Materials of Conferences

ASCORBATE LEVEL IN REPRODUCTIVE ORGANS OF MALE RATS IN ACUTE DELTAMETHRIN INTOXICATION

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It has been determined by the studies carried out by M.F. Ismail and H.M. Mohamed [4] that deltamethrin (DM) ($C_{22}H_{19}Br_2NO_3$) negatively exposes on the reproductive system of the mammals. Disturbances in the reproductive organs are probably associated with the oxidative stress after DM exposure [5]. Ascorbic acid is a part of the non-enzymatic antioxidant system and prevents the enhancement of the lipid peroxidation of the cell membranes observed while the oxidative stress. In this regard, relevant is to study ascorbate level and other non-enzymatic antioxidants in the reproductive organs of the experimental animals in DM intoxication.

The aim of our study was to determine the effect of DM acute intoxication on the ascorbic acid level in the reproductive organs of male rats.

The study has been carried out on 24 male rats of Wistar weighing 240 ± 10 g rats divided into two groups: Group 1 (n = 12) – the control rats; Group 2 (n = 12) – animals exposed to acute intoxication DM. Rats of Group 2 were orally administered once at a dose of DM 43,5 mg/kg body weight (½ LD 50) using a metallic probe and the animals of the 1st group in the same manner were administered an equivalent volume of saline. The experiment used a formulation of DM under the brand name "Butox 50" of the firm "Intervet International BV" (Netherlands).

Testes, epididymis and prostate gland were extracted 24 hours after DM administration followed by homogenization. Total protein was measured in the supernatant applying the biuret reagent and ascorbic acid by the H. Varley method [6]. The experiment was conducted in accordance with the European Convention for the Protection of Vertebrate Animals used for Experimental and other Scientific Purposes (Council of Europe No 123, Strasbourg, 1985).

Statistic data processing was performed using non-parametric U–Mann–Whitney test.

The study results indicate that ascorbate deficiency is developing in the reproductive organs of the experimental animals within one day after DM administration. DM concentration in the testes of rats in group 2 was reduced by 32 % compared with the control group. In the epididymis and prostate gland of rats in group 2 the ascorbic acid ratio was reduced by 27 and 23 %, respectively, compared to the 1st group.

Ascorbate reduction was occurred due to its intensive involvement into the inactivation process of reactive oxygen species including the reactions transforming tocopheryl quinone into tocopherol. Reinforced lipid peroxidation of the cell membranes under the free radicals effect stimulates tocopheryl quinone accumulation. One of the major sources of reactive oxygen species in the cells of the reproductive organs in DM intoxication can be an acute disorder of purine metabolism described previously in various pathological conditions [1; 2; 7]. The acute disorder of purine metabolism is characterized by nucleic acids damage, impaired energy metabolism with subsequent AMP accumulation triggering a profound catabolism of purine mononucleotides up to uric acid. Our hypotheses are matched with the studies conducted by M.M. Hossain and J.R. Richardson [3] on the cell cultures found that DM causes damage and fragmentation of DNA.

Thus, the results revealed that the decrease of ascorbic acid in the testes, epididymis and prostate gland of rats is observed in a day after a single administration of deltamethrin in a dose of 43,5 mg/kg body wt.

References

1. Chigrinskiy E.A., Conway V.D. Protective effect of D-ribose against inhibition of rats testes function at excessive exercise // J. Stress Physiol. Biochem. – 2011. – Vol. 7, № 3. – P. 242–249.

2. Conway V.D., Race B.A., Chigrinskiy E.A. Role of ribose deficit in rat testicular metabolism under conditions of overtraining // Bull. Exp. Biol. Med. – 2011. – Vol. 150, № 5. – P. 649–651.

3. Hossain M.M., Richardson J.R. Mechanism of pyrethroid pesticide-induced apoptosis: role of calpain and the ER stress pathway // Toxicol. Sci. – 2011. – Vol. 122, № 2. – P. 512–525.

4. Ismail M.F., Mohamed H.M. Modulatory effect of lycopene on deltamethrin-induced testicular injury in rats // Cell Biochem. Biophys. – 2013. – Vol. 65, № 3. – P. 425–432.

5. Issam C., Samir H., Zohra H. et al. Toxic responses to deltamethrin (DM) low doses on gonads, sex hormones and lipoperoxidation in male rats following subcutaneous treatments // J. Toxicol. Sci. – 2009. – Vol. 34, № 6. – P. 663–670.

6. Varley H. Practical clinical biochemistry. – New Delhi : CBS publisher, 1988. – 438 p.

7. Zolin P.P., Conway V.D. Disturbances of hypoxanthine metabolism in the liver of resuscitated rats // Bull. Exp. Biol. Med. – 1997. – Vol. 124, № 12. – P. 1180–1182.

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EXPERIMENTAL SUBSTANTIATION OF THE ROLE OF FREE RADICAL MECHANISM OF NEUROTOXICITY IN REDUCING THE QUANTITY OF STURGEON POPULATION

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Influence of fluctuations the hydrothermal regime in the system "reservoir – hydroelectric

complex – tailwater pool of the river" on the state of lipoperoxidation and the activity of antioxidant defense system in brain tissues of the Siberian sturgeon was investigated in aquarium conditions. Experimental modeling of the flush of "warm" water from the reservoir into the tailwater pool of the river showed the important role of free radical mechanisms in the realization of ecotoxicological effects in the water of the dam site of hydroelectric power station.

Streamlining of river drains by dams of hydroelectric power plants causes the profound transformations in environment and promotes emergence of environmental problems [1] that leads to a decrease in number of commercial fish population [2, 4]. In accordance to classical concepts of Environmental Toxicology, the decreasing of number of living organisms, as well as rising of their quantity is a sign of the ecotoxicity [3]. It is considered that fluctuations of hydrothermal regime in the system "reservoir – hydroelectric complex – tailwater pool of the river" is a factor of ecotoxicity in water areas of many rivers [4]. Mechanisms of implementation the ecotoxic effect in such systems are still poorly explored. In this case, the development and use of experimental models which reproduce fluctuations of the hydrothermal regime and allow observing a condition of fish is a prospective approach. It studies the ecotoxicological problems of the construction and operation of dams at hydroelectric power plants.

The purpose of this research was to study the influence of fluctuations the hydrothermal regime on a state of lipoperoxidation and the activity of antioxidant protection system in brain tissues of the Siberian sturgeon.

Material and methods of research. The research was carried out in the Laboratory of Reproduction of Aquatic Biological Resources on the young fish of Siberian sturgeon during Autumn-Winter period of 2009–2013.

20 Sturgeons of control group were in aquarium filled with water of constant temperature 17,2 ± 0.57ºC. 20 fishes of experimental group were in aquarium with temperature fluctuations every 24-hours as it takes place in natural environment. Fluctuation of the hydrothermal regime of water was carried out by sequentially increasing and decreasing the temperature on 5 ± 0,57ºC relatively to 17,2ºC. Experimental modeling of the flush of warm water took place during two hours at three times per 24-hours for one month. Fishes of all groups were removed from experiment through 30 days of observation.

The important role of free radical processes in brain tissues evaluates by the methods of biochemical analysis. Structural characteristics of brain tissues tested by methods of morphological analysis using the light optical (microscope CARL ZEISS Axio Imager M2, Germany) and the ultrastructural levels (electronic microscope JEM-1400 "Jeol" Japan).

Results of research and their discussion. Difficulties of metabolic processes in brain tissues of the Siberian sturgeon were found during modeling of the impact of fluctuations of hydrothermal regime on the organism of fish. This is evidence by changes the biochemical indexes of lipoperoxidation and activity of antioxidant protective system. Sturgeons of experimental group had increase diene conjugates and catalase activity than in control samples. At the same time a quantity of malondialdehyde and activity of superoxide dismutase had decrease. This was the reason to suppose that the brain cells of experimental group' fishes during the process of adaptation to temperature fluctuations continue to provide the inactivation of toxic hydroperoxides. During testing the samples of front part of brain of Sturgeons from experimental group in laboratory by the light microscope were found signs of water-ion homeostasis in ependimoglia and neuropil. Results of morphological testing show that these Sturgeons had a structural disruption, including ependimoglia functions.

Using the electronic microscope we found that neuron structure of front part of brain of the experimental group is different from the control samples. A wide lucidity in the cistern of endoplasmatic reticulum and Golgy apparatus are in cytoplasm of neuron. Compared with the control of neuron in cytoplasm of experimental group fishes the quantity of lysosomes and phagosomes are increased. Regularity in all studied samples of brain of the fish showed violating the structure of myelin of different levels in neurons.

The set of identified morphological changes proved that the long-term temperature fluctuations lead to structural changes in grey and white stuff in brain of the Siberian sturgeon. Results showed that the temperature fluctuations accompanied with changing the level of synthetic processes which provide the antiradical protection of brain cells. The revealed free radical mechanism can testify to its key role in decreasing the number of sturgeon in streamlined river drains of dams of hydroelectric power plants.

References

1. Berkovich K.M. Channel processes on the rivers in the area of influence of the reservoirs. Moscow: MSU, Faculty of Geography, 2012 – 163 p.

2. Dubrovskiy A.V., Fadeenko N.V. geoinformational providing the ecological problems of Novosibirsk water reservoir // Interexpo Geo-Siberia. – 2012. – Vol.3, №1. – P. 70–76.

3. Loshenko V.I., Sakharov A.V., Prosenko A.E. Experimental approaches to study of ecotoxiological problems of damp site of Novosibirsk hydroelectric power plant // Ecology of urbanized territories. – 2014. – № 1. – P. 59–63.

4. .Caudill CC., Keefer M.L., Clabough T.S., Naughton G.P., Burke B.J., Peery C.A. Indirect effects of impoundment on

migrating fish: temperature gradients in fish lad ladders slow dam passage by adult Chinook salmon and steelhead // VB PLoS One. – 2013. – V. 8(12). – P. 855–886.

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EFFECT OF ACTIVE OXYGEN METABOLITES ON THE STRUCTURE AND ELEMENT COMPOSITION OF RAT KIDNEY TISSUE

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The methods of biochemical analysis revealed, that one of the complications prolonged use of glucocorticoids is the development of oxidative stress on the tissue level. Experiments on the rats proved, that the kidney together with other organs are the most sensitive to active oxygen metabolites. In case of study samples rat kidney with glucocorticoid-induced oxidative stress in transmitted light allows to discover the violation structure components of glomerular basal membrane, walls of capillaries vascular glomeruli, epithelium of distal convoluted tubule. Using atomic-emission analysis of kidney tissue homogenates indicates a violation of Na / K homeostasis, filtration and reabsorbtion functions of this organ. Addition to these elements, which are of decisive importance in the regulation of water-salt homeostasis, found change in the content of Cu and Fe, included in the active sites of key antioxidant enzymes.

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