreatment, purification with the production of fuel, restoration at the site of application, purification at a special enterprise, restoration with the production of a new lubricant. However, domestic enterprises from all of these methods prefer the most inefficient and dangerous for human being, the method of burning without pretreatment. According to the government statistics, about 80–85 thousand tons of waste oil wastages are produced in the republic every year. Analysis of regeneration in Belarus indicates the prevalence of mostly obsolete processes and imperfect technologies, and the produced oils are of poor quality. As a result, the country loses millions of dollars, and uncontrolled petroleum burning has a negative impact on human health and pollutes the environment. On the other hand, in recent years very effective stationary installations have been developed in the world, the application of which is based on natural methods of purification. In the EEC directive, processed oils are not considered as waste, that need to be destroyed, but as waste products for secondary use.

It should be noted that the state carries out certain strategies to control issues, concerning the collection and environmentally-friendly use of waste oils. The country has established a legislative framework regulating waste management, in particular, waste oils. But the measures that the government takes are not enough. In order to solve the problem of effective collection and processing of waste oils, it is advisable to implement the following expert concepts:

1. To develop and adopt legislative norms that establish the priority of processing (regeneration) of waste oils using the best technologies in this field.

2. To establish at the legislative level the requirements for organizations that deal with the collection of waste oils, as well as processing of waste oils.

3. To develop and adopt legislative and institutional arrangements that prohibit the burning of waste oils on equipment that does not meet environmental requirements.

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APPROACHES TO ESTIMATION OF BIODIVERSITY OF FOREST PHYTOCENOSES OF BREST REGION

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The article analyzes the quantitative and qualitative indicators of the forest fund of the Brest region. The species composition of forests is compared. Forest phytocenoses are characterized by the following parameters: the area of individual types of forests, timber reserves, age characteristics, the presence and composition of protective areas, the composition of forest species, the completeness of plantations and productivity.

Keywords: biodiversity, forest phytocenoses, forest lands of Brest region, timber reserves, forest cultures, protective areas, tree plantations age, productivity.

Biological diversity reflects the complexity of the biological system, the different qualities of its components. Biodiversity can be classified into three levels of the organization: genetic, species and ecosystem diversity, that is, the diversity of ecosystems themselves. Biodiversity is a dynamic indicator, because It varies easily in time and space. However, a general rule is the reduction in the number of species. The causes of this phenomenon are diverse: changing climatic conditions, technogenic transformation of natural territories, pests, anthropogenic activities, leading to species destruction and pollution of natural ecosystems, etc. In this regard, in 1992 in Rio de Janeiro, the Convention on Biodiversity was adopted, in which for the first time the conservation of biodiversity was declared a priority for humanity.

In Belarus, at the highest state level, strategies for the conservation and sustainable use of biological diversity have been developed, integrated into wider national plans for environmental protection and development.

The territory of the Brest districtaccounts for 36.5 % of forest land. The forest fund of this districtconsists of the Brest Forestry Enterprise (52341 ha), the Malorita Forestry Enterprise (6617 ha) and the State Unitary Enterprise “Brestzelenstroy” (318 ha).

The largest part of the lands, belonging to the forest fund of the Brest district,comprises of wooded lands, where prevail the forest coveredlands, the sparse planted forest ranks second and the smallest area is occupied by forest nurseries and plantations. As part of non-forest lands, the leaders are the lands under roads, fire breaks and other transport routes, as well as land under swamps.

As for the forest-covered lands, the territories of the Brest Forestry Enterprise (48141 ha) are dominant, the Malorita Forestry Enterprise (6055 ha) is the second, the Brestzelenstroy (288 ha) occupies the smallest area. A significant part of this indicator is represented by the main forest-forming species, whereconifers rank first (70,5–80,2 %), soft-wooded broadleaved species account for 18,4–26,5 %, the Brest Forestry Enterprise and the Malorita Forestry Enterprise have also hard-wooded broadleaved species (3,8–4,6 %).

The same dependence is observed on timber reserves: the State Forestry Enterprise (SFE) "Brest Forestry" is also leading – 8590,5 thousand m3, “MaloritaForestry” has a reserve of 1116,5 thousand m3. The State Unitary Manufacturing Enterprise "Brestszelenstroy" has the smallest reserves – 52,2 thousand m3. Amongthemainforest-forming species, coniferous species is the leader in this indicator(71,5–91,8 %). Soft-leaved species (8,2–24,5 %) and hardwoods species in SFEof Brest and Malorita(4 %)show lower percentage.

Pine, birch and black alder forests are dominating among the timber species of the region. Mossy, bilberry and heather forests occupy the largest areas in their composition.

Regarding the qualitative characteristics, it should be noted that the main representatives of the forest areas are the middle-aged plantations and young growths. The smallest area is occupied by ripestandsandold-growth timberstands.

The forest fund of the territories which belong to the State Unitary Manufacturing Enterprise "Brestszelenstroy"is represented by parkland zones (75 %) and forests of the 3rd zone of the protective sanitary zone of the resorts (24 %). Theprotectiveterritories of the SFE "Malorita Forestry" are represented by forests of the 3rd zone of the health protection zone of the resorts, as well as by the protective forest strips along the railway lines (1 %). SFE "Brest Forestry" has the largest variety of territories of this type. Forests of forestry areas of green zones (61,2 %) and forest reserves of national importance (14,5 %) dominate in its composition, while forests of natural monuments of national importance (0,1 %) occupy the smallest areas.

BIOKINETIC AND DOSIMETRIC MODELS FOR RADIOLOGICAL PROTECTION

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This article provides a description of biokinetic and dosimetric methodology, and the use of bioassay data. It will consist of element sections describing element-specific biokinetic models, and provide dose coefficients and bioassay data.

Keywords: biokinetic and dosimetric models, radiological protection, dose coefficients, bioassay functions.

The effective dose enables the summation of internal and external exposures to reference persons for protection purposes, but it is not a scientific quantity and does not provide the best estimates of dose and risk to individuals, while the most recent biokinetic and dosimetric models are ideally suited for such specific calculations, being readily adapted to the age and sex of individuals and to specific biokinetic characteristics. The International Commission on Radiological Protection (ICRP) has developed biokinetic and dosimetric models, used to calculate dose coefficients and bioassay functions. Biokinetic models are mathematical representations of the movement of elements and their radioisotopes within the body and their uptake and retention in organs and tissues. The biokinetic models can be used in many other areas, including toxicology, pharmacology, and medicine. The new generation of computational phantoms can be adjusted to the body shape and organ dimensions of specific individuals so that they can be used, for example, for medical applications, in which accurate estimates of absorbed doses are required. It is also important to ensure that models are sufficiently reliable to ensure adequate protection.

WARP DRIVE - SUPERLUMINAL TRAVEL

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Considered some of its twists and turns when general relativity and quantum mechanics come into play, discuss one of the most interesting proposals for faster than light travel: warp drives.

Keywords: warp drive, hyperspace, space-time, superluminal travel, general relativity, The Casimir effect.

Nothing can travel faster than light with respect to space, but what about space itself? The kinematics of general relativity (GR) sets no restriction on the expanding or contracting capacities of space-time itself. By manipulating the light-cone structure of Minkowski space-time one can construct geometries allowing for superluminal travel. Prototype of that is the warp-drive geometry introduced by Miguel Alcubierre in 1994 [1]. This geometry represents a bubble containing an almost at region, moving at arbitrary speed within an asymptotically at space-time. Mathematically its metric can be written as:

$$ds^2 = -c^2dt^2 + [dx - \vartheta(r)dt]^2 + dy^2 + dz^2$$

Looking at the previous geometry it would seem that general relativity easily allows superluminal travel; but this is not quite true. In that iteration of the warp drive, the starship would ride a "wave" of space-time, much like a surfer rides a wave on the ocean. But, it is not so simple:

The sheer amount of energy required to create the necessary expansion and contraction of space-time would exceed the output of the Sun (The Casimir effect);

The central region of the warp drive behaves like the asymptotic region of a black hole [2; 3].

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SECTION 4

CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT. RENEWABLE ENERGY SOURCES AND ENERGY CONSERVATION

WEB-APPLICATION FOR GEOINFORMATION MODULE AS A PART OF UNIFIED DATA BASE OF PERSISTENT ORGANIC POLLUTANTS

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According to Stockholm Convention on Persistent Organic Pollutants (POPs) countries-participants should take measures to eliminate or reduce the release of POPs into the environment. Belarus is one of 152 signatories of Stockholm Convention. This circumstance imposes on our country a number of obligations. One of them is development and maintenance of unified data base of Persistent Organic Pollutants that will contain all information connected with POPs utilization, storage, transition and elimination. Unified data base of POPs will be implemented as an open source web-application. Belarus Research Center "Ecology" is main executor of this important international obligation. Proposed geoinformation module is a part of the project.

Keywords: Stockholm convention, persistent organic pollutants, ASP.NET, C#, web-application, GIS, MySQL.

Web-application for unified data base of persistent organic pollutants is developing on ASP.NET MVC technology. According international obligations the web-application should be open source and anyone can use provided public information. MySQL data base management system (DBMS) is using to store large amount of data. The main reasons of this choice is openness of software product and DBMS performance. The aim of our work is development geoinformation module which will be integrated in web-application of unified data base.

To reach main goal we should complete a number of tasks. They are: 1) set up connection to unified data base; 2) create necessary layers on map of territory of Belarus; 3) develop user interface; 4) display special information on the map and give users ability to choose kind of displayed data; 5) develop administrative and user parts of this geoinformation module.

These tasks are solved: frontend part by using Google Maps API, HTML, CSS and Java Script programming language with it's different frameworks; backend part by using ASP.NET technology and C# programming language; storage access part by using DBMS MySQL and SQL programming language.

LEGAL REGULATION OF USE AND PROTECTION OF SURFACES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

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In this article, some aspects of the legal regulation of the use and protection of subsoil in the context of sustainable development are considered. The study of the presented direction requires an integrated approach that provides for the wide application of scientific knowledge from various fields. Subsoil use often leads to negative anthropogenic impact on the environment, which causes significant harm both to the environment as a whole, and to its individual components, natural objects.

Keywords: sustainable development, mineral resources, mineral resources, environment

The strategic goal of sustainable development of the Republic of Belarus is a dynamic increase in the level of well-being, enrichment of culture, the morality of the people on the basis of the intellectual and innovative development of the economic, social and spiritual spheres, preserving the environment for present and future generations. One should agree with the opinion of E. M. Babosov that sustainable development is a regulated development that provides for a high level of management activity and purposeful effective control by the state over the change staking place in the country in all segments of the socioeconomic and political system [1]. Realization of the concept of sustainable development as a program for future world development requires solving the problem: reflection of the principle of sustainable development "in all normative legal acts on the basis of which sustainable development is provided in the Republic of Belarus" [2].

Sustainable social and economic development of the country is largely determined by the balanced use and reproduction of natural resources, which are the basis of material production and national security. So in the subprogram "Study of mineral resources and the development of the mineral resources base" of the state program "Environmental protection and sustainable use of natural resources" for 2016–2020, approved by the resolution of the Council of Ministers of the Republic of Belarus No. 205 of March 17, 2016, it is stated that the main the purpose of the state program is tonsure the protection of the environment, rational nature management, environment al safety of the country and the transition to a "green" economy, as well as the fulfillment of the international obligations of the Republic of Belarus in the region and environmental protection. To achieve this goal, it is necessary to solve the problem of identifying mineral deposits, geological support of projects in the field of construction, melioration, defense, ecology, assessment and forecast of the state of mineral weal thin areas prone to dangerous geological processes and phenomena.

One of the essential conditions for increasing the efficiency of measures applied by the state in the field of use and protection of subsoil resources is the establishment of a more precise mechanism for compensation of caused to the environment as a result of violation of the legislation on the protection and use of mineral resources. In turn, the mechanism of compensate on for harm ensures the restoration of the state of the environment.

We believe that there is a need to improve the legal preventive mechanisms that ensure the preservation of the bowels, as well as the security of the processes of compensation for damage caused to the environment as a result of violation of the subsoil legislation, legal instruments. The development of a clear system of conceptual priorities in the sphere of the use and protection of mineral resources, their consistent consolidation in the legislation and implementation in law enforcement and law enforcement activities of state bodies will contribute to the sustainable development of relation son the use and protection of mineral resources.

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ENERGY ASSESSMENT OF FUEL BASED ON "TORF-CROWN" AND "TORF-IVA"

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The results of the study of the calorific ability of reeds and willow and on its basis mixtures of "peat-reed" and "peat-willow".

Keywords: peat, reed, short rotation coppice, willow, fuel

Currently, much attention has been paid to the problem of restoring peat bogs and using the territories of spent peatlands in the Republic of Belarus. Thus, the Resolution of the Council of Ministers of the Republic of Belarus No. 1111 of 30.12.2015 approved the "Strategy for Conservation and Rational Use of Peatlands", which defines the main problems in this area and the current state of peatlands. Proceeding from the document, restoration of not less than 15 % of the area (about 75 thousand hectares) should be provided.

The restoration of peat bogs is directed, first of all, to restoring the process of peat accumulation, which involves the interconnection of vegetation, water and peat. Ordinary cane can be used as vegetation in repeated flooding. In future, it can be used as biofuel during the 1st year from the beginning of the plantation.

Another area of use of the developed peat bogs is the cultivation of woody and shrubby species with a short period of willow growth (*Salix alba*), which grows on degraded soils.

Both these crops can be used as independent fuel in the form of pellets and chips, or it can be used as an additive to other types of fuel. The research aimed to determine the energy characteristics of the fuel, which is obtained as a result of mixing peat with willow and cane chips in different percentage ratios.

One of the energy characteristics of "peat-reed" and "peat-willow" fuel is its calorific value. The results of the study of the highest calorific value of cane burning at four selected sites of the OJSC «Lidsky Peat Briquette Works» and willows at the experimental site in Volma of Dzerzhinsky district are presented in Tables 1 and 2, respectively.

The lowest calorific value of milling peat is calculated according to the elementary composition and it is 8001 kJ / kg. When burning a mixture of fuels with a specified mass fraction, the net calorific value, kJ / kg, of 1 kg of the mixture is [1]:

$$Q_i^r = (Q_i^r)' g' + (Q_i^r)''(1 - g')$$

where $(Q_i^r)'$ is the heat of combustion of cane (willow), kJ / kg; g' is the share of cane (willow) in the mixture; $(Q_i^r)''$ is calorific value of peat, kJ / kg.

According to the formula (1), the calculation was carried out in 5 % increments in the range from 5 to 50 %. The results of the calculation are presented in Tables 3 and 4.

Table 1

Higher calorific value of cane

Site number	Q_s^a, max, kJ / kg	Q_s^a, min, kJ / kg	$\overline{Q}_s^a$, kJ / kg	σ
station 1	16594	15769	16356	270,4
station 2	16409	15875	16367	340,2
station 3	16760	15103	15578	224,7
station 4	16289	15870	14247	237,1

Note: when calculating the highest heat of combustion, the fuel samples S_t^a = 0,04%.

Table 2

Calorific Value of Willow Biomass Fraction

	Q_s^a, max, kJ / kg	Q_s^a, min, kJ / kg	$\overline{Q}_s^a$, kJ / kg	σ
stemwood	19718	18022	19080	577,4
branches with bark	19106	17801	18539	508,8
bark	18604	17372	17843	382,1
foliage	18826	17690	18076	438,4

Table 3

Lower heat of combustion of the mixture of "peat-reed"

Value	Reed content in the mixture									
	5 %	10 %	15 %	20 %	25 %	30 %	35 %	40 %	45 %	50 %
Net calorific value Q_i^r, kJ / kg	8418	8836	9254	9673	10091	10509	10927	11345	11763	12181

Table 4

Lower heat of combustion of a mixture of "peat-willow"

Value	Value	Willow content in the mixture									
		5 %	10 %	15 %	20 %	25 %	30 %	35 %	40 %	45 %	50 %
Net calorific value Q_i^r, kJ / kg	Net calorific value Q_i^r, kJ / kg	8542	9082	9623	10162	10703	11243	11783	12323	12863	13404

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ENVIRONMENTAL SAFETY: DISCUSSION OF CLIMATE CHANGE PROBLEMS

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The Republic of Belarus has ratified the Paris Agreement that was signed at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, on September 20, 2016. According to international estimates, the environmental efficiency index of the Republic of Belarus for 2016 is 82,3 percent (the Republic of Belarus ranks 35th among 180 countries).

Keywords: the Paris Agreement, greenhouse gas emissions, climate change, consequences of climate change.

In comparison with many other countries, the advantage of the Republic of Belarus is the higher adaptation potential of the country on the whole, due to:

• high rate of forest cover of the territory;
• availability of water resources;
• a considerable proportion of peatlands and special protection natural areas.

The obligations of the Republic of Belarus under the Paris Agreement are to reduce the greenhouse gas emissions by 28 percent by the year of 2030 compared to 1990. These obligations do not include the possibility of using the mechanism of international trade on the Carbon Markets and do not take into account the greenhouse gas emissions and leakages in the sector "Land use, land use change and forestry".

The activities of the Republic of Belarus in the field of climate change are the following:

• The legal framework has been created and is being improved, and strategies and programs have been developed and adopted in the field of energy efficiency, energy saving and climate change.
• Scientific research in the field of climate change is being carried out.
• The institutional framework for a national accounting and control system has been established to fulfill obligations under international climate agreements.
• A system of education, training and information in the field of climate has been established.
• International cooperation with other countries, international organizations, Programmes and Projects is carried out.

In the Republic of Belarus, it is planned to create a regulatory and legal framework for the period after 2020 aiming at stimulating the reduction of greenhouse gas emissions in the country, including the attraction of the latest technologies and financial support.

The National Plan for the implementation of the obligations of the Republic of Belarus under the Paris Agreement should be developed taking into account the rules and procedures that were developed and adopted in Marrakech with respect to all elements of the Paris Agreement: financing, adaptation, mitigation, forests, etc. In addition, the adoption of a number of decisions on the requirements for the national system, the issues of future reporting, adaptation, and requirements for a nationally-defined contribution are planning.

The process of climate change in the Republic of Belarus has both positive and negative consequences. Among the positive issues are: reduction in energy costs during the heating season; improving the structure and expansion of the plant growing zone, as well as improving the efficiency of livestock production (with a number of additional conditions and taking certain measures); increasing forest productivity.

Negative consequences of the expected results of climate change for the Republic of Belarus are: increased risk to health (increase in morbidity and mortality); increase in the frequency, intensity and duration of droughts in Brest and Grodno regions; extreme precipitation, floods in Vitebsk and Mogilev regions; increase of the fire risk in forest areas; violation of ecological balance, including the displacement of some biological species by others; the spread of new infectious and parasitic diseases; an increase in electricity consumption for air conditioning in the summer season in public areas.

Ecologically safe development of the country in the conditions of a changing climate can be ensured only by the joint participation of all sectors of economy of the Republic of Belarus on the basic of the necessary legislation. Important steps in solving these issues are: the transition to a "green economy", the modernization of production

processes, provision of energy efficiency of buildings, forests protection, the introduction of the principles of low-carbon agriculture, sustainable use of natural resources of the Republic of Belarus. Prevention measures are very important to reduce the risk of natural disaster consequences.

EMPIRICAL EVALUATION OF THE ARRIVAL OF THE DAILY SUM OF DIRECT AND SCATTERED RADIATION

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The article describes the use of empirical models that allow calculating the arrival of direct and scattered radiation.

Keywords: scattered radiation, empirical model, solar radiation.

In the world practice, a number of empirical models are used that allow calculating the arrival of direct and scattered radiation on the basis of monthly data of total solar radiation, among which the models of Collares-Pereira, Reible, and others can be distinguished.

Comparing the results of the simulation with the actual measured values of the input of scattered solar radiation, it was proved that the proposed models are not acceptable for the territory of Belarus. This discrepancy is due to a number of factors, such as: the difference between measurement techniques, methods of data correlation, geographical location of registration and data completeness.

Special interest is caused by the data of the daily sum of total solar radiation, design and operation of active and passive energy supply systems are only estimated when solving engineering problems related to the modeling.

In the development of correlation relationships of the empirical estimation of the daily daily and scattered solar radiation fluxes, surface network actinometric observations were carried out by the State Republican Hydrometeorological Center of the Minsk Oblast Medical Academy Minsk (φ = 53,92 °, λ = 27,63 °) obtained for the period from 2006–2015 years.

Based on the results of the study, the following equations were obtained:

$$H_D = H_Q \begin{cases} 0{,}99 & K_T \le 0{,}17 \\ -0{,}5792K_T^2 - 0{,}9643K_T + 1{,}2111 & 0{,}17 \ge K_T > 0{,}75 \\ -0{,}0318K_T + 0{,}2619 & 0{,}75 \ge K_T > 0{,}8 \\ 4{,}4082K_T - 3{,}3433 & K_T \ge 0{,}8 \end{cases}$$

where H_Q – is the total solar radiation, MJ / m2; H_D – scattered solar radiation, MJ / m2; $K_T = H/H_0$ – the index of atmospheric clarity, characterizes the ratio of the actual total solar radiation entering the earth's surface H to solar radiation entering the upper boundary of the atmosphere H_0.

Direct solar radiation H_S, MJ / m2, is determined by the formula:

$$H_S = H_Q - H_D$$

The reliability of the approximation of the proposed equations (for the number of arguments in the sample n = 2888) between the measured and calculated values of the total solar radiation is R2 = 0,88. A graphic interpretation of the approximation H_D/H_Q is shown in Fig. 1.

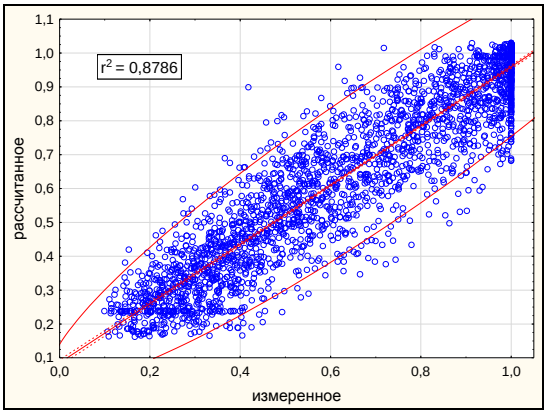

Figure 1 – Reliability of the approximation between the measured and calculated values H_D/H_Q

The statistical processing of the results of the study was carried out using the statistical package STATISTICA v.10.

The above presented results obtained for the MHM Minsk are adequate for an empirical assessment of the receipt of daily amounts of direct and scattered radiation arriving on a horizontal surface within the borders of Belarus.

THE ANALYSIS OF POLLUTANT EMISSIONS INTO THE ATMOSPHERE AT OJSC "BARHIM"

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The analysis of pollutant emissions into the atmosphere at OJSC "Barhim" has been conducted in that term paper. The most significant pollutants during the period of 2010–2015 have been identified, as well as substances that were not present due to the changes in the technological process and are not emitted at the present time.

Keywords: contaminants, atmosphere, emission source, xylenes, aromatic hydrocarbons, toluene, measures to reduce pollutant emissions.

At the present time, 71 sources of pollutant emissions are in operation at OJSC "Barhim". The nomenclature of pollutants is 33 substances, among which the priority ones are xylenes (hazard class 3), inorganic dust containing SiO_2 < 70 % (hazard class 3), toluene (hazard class 3), aromatic hydrocarbons (hazard class 2), alicyclic hydrocarbons (hazard class 4), saturated hydrocarbons of the aliphatic series C_1–C_{10} (hazard class 4), saturated hydrocarbons of the aliphatic series C_{11}–C_{19} (hazard class 4), unsaturated hydrocarbons of aliphatic series (hazard class 4). The company is referred to as hazard class 4 and the size of the sanitary protection zone is 100 m.

The dynamics of pollutant emissions into the atmosphere at OJSC "Barhim" for the period 2010–2015 have been analyzed. For the analysis, pollutants with the maximum volume of formation for the period under study have been chosen.

The emissions of xylenes were found to be 0,001 tons in 2010, these emissions were 0,340 tons in 2013, and they increased to 0,577 tons in 2015. This increase is associated with a significant expansion of the production of liquid detergents.

The emissions of such a polluting substance as inorganic dust with a SiO_2 < 70 % occur in the mechanical repair area during machining metals, welding and cutting metals (equipment). The emissions were 0,032 tons in 2010, 0,188 tons in 2013, 0,194 tons in 2015, thus, it is possible to trace the trend of increasing this type of emissions of polluting substances.

The emissions of toluene, aromatic hydrocarbons and alicyclic hydrocarbons are formed in the maintenance-energy area as well as in the compressor and transformer sectors during mechanical processing of metals, repair of pallets, repair and construction works, production of steam and hot water for the production of granular synthetic detergents. From 2010 to 2015, the emissions of toluene have increased by 0,063 tons, since in this period more paint work was done, namely painting equipment and vehicles. The emissions of aromatic hydrocarbons and alicyclic hydrocarbons have increased by 0,032 tons and by 0,033 tons respectively.

Saturated hydrocarbons of the aliphatic series C_1–C_{10}, saturated hydrocarbons of the aliphatic series C_{11} –C_{19} and unsaturated hydrocarbons of aliphatic series are formed during loading and unloading operations, as well as during transportation of raw materials and finished products, including fueling of the vehicles, at transport and loading site. The emissions of saturated hydrocarbons of the aliphatic series C_1–C_{10} were 0.104 tons in 2010, 0,043 tons in 2013, and 0.041 tons in 2015, thereby it is possible to trace the trend of reducing the emissions of this type of pollutants. The emissions of saturated hydrocarbons of the aliphatic series C_{11}–C_{19} have decreased by 0,005 tons during this period. The emissions of unsaturated hydrocarbons of aliphatic series increased by 0,042 tons from 2010 to 2012, the emissions decreased by 0,027 tons from 2012 to 2013 and by the end of 2015 the emissions were 0,047 tons, thus in comparison with 2013, they have increased by 0,027 tons.

The analysis of pollutant emissions into the atmosphere at OJSC "Barhim"during the period of 2010–2015 has shown that in the first place in the terms of formation there are xylenes, namely 1,449 tons, which is 46 %. In the second place, there is inorganic dust with SiO_2 <70 %, namely 0,698 t, which is 22 %. In the third place there are saturated hydrocarbons of the aliphatic series C_1–C_{10}, namely 0,333 t, which is 11 % of the total volume of the emissions.

By the end of 2015, such substances as wood dust, benz(a)pyrene, fluorine gaseous compounds – hydrofluorides, as well as benzene, were not present due to the changes in the technological process and are not emitted by the enterprise at the present time.

The company annually carries out measures to reduce pollutant emissions into the atmosphere, such as the replacement of bag filters of gas cleaning systems, control of the exhaust gases and smoke content in vehicle exhaust, control of pollutants in the sanitary protection zone, obtaining permits for the emission of pollutants into the atmosphere, verification of the efficiency of gas cleaning systems (tests are conducted during the stocktaking), technical inspection of gas cleaning installations by the commission.

AUTOMATION OF POWER MANAGEMENT IN THE EDUCATIONAL BUILDING

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The purpose of the developed automated system is the optimization of energy consumption, ensuring the reliability of data on accounting of consumption of energy resources, increase in comfort due to informing and automatic control of resources. It will allow not only to control the current electricity consumption, but also in an emergency situation automatically to block power supply or to use alternative power engineering. In the future the automated system will allow to carry out self-regulation on management of certain components of system.

Keywords: automated system, power management, microcomputer Raspberry Pi, MySQL.

The application of modern means and the systems of automation allows to perform the following problems:

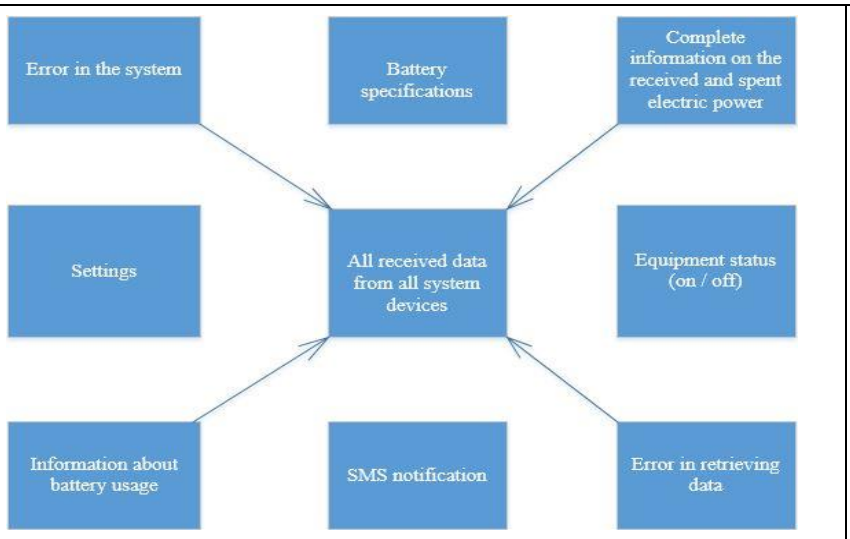
• to conduct the process with the maximum efficiency automatically taking into account continuous changes of technological parameters, properties of raw materials, changes in the environment, possible human mistakes;

• to operate process by expeditious reorganization of the modes of technological equipment, redistribution of actions on the same equipment, etc.;

• to operate automatically the technological processes under harmful or dangerous conditions [1].

The object of automation is monitoring and control of power supply of the educational building of ISEI. As a basis of the control system the one-paid microcomputer of Raspberry Pi is chosen. A feature of this microcomputer is that it can work under control of Windows and Linux operating systems and also Android mobile operating system. Besides standard interface, inherent in the computer the Raspberry Pi has exits for connection of external devices that broadens the scope of its application in the systems of different level of automation.

As storage of data it is chosen MySQL database. The scheme of base is provided on the Figure 1.



The central link in base (it is specified by shooters) is the module storing information from all devices which are built in system: from stationary sources of power supply, from the solar batteries, on energy from the accumulators

Figure 1 – The schema of database

Today all such systems (e. g. "Smart house"), are expensive, so not each person or the enterprise is able to afford to acquire such system. The presented system, considerably will lower expenses. Also, the system is quite compact and can quietly be located in a box, but not occupy the whole room.

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THE FUTURE OF FOOD: MEAT ALERNATIVES

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The influence of livestock farming on the general state of the planet is discussed in this work. There are many negative effects of irrational meat consumption such as hungry in ones countries and obesity in others. Changing of climate is linked with greenhouse gases, which located in the processes of animals live activity.

Keywords: meat, climate change, greenhouse gas, global hungry, alternatives of animal protein, crickets, cell culture, yields, hem.

Focusing only on energy policy it is not enough to head off climate change successfully [1].

The livestock sector is a large source of global greenhouse gas emissions such as carbon dioxide, methan and nutrious oxide. The livestock sector is also a disproportionate user of land and water, and a major contributor to deforestation due to the soya required to produce animal feed. Despite growing evidence that animal agriculture is damaging the planet, the Western diet isn't likely to change anytime soon. In fact, studies suggest rising incomes and urbanization are actually fueling a global dietary shift toward consuming even more meat and dairy in the future. Earth cannot continue to support a population of 7 billion people and 70 billion animals they raise and slaughter each year for food. Meat consumption is growing faster than the overall population.

Over the past few years, a handful of enterprising startups have sprung up with the goal of creating animal-free meat. The scores of companies are developing animal protein alternatives – made from ingredients like insects, plants and yeast – to address these challenges [2].

Using insects instead animal meat can significantly reduce greenhouse gases emission and amounts of require water. For example, students at Rhode Island's Brown University created cricket flour from insects. Moreover, for every hundred pounds of feed, you get 60 pounds of cricket protein – 12 times the average yield from cattle.

Impossible Foods, The Silicon Valley, California, created a completely plant-based burger that actually tastes – and bleeds – like real meat. And the burger is only the beginning. Impossible's scientists already have concept products for chicken, pork, fish, and even a kind of yogurt that is entirely plant based.

Beyond Meat company doesn't grow fake meat in a lab. Instead, it uses a specific combination of plant proteins to create a meat-like burger patty.

Clara Foods is working toward a completely animal-free egg white substitute. While quite a few options already exist, those substitutes are often insufficient for sensitive applications like angel food cakes, meringues, and macaroons. So the company is taking things a step further by actually building the egg whites "from the ground up".

Cutting down on meat is where the best public health opportunity lies in relation to climate change. Moving away from meat would also help farmers to use nitrogen more efficiently, which would have the dual impact of causing less pollution while also helping people get more nutrition from the foods they grow.

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MAIN DIRECTIONS OF THE DEVELOPMENT OF "GREEN" ECONOMY IN THE REPUBLIC OF BELARUS

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The concept of greenways is becoming more and more popular in Belarus. It is based on an integrated approach and presents cultural and natural heritage as a whole phenomenon. The"green" economy aims to improve the wellbeing of people and mitigate environmental risks. Nature is a key resource from the perspective of the "green" concept. Application of modern, efficient strategies helps to benefit from its advantages without causing damage [1–3].

Keywords: sustainable, cities, municipalities, urban ecology.

Main directions of the development of "green" economy in the Republic of Belarus are as follows:

1.Reducing the energy intensity of the gross domestic product, increasing energy efficiency, including through the introduction of energy-efficient technologies and materials;

2.Sustainable consumption and production, including government sustainable ("green") purchases;

3.Increasing the potential of renewable energy sources;

4.Development of electric transport (infrastructure) and urban mobility, implementation of the "smart" cities conception;

5.Construction of energy efficient residential buildings and increasing an energy efficiency of housing stock;

6.Creation of conditions for the production of organic products;

7.Development of ecological tourism and, in particular, ecological tourism in specially protected areas.

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