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## ANALYSIS OF LOCAL MONITORING DATA OF JSC “BOBRUIK PLANT OF BIOTECHNOLOGIES”

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The paper analyzes the local monitoring data on controlled indicators. The air and groundwater pollutant concentration changes during the period of the study have also been analyzed.

**Keywords:** local monitoring, control, pollutant emission, groundwater.

Local environmental monitoring is one of the types of the national environmental monitoring system and is carried out by legal entities exploiting the sources of harmful environmental impact to observe the state of the environment in the vicinity of these sources. The study analyzes the system of local monitoring of groundwater and emissions at JSC “Bobruisk plant of biotechnologies”.

The main activity of the enterprise, the user of natural resources, is the production of ethyl alcohol of agricultural origin, denatured rectified spirit; fodder; industrial gases, carbon dioxide; windshield washer fluids; agrochemical products and fertilizers; pharmaceuticals, and veterinary medicines.

During its production activity the enterprise has a complex impact on the components of the environment: air pollutant emissions from 141 sources comprised 108.19 tons per year which is much less than the allowed indices; water consumption and wastewater discharges into the city sewer systems; production waste management (storage, utilization and disposal). About 85% of production wastes were recycled.

The enterprise carries out production environmental and analytical control, local monitoring, which is aimed at the observation of groundwater in the area of the revealed or potential sources of pollution, and the emissions of air pollutants.

According to the schedule local monitoring of emissions is carried out once a month on the following observation parameters: concentration and mass emission of carbon oxide, nitrogen oxide (in terms of dioxide), and particulate matter. The pollutant concentration measurement is carried out according to the techniques, included in the area of accreditation of Central Laboratory Quality Control of JSC “Bobruisk plant of biotechnologies”.

The analysis of monitoring data on pollutant emissions at the main site over the past 3 years has shown a significant increase, in particular, in such indicators as sulfur dioxide, nitrogen oxides (II and IV), carbon oxide and particulate matter. First of all, it is referred to the increase in the output of fodder yeast and lignin fuel briquettes. The main part of emissions is non-methane volatile organic compounds represented by methyl, ethyl, propyl, isopropyl, butyl, and isobutyl alcohols, however, the emissions of these substances has remained approximately the same in the recent several years. Gross emission of the pollutants coming from the experimental production site manufacturing fuel briquettes in the settlement of Tugolitsa, and a lignin warehouse in the settlement of Titovka has remained at the level of the 2014. For the period studied the excess of permissible levels of emission, dumping and concentration of pollutants haven't been recorded.

Local monitoring aimed at the observation of groundwater is carried out with the network of the underground wells located at the lignin storage site in the settlement of Titovka. The quantity and location of observation bores and wells are defined by the project documentation. The local monitoring of groundwater is carried out once in three months in the first year of observations, and once a year during the recession of spring flood in subsequent years according to the observation schedule. The list of parameters is as follows: a groundwater depth,

phosphate phosphorus, temperature, chlorides, a hydrogen indicator, sulphates, ammonium nitrogen, oil products, nitrogen nitrate, nickel, synthetic surface-active agents, zinc, some chrome forms, copper, some iron forms, the dry residue, mercury, cadmium, lead, manganese.

According to the monitoring data obtained over the past 8 years the concentrations of pollutants in the groundwater has increased in general, however, in 2016 there was a recession of the concentrations of ammonium nitrogen, some iron forms, and sulphates. The increase in concentration has occurred in such indicators as oil products, nitrate nitrogen and dry residue. In the entire period of observation the concentrations of copper, cadmium, arsenic, mercury, and cobalt were below the detection limit. The data may vary a lot from well to well.

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## THE PROBLEM OF RADIATION SENSITIVITY OF ALBINO RATS MYOCARDIUM

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The effect of ionizing radiation on the myocardium is manifested by an increase in the variability of cardiovascular system reactions and the mechanisms of myocardial energy homeostasis, realized mainly in mitochondrial oxidation reactions. The combined effect of ionizing radiation and other damaging factors can initiate or exacerbate the already existing cardiac pathology.

**Keywords:** post-radiation, albino rats, myocardium, cardiac pathology, mitochondrial respiration,  $\gamma$ -irradiation.

**Introduction.** Numerous data of post-radiation complications development in heart and large vessels are not consistent with the opinion of high radiation resistance of the myocardium. The effect of ionizing radiation on the myocardium is manifested by an increase in the variability of the reactions of the cardiovascular system and the mechanisms of the energy homeostasis of the myocardium, realized mainly in mitochondrial oxidation reactions. The combined effect of ionizing radiation and other damaging factors can initiate or exacerbate the already existing cardiac pathology.

**Aim of the study.** To study the parameters of mitochondrial respiration of the myocardium of albino rats with a single general external  $\gamma$ -irradiation.

**Materials and methods.** The state of tissue respiration of pieces of myocardium of albino rats irradiated in doses of 0.5 Gy and 1 Gy (dose rate 0.92 Gy/min) was evaluated by polarography using Clark's closed platinum electrode in a thermostated cell (25°C) in Hanks solution. The rate of oxygen consumption (nmol O<sub>2</sub>/(min×mg protein)) was measured on endogenous substrates, and also after exogenous substrates added – succinate and glutamate.

**Results.** A significant increase in the endogenous respiratory activity of myocardial tissue of irradiated rats at doses of 0.5 Gy and 1 Gy was observed. Thus, on 3<sup>rd</sup> day after  $\gamma$ -irradiation, the rate of endogenous respiration increased by 29.4% (0.5 Gy) and 43.1% (1 Gy), compared to a control of  $2.11 \pm 0.02$  nmol O<sub>2</sub>/min×mg of protein. Ten days after  $\gamma$ -irradiation, in doses of 0.5 and 1 Gy, this indicator increased compared to the control, respectively, by 49.3% and 60.7%. The greatest increase in the rate of respiration was observed when glutamate was applied on the 10<sup>th</sup> day after exposure up to 92.9% and 98.2%, respectively, for doses of 0.5 and 1 Gy.

**Conclusions.** The obtained data testify to the high sensitivity of the myocardium to  $\gamma$ -irradiation, as evidenced by the dynamics of changes in mitochondrial respiration on endogenous and exogenous substrates. Stimulation of respiratory activity of functionally unloaded irradiated myocardium makes its energy less effective and vulnerable to the action of other damage factors, which contributes to the development of cardiovascular pathology.