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**STRES RESISTANCE AND PRODUCTIVE HEALTH
ANIMAL MOTHERS AND THEIR OFFSPRING***Kazan (Volga) Federal University
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**СТРЕССУСТОЙЧИВОСТЬ И ПРОДУКТИВНОЕ ЗДОРОВЬЕ
ЖИВОТНЫХ-МАТЕРЕЙ И ИХ ПОТОМСТВА***Казанский (Приволжский) федеральный университет
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Аннотация. Нами установлено неизвестное ранее явление регрессии иммунных функции плацентарных жвачных животных в период беременности, заключающееся в том, что в организме как сложной иммунобиологической системе имеется множественная относительно постоянная регрессия его функции иммунного качества (алгоритма), выражающаяся в зависимости (синхронности) их количественных и качественных характеристик, степень ее выраженности. Снижение жизнеспособности связано с морфологическими и физиологическими показателями крови и чаще проявляется в системе мать-плод-новорожденный при патологии беременности.

Ключевые слова: стресс-факторы, стресс-чувствительность, регрессия, иммунная, функция, беременность, жвачные плацентарные животные, потомство.

Introduction.

When different technologies and produce offspring during its adaptation to growing conditions, and feeding on the offspring of placental ruminant animals affected by numerous unfavorable stress factors significantly reduce the symptoms of hereditary stability and productive health. Progeny placental ruminant animals with weak natural defense mechanisms and exhausted adaptation system are often prone to various diseases first days and months after birth - in the early stages of growth and development [1-6].

The purpose and objectives of the present work to study the formation and productive health stressustoychivosti animal mothers and their offspring Material and research methods. Given the characteristics of the offspring of placental ruminant animals, the goal and objectives we decided as follows. For this, 128 lambs at birth from the umbilical cord and jugular vein blood was taken to determine the immunobiological status in the future to reproduce in a laboratory stress reactions in the peripheral blood system in newborns. As a result of newborn lambs stresschuvstvitelnosti Definitions 2 groups of animals formed. In pervuyu-experimental group consisted of animals with the lowest degree of sensitivity to the 0.1% solution of epinephrine hydrochloride. Second group - control animals entered with a high degree of sensitivity to a solution of 0.1% epinephrine. In each group of 10 newborn lambs.



The results of research.

Newborn animals with symptoms stresschuvstvitelnosti low number of intact cells after 30, 60, 120 minutes of incubation, respectively, remained on average 96.0; 88.5; 67.5 (polynuclears - 98, 92, 63; mononuclear - 94, 85, 72). Newborn lambs with a high degree of manifestation stresschuvstvitelnosti inferior in the number of white blood cells undamaged to their peers in the control group. The number of intact leukocytes of the control group after 30, 60 and 120 minutes of incubation averaged 76.0; 58.5; 42.5; polynuclears - 82, 79, 44; mononuclear-74, 65, 42.

As the analysis of morbidity and mortality of lambs that during the first months of early postnatal growth and development, all of the lambs in the control group had been ill, while sick in the control group, only 4 out of 10. Mortality lamb lambs in the experimental group for 3 months in the early postnatal period It was 3 animals, which accounted for 30 percent. In the control group mortality cases lambs were observed.

Discussion of research results.

Theoretical analysis and experimental data results of the study showed that the method of determining the stress reactions to adrenaline hydrochloride and degree of symptoms of sensitivity to it makes it possible to differentiate newborn on stressustoychivoe and stresschuvstvitelnoe offspring placental ruminant animals. Stressustoychivye lambs for the manifestation of stress reactions to adrenaline hydrochloride significantly superior stresschuvstvitelnyh animals in terms of productive health, especially in absolute body weight. On the basis of differences in growth rates and development, lambs with different manifestations of stress - reaction and sensitivity to adverse stress - factors that are regulating mechanisms of nervous, endocrine, immune and metabolic processes at the organism level, organ, tissue and cell structural and functional phenomena, properties and laws, which involve and corticosteroid hormones. Hydrocortisone and corticosterone hormones involved in the regulation of metabolism of organic substances. The strongest in the metabolism of the growing organism is influenced by glucocorticoids, so the lambs because of their constitutional peculiarities caused by heredity, are more responsive to the effects of different stressors environment and therefore some are ahead, while others lag behind in growth and development in the early stages postnatal ontogenesis.

Summary and Conclusions.

We have found previously unknown phenomenon of regression immune function ruminant placental animals during pregnancy, which consists in the fact that in the body as an immunobiological system has multiple relatively constant regression of its quality of immune function (algorithm), which is expressed as a function (synchronism) their quantitative characteristics, severity . Reduced vitality has a direct relationship with the health indicators of the productive and with morphological and physiological indicators of peripheral blood. This occurs most often in the mother-fetus-newborn at a pathology of pregnancy placental ruminant animals.

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j1101-002

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ECOPHYSIOLOGICAL CONTROL OF ORGANOPHOSPHORIC PESTICIDES IMPACT ON AGROPHYTOCENOSIS

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**ЭКОФИЗИОЛОГИЧЕСКИЙ КОНТРОЛЬ ВЛИЯНИЯ
ФОСФОРОРГАНИЧЕСКИХ ПЕСТИЦИДОВ НА АГРОФИТОЦЕНОЗЫ**

Abstract. There have been revealed the changes in plant organisms under the influence of organophosphoric pesticides on ecophysiological level. There also has been detected the index evaluating the toxicity of preparations for plant organism. It is illustrated that on physiological level as for the chlorophyll content more sensible is chlorophyll –b which can be used for ecophysiological control of the dangerous influence of organophosphoric pesticides on phytocenosis.

Key words: organophosphoric pesticides, chlorophyll, toxicity of preparations, ecophysiological level.

Аннотация. Выявлены изменения в растительных организмах под влиянием фосфорорганических пестицидов на экофизиологическом уровне. Определен показатель, за изменениями которого, можно оценивать токсичность препаратов для растительного организма. Показано, что на физиологическом уровне относительно содержания хлорофилла, более чувствительным является хлорофилл в, который может быть использован для экофизиологического контроля опасного воздействия фосфорорганических пестицидов на фитоценозы.

Ключевые слова: фосфорорганические пестициды, хлорофилл, токсичность препаратов, экофизиологический контроль.

Active use of xenobiotics - foreign compounds, for which there are no natural biogeochemical cycles, constantly provokes soil pollution problem, which is very serious nowadays. Among them quite a number of chlororganic and organophosphoric pesticides characterized by resistance to photolysis and thermal destruction [1]. The systematic use of pesticides in agriculture causes that they become a permanent environmental factor that modifies and shapes the macro and microbiocenosis. The agrophytocenosis and their components: soils of agriculturally used areas, vegetation, land and soil biota, water bodies, including groundwater are subject to primary impact of pesticides.

At the present time the biotest methods [2, 5] are widely used to assess the negative impact of toxic substances on agrophytocenosis, i.e. the test objects reacting to changes in the environment under the influence of various factors.

The researchers are conducted at the organism and physiological levels. In particular, one of the physiological parameters is the chlorophyll, which is a component of the pigment system of chloroplasts, where photosynthesis takes place, ensuring the vital activity of living organisms. The chlorophyll *a* is the main functional pigment, which is a direct energy donor for photosynthetic reactions. All



other pigments, such as: chlorophyll *b*, carotinoids, as well as some of the chlorophyll's *a* molecules - are the accessory pigments performing auxiliary functions [3]. It is important to observe the change in the concentration of pigments, depending on the pesticide content in the plant, as it will be possible to monitor the accumulation of biomass by plants during photosynthesis process.

Thus, seeking the most informative universal test objects for determining the toxic properties of substances and mixtures thereof is in progress.

Work objective. Identifying influence patterns of organophosphoric pesticides (famidofos - insecticide and derozal - fungicide) on plant metabolism in "pesticide – plant " relationship and defining the safe xenobiotics concentration for the ecosystem according to their reaction.

Materials and methods. The studies were conducted in April 2010 at the laboratory of the National University of Life and Environmental Sciences of Ukraine at the General Ecology and Life Safety Department.

In our studies we determined the changes in plant organisms influenced by organophosphoric pesticides on ecophysiological level. It is known that pigment complex plant organism is characterized by considerable sensitivity to environmental conditions, so it is often used as one of the expressive characteristics of the photosynthetic apparatus to adapt to unfavourable factors [4]. That is why just the chlorophyll was decided as one of the indicators of physiological state of the plants, which allows tracking the plant performance in the accumulation of organic substances formed during photosynthesis.

As a test object the spring wheat "Rannia 93" is taken. The soil - a typical light loamy chernozem. To conduct researches the man-made soil pollution by pesticides such as "derozal" and "Bi- 58" ("famidofos") were prepared. The greenhouse trial design and the soil preparation were carried out under the Yudin method [6].

The seeds for investigation were taken of high quality as its similarity varied between 94 -100%. The Petri dishes were applied for seed sprouting. To conduct the greenhouse trial the cells filled with the same value of soil were used.

The test was run in four options and three duplications under the scheme presented in Table. 1.

1. The scheme of greenhouse trial using the spring wheat "Rannia 93" as a plant test-object

S/No	Product name	Pesticides application rate in kg/ha	Entered active substance, mg
1 st option	Control	–	–
2 nd option	Bi-58	0,5	0,004
3 rd option	Derozal	0,5	0,004
4 th option	Mix (Derozal + Bi-58)	0,25+0,25	0,004

The seeds were planted in the cell with the prepared soil (moisture content



60%). Watering was carried out with the same volume of water. The room temperature ranged between 20-23⁰C.

The experimental plant material was collected in the third leaf stage. 10 plants from different points were taken from each cell; determined the average values of plant growth for the replicates for each variant separately. In order to identify changes in plants under the influence of pesticides at the organismal level we measured the culm height and root length, determined their mass. At the physiological level we measured chlorophyll a and b.

Chlorophyll from green wheat leaves, pounded in a mortar, was removed using a 90% ethanol solution. The subsample of live green plants (0.2 g) was crushed in a mortar with 3.2 ml of ethyl alcohol; added 4.5 ml of alcohol and grinded up within several minutes. After equilibrating the extract was filtered, then the filtrate was adjusted to 25 ml. in dimensional cones closed with a glass stopper, shake up thoroughly and used to detect the concentration of pigments.

Determination of plant physiological parameters was performed with the aim of spectrophotometric analysis using a digital spectrophotometer UV-VIS PD-303 UV [3]. Extract density was measured with a spectrophotometer at a wavelength corresponding to the chlorophyll a (663 nm) and b (644 nm) peak absorption within the red spectral region.

The results of the researches. The results we delivered, show (Fig. 1), that usage of organophosphoric pesticides in concentrations not exceeding one normal range against pests (Bi-58) and plant diseases (Derozal) almost never carry a negative influence on morphological indicators of plant growth and development. More significant was the influence of a mixture of drugs to culm height (stagnation by 16.08%), while a greater impact on the length of the root system of plants is evaluated in the version with an insecticide “Bi-58 (decrease in growth of 20.51% as compared to control).

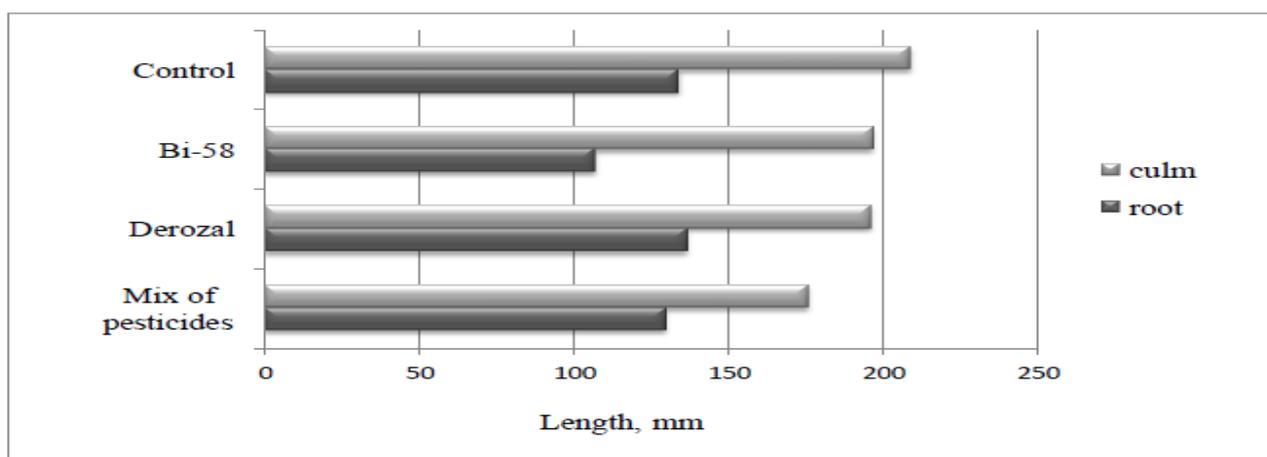


Fig. 1. The influence of organophosphoric pesticides on culms height and roots length of “Rannia 93”spring wheat plants

It emerged that more indicative is the influence of organophosphoric specimens on plant organisms at the physiological level (Table. 2).



2. The influence of organophosphoric pesticides on chlorophyll content in “Rannia 93” spring wheat plants (the third crop stage)

Option	Plants mass, % to control	Chlorophyll content, % to control	
		Chlorophyll <i>a</i>	Chlorophyll <i>b</i>
Control	100	100	100
Bi-58	90,3	61,0	55,3
Derozal	99,7	98,3	72,4
Mix	85,6	44,4	25,3

Besides, a higher phytotoxicity showed the specimen “Bi-58” that coincides with its high toxicity to other living organisms (animal and human) as well. The synergistic effect of test items is enormously vividly shown itself just here. It is interesting to note that more sensitive to both specimens became the chlorophyll b compared to chlorophyll a. There is a direct correlation of pesticides influence on the mass of plants and chlorophyll content in it (Fig. 2).

However, just at the physiological level the plants appeared more sensitive to the action of both specimens but especially it is concerned the chlorophyll b.

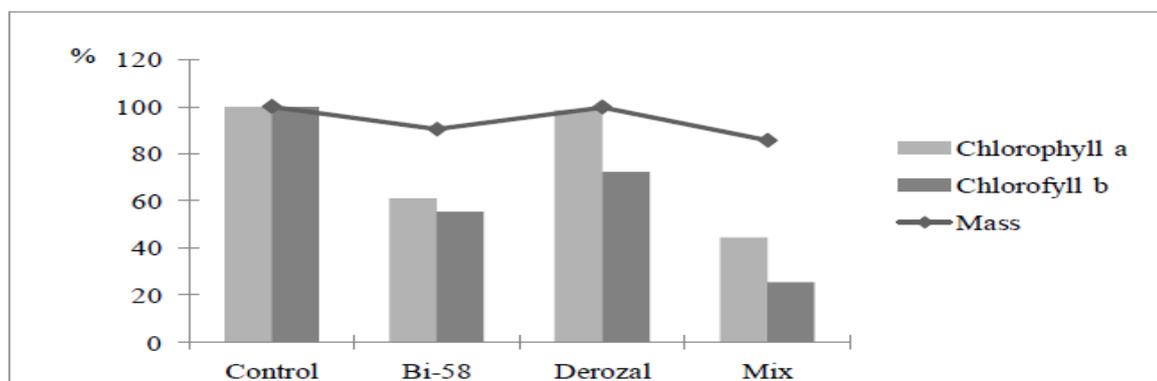


Fig. 2. “Rannia 93” spring wheat plants mass and chlorophyll content reliance on organophosphoric pesticides

Summary and conclusions. The most “Rannia 93” wheat plant’s culm stagnation has manifested in a variant with a mixture of both specimens, and the root down growth - in the version with the insecticide Bi-58. It has been established that the sensitivity of the “Rannia 93” wheat plants organisms is higher at the physiological level as compared with the morphological growth rates.

The tests have shown that at the physiological the more sensitive is the chlorophyll b, which can be used to ecophysiological control of safety impact of organophosphoric pesticides on phytocenosis. This will enable to foresee a threat to the environment and to ensure the ecological safety of the agrophytocenosis.



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ADMINISTRATIVE MECHANISMS OF ENVIRONMENTAL
MANAGEMENT FOR SUSTAINABLE DEVELOPMENT OF RUSSIAN
RURAL TERRITORIES

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АДМИНИСТРАТИВНЫЕ МЕХАНИЗМЫ УПРАВЛЕНИЯ ОХРАНОЙ
ОКРУЖАЮЩЕЙ СРЕДЫ ДЛЯ УСТОЙЧИВОГО РАЗВИТИЯ
СЕЛЬСКИХ ТЕРРИТОРИЙ РОССИЙСКОЙ ФЕДЕРАЦИИ

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Abstract. Administrative control of environmental management and protection is a component of social management, one of the most important functions of the Russian Federation. It generally manifests itself as government organizational activities on regulation of maintenance of requirements in environment protection by business entities. In this article, the authors provide an analysis of existing in the Russian Federation of methods and tools for environmental management in rural areas.

Keywords: environmental management, rural territories, sustainable development.

Аннотация. Административное управление природопользованием и охраны окружающей среды является составной частью социального управления, одной из важнейших функций Российской Федерации. Как правило, оно проявляется через государственные организационные мероприятия по регулированию содержания требований в области охраны окружающей среды хозяйствующими субъектами. В данной статье авторами приведен анализ существующих в Российской Федерации методов и инструментов управления охраной окружающей среды в сельских районах.

Ключевые слова: экологический менеджмент, сельские территории, устойчивое развитие.

Introduction. Experience of many developed countries demonstrates that the government plays an important role in formation of market economy, as well as in organization of its efficient functioning. Even in those countries where the principle of government non-interference in economy is enunciated (for example, the USA), in practice it significantly influences economic development. That is particularly true for a such uncommon area as natural management where the range of government influence may be rather wide – from direct administrative compulsion to formation of institutional conditions for market self-regulation of some areas of environment protection.

The main principle of administrative environmental management is one of permission and prohibition (management is executed by means of introduction of



instructions for compulsory implementation (legal acts) and control of compliance with these instructions). Herewith, management is executed directly or by notified bodies.

Therefore, effective operation of state authority in environment management in rural territories must promote implementation of plans, programs, activities in environmental management and environment protection and environmental security in general; maintenance of requirements of environmental law by all enterprises regardless of their form of ownership; achievement of sustainable development of rural territories.

Material and methods. The aim of our research is ecological and legal analysis of the application of the existing administrative arrangements for environmental management and environmental protection. Originally, examined existing mechanisms in the Russian Federation administration. After this, we evaluated the applicability of each mechanism in rural area. Proposed basic approaches to environmental management and environmental protection in rural settlements. The work is the analysis and assessment of the existing norms of the Russian environmental legislation.

Results and discussion. The central place in administrative regulation belongs to the system of environmental standards that implies establishment of norms and requirements being uniform and obligatory for all objects of management environmental.

According to environmental legislation of the Russian Federation environmental load rationing is performed for the purpose of state regulation of anthropogenic influence on the environment ensuring the maintenance of favourable environment and environmental security of the population. The purpose determined in that way implies establishment of boundary conditions (standards) on the influence, environmental factors and replies of ecological systems.

The Federal Law «On environment protection» classifies as standards on environmental quality: standard on allowable emissions and dumping of substances and microorganisms; standard on production and consumption waste generating and disposal limits; standards on allowable physical impacts; standards on allowable removal of environmental components; standards on allowable anthropogenic stress on environment; standards on other allowable impact on environment in carrying out economic and other types of activity established by legislation of the RF and legislation of the regions of the RF for environment protection. In this regard, the following types of standards are indicated in the Russian practice of prevention of adverse environmental impact: sanitary and hygienic (maximum allowable concentration, tentative safe exposure level, etc.), production and economic (maximum allowable emissions, limit reset, waste limit, etc), complex environmental standards.

It must be noted that production and economic standards (standards of allowable impact) are applicable at certain enterprises and can be an effective economic «leverage» in maintenance of natural and resource potential in rural territories.

Environmental management is carried out by withdrawal of substance from nature and carrying in pollutants. Accordingly limitation is carried out by setting the



limit norm of resource withdrawal as well as emission standards and discharge norms and waste emplacement.

Administrative methods of environmental management also suggest formation of system and carrying out control of organizational and economic activities for implementation of the state environmental policy. Such activities include: environmental monitoring, registration and control of environment protection activity of users of natural resources, environmental assessment and audit, organization of scientific and research work, carrying out environmental renovation and nature conservation, international environmental cooperation, etc.

The Article 32 of the federal law «On environment protection» is devoted to environment impact assessment (EIA) for the proposed economic and other activities that may have a direct or indirect impact on the environment. EIA is performed in the development of all alternative variants of pre-project documentation including pre-investment and project documents, justifying planned economic or other activity with participation of non-governmental organizations.

EIA is organized and performed while preparation of programmes and plans of social and economic development, schemes of complex use and protection of natural resources, documentation for the development of new machinery, technology, materials, pre-project grounds of investments in building, technical and economic grounds and building projects of new, reconstruction, expansion of existing economic and other facilities and complexes. The result of the EIA is the conclusion of the customer on the tolerability of the impact of the planned activities on the environment. Information about the state of the environment used in the EIA, is prepared by the methods of measuring meeting the requirements of Russian legislation and regulations to ensure the uniformity of measurements. The EIA results are submitted by the customer for the state ecological expertise.

Environmental assessment of projects is a compulsory part of the general project assessment. It must establish that the company will not excessively impact on the environment and affect the operation of neighboring businesses, breaking the technological process through the environment. Environmental assessment of projects involves the assessment of long-term impact on natural resources, natural conditions, factor of further economic development and living conditions.

Also the effective environmental management is impossible without a system of environmental accounting (fig. 1).

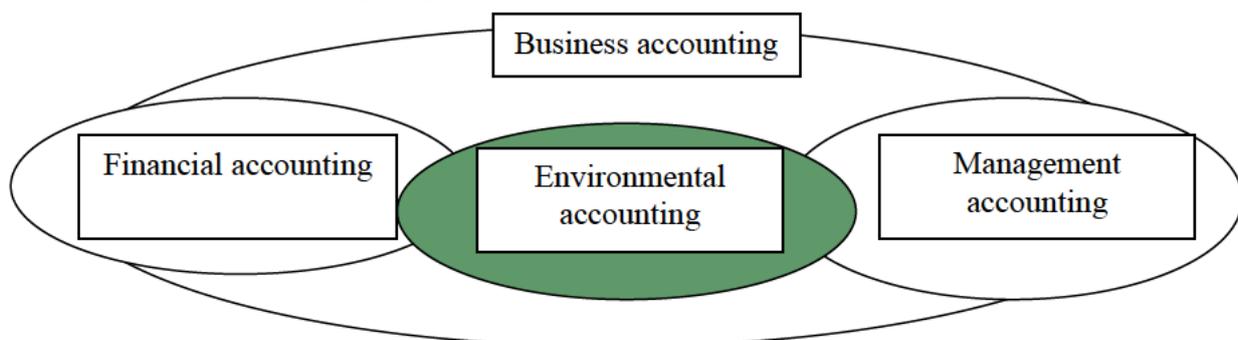


Fig. 1. Place of environmental accounting in reporting and accounting system of an entity



Environmental audit is a management tool in the field of environmental protection and management. Environmental audit is a procedure of authentication of compliance of the enterprise (entity) activity with legal requirements to ensure technogenic safety of the environment and environmental security of the company, the reliability of its financial obligations, financial reporting and accounting records of payments for environmental management, performed by an environmental audit company (or environmental auditor) to improve human and environmental safety and investment attractiveness of enterprises. Environmental auditing is environmentally oriented activities carried out by independent audit firms and auditors, and which includes organizing and performing environmental audits of enterprises and providing them with audit services.

Conclusions. Thus, the main principle of administrative environmental management is a permissive-prohibitive one. The core of the principle is that the relevant authorized bodies of the government set limits on the use of natural resources, emission of pollutants, waste disposal, etc. and in accordance with them issue the licenses for environmental management. In addition, the stated power structures have the right to suspend the activities of enterprises in the case of non-compliance with the norms of environmental security, draw up reports and to impose administrative penalties on citizens and officials for violations of environmental laws. We see that there are a lot of administrative mechanisms of environmental management and environment protection, and at the moment all of them work. Still, the main feature is that these mechanisms are mostly prescribed for the production (industry, agriculture). The areas of environment protection, resource reproduction require enormous work on developing relevant regulations governing environmental relationships.

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THE MORPHOMETRIC PARAMETERS OF THE SPLEEN IN POIKILOTERMIC ANOMALS AS BIOMARKER OF ENVIROMENTAL CONDITIONS

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МОРФОМЕТРИЧНІ ПАРАМЕТРИ СЕЛЕЗІНКИ ПОЙКІЛОТЕРМНИХ ТВАРИН ЯК БІОМАРКЕР СТАНУ ДОВКІЛЛЯ

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Abstract. The morphometric feature of parameters of the spleen in poikilothermic animals (wels catfish, marsh frog, lizard green) is considered in this work. These values proposed to use as biomarkers in the system of the biomonitoring of environment and creating optimum conditions for aquatic organisms. The histological preparations of spleen were received after fixation for study. The Van-Ghisoni` method has used with the hematoxylin and eosin staining. Relative weight of spleen was equal to $0,086 \pm 0,0006\%$ in wels catfish, $0,1170 \pm 0,0215\%$ in marsh frogs and $0,099 \pm 0,021\%$ in green lizards. The relative area of support-contractile apparatus was $7,04 \pm 0,65\%$, $5,39 \pm 0,07\%$, $5,21 \pm 1,47\%$ respectively. White pulp took from $13,36 \pm 1,80\%$ in green lizards to $22,14 \pm 6,61\%$ in a fish relative area of the spleen. The value white to red pulp was 1: 3.2 (fish), 1: 5.25 (frog), 1: 5.99 (lizard).

Keywords: spleen, morphometry, fish, reptiles, amphibians, relative weight, relative area.

Introduction. The modern and promising method of the biological indication has been successfully used for integrated assessment of the ecological state of the environment; the natural reaction, which was identified, often extrapolated from animals to humans. Bioindicators are representing the different classes of poikilothermic amniotes (wels catfish, marsh frog, green lizard). The biomarkers are presented the morphological parameters, including the splenic relative mass (RM) and relative area of the main structural units [1, 2, 3]. These options should be considered for assessing the physiological status of fish and creating optimal conditions for the aquatic during their formation [4].

The aim of the study was assessed the histological and morphometrical marks of the morphological structures of the spleen in the wels catfish, marsh frog, green lizards, which based on diagnostic capabilities, morphological and morphometric parameters.

The object of the study was the spleen of mature animals of both sexes in the ratio of 1: 1 in the phase morphofunctional maturity of organ: the wels catfish (the age of 2 years), the marsh frogs (the age of 24-26 months), the green lizards (the age



of 23-25 months) in number 20-38 individuals from Zhytomyr region.

The pieces of material recorded in 10-12% aqueous solution of formalin and neutral liquid Karnua for histology research [5]. Paraffin sections were stained with hematoxylin and eosin by Van-Ghisoni's method [5]. Morphometry was performed according to recommendations [5]. All experimental parts of the study were established in accordance to the international principles "of the European Convention for the protection of vertebrate animals used in experiments and other scientific purposes" (Strasbourg, 1986) and the relevant law of Ukraine "On protection of animals from cruelty" (number 3446-IV of 21.02.2006, Kyiv).

The relative weight of spleen is the smallest in fish and the biggest in frogs according to studies (Table 1).

Spleen formed the stroma and parenchyma in studied animals. Stroma formed with capsule and trabeculae, which together form a support-contractile apparatus (SCA). It is the most received in fish (see tab. 1), the percentage of capsules in fish was 46,22% in frogs – 68,83% and 85,61% in lizards. Average thickness of the capsule of the spleen is $21,85 \pm 7,44$ micrometers in fish, $19,37 \pm 4,45$ micrometers in frogs, $11,04 \pm 3,30$ micrometers in lizards. The capsule was clearly formed, but the trabeculae are not formed. The pulp's trabeculae are detected only; there were presented connecting and vascular species. The vascular's trabeculae presented mainly in the pulp and the gate area and less – area under capsule. The parameters of the vascular trabecular have the following dimensions in lizards: the length ranged from 25,4 to 203,78 micrometers and its average value – $86,93 \pm 24,69$, the width from 14,1 to 63,54 micrometers, the average – $38,26 \pm 11,29$ micrometers. Options in the vascular trabecular have the following dimensions in frogs: the length ranges from 58,3 to 580,7 micrometers, the average – $179,83 \pm 16,34$, the width from 24,9 to 83,2 micrometers, the average – $50,72 \pm 1,88$ micrometers. In fish the length of connecting trabeculae is varied in large limits: from 37,5 micrometers to 162,5 micrometers (the average is numbered $84,06 \pm 39,59$ micrometers); the width is varied from 17,5 micrometers to 90 micrometers (the average – $38,75 \pm 24,01$ micrometers). The diameter of the connecting trabeculae was $28,75 \pm 8,75$ micrometers, sometimes met few trabeculae, there length is 90-122,5 micrometers. The vascular trabeculae was achieved the biggest development. Their length is varied in large limits: from 32,5 micrometers to 1275 micrometers; the width of vascular trabeculae is varied from 15 micrometers to 367,5 micrometers. The ratio of the width to the diameter and length was 1: 1,27: 4,14.

The basis of the splenic pulp is reticular stroma, which consisting of fibroblasts, macrophages, collagen and elastic fibers. The pulp is divided into red (RP) and white (WP) one. However, the clear distinction is missing between them.

The relative area of RP is the largest in lizards and the smallest in fish (see tab. 1). Lots of WP are differed denser arrangement of cells, which centered around the arterioles and formed lymphoid sheath near the vessels (LSNV). The LSNV look like strands around the vessels. The lymphoid nodules (LN) are allocated in the form of clusters of cells rounded form. The bright center is absent. The diameter of LN in lizards was $132,8 \pm 10,75$ micrometers. The radius of LSNV are amounted to $59,76 \pm 28,43$ micrometers.



Table 1

Ratios spleen poikilothermic animals (%)

Animals species	RM	SCA	WP	RP
Fish	0,086±0,0006	7,04±0,65	22,14±6,61	70,82±10,76
Frog	0,1170±0,0215	5,39±0,07	15,36±5,71	80,67±6,53
Lizard	0,099±0,021	5,21±1,47	13,36±1,80	81,43±7,05

The LN were determined like round and oval form in fish. The diameter of LN are amounted $71,67 \pm 25,05$ micrometers. Also met the LN with small size (diameter 27,5-40 micrometers) and large (diameter 100-130 micrometers). Often arterioles were located in LV. The small LV allocated with thin dark rim, the thickness was $6,667 \pm 1,179$ micrometers. Number of LN per unit area (0,021 micrometers) was $109,4 \pm 15,93$ pieces. The LSNV consisted often of 2-3 rows, which formed by closely spaced cells. The WP took $13,36 \pm 1,80\%$ in lizards, $22,14 \pm 6,61\%$ in fish the relative area of the spleen according to the morphometric studies. The ratio of WP:RP was 1: 3,2 (fish), 1: 5,25 (frog), 1: 5,99 (lizard). The ratio of SCA to pulp is – 1: 13,2; 1: 24,19; 1: 18,19 respectively. The vessels of the spleen in fish have different length and width: length up to 760 micrometers and the width to the 70 micrometers. These settings were within in most cases: the length from 17,5 micrometers to 75 micrometers, the width from 10 micrometers to 15,5 micrometers, the diameter from 10 to 60 micrometers, the diameter of vascular wall from 2,5 micrometers to 12,5 micrometers. The relative proportion of vessels of the spleen lizard was $3,13 \pm 0,92\%$. Their length reaches the 115 micrometers sometimes, the width – 42,5 micrometers, the diameter – 17,5 micrometers. These parameters were $50,83 \pm 30,17$ micrometers, $24,17 \pm 9,97$ micrometers, $8,75 \pm 4,27$ micrometers an average respectively. In the pulp of the spleen in poikilothermic animals characteristic feature is the presence of pigment cells. The splenic pigment cells have formed the clusters in frogs and constituted centers in fish. The pigment cells in lizards are single, the number of which increases in the summer. The cluster of pigment cells topographically related to the sine's wave often. The total area of there are concentrated on sections of spleen frogs on average $1,82 \pm 0,42\%$.

Conclusion. The spleen, in studied poikilothermic animals, was formed by support-contractile apparatus and pulp, which is a characteristic feature of vertebrates. The feature of the normal spleen in a wels catfish, a marsh frog and a green lizard is the absence of capsular trabeculae, lack of lymphoid nodules in light tanks, the presence of pigment cells in the soma are formed the clusters of centers in frogs. Morphometric parameters have established the biomarkers of these animals from Zhytomyr region.

The prospects for further research. Further research is planning to guide the study of morphometric features of the spleen in represented animals from different areas of the Zhytomyr region. First of all, industrial and radioactive contaminated by the Chernobyl accident. It is necessary to identify and develop biomarkers, which will be used to monitor the anthropogenic impact on biological systems.



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