

## **Подсекция «Postgraduate students: Biology»**

The organizing committee: prof. Safronenko O.I., senior lecturer Gorovtsov A.V.

### **1. ASSESSMENT OF SOIL CONTAMINATION WITH ARGs AND PAHs USING BIOSENSORS**

Presenter: Azhogina T.N., 1st -year postgraduate student

Research advisor: Prof. Sazykina M.A.; Language consultant: Prof. Safronenko O.I.

Information on the spread of ARGs and PAHs in the soils of Rostov and Rostov region is provided. The main purpose of the study performed is to identify different ARGs and PAHs in the soils of the Rostov region. The following methods are used: methods of extracting DNA, PAHs, PCR method, electrophoresis. Several types of the sample points have been chosen, including industrial, agricultural, recreational zones, hospital areas and landfills. Concentrations of PAHs are expected to be higher in the industrial area and landfills. A higher number and biodiversity of ARGs would be in the hospital areas and livestock sites.

### **2. BIOMODELING BY MEANS OF BIOLUMINESCENT BACTERIA**

Presenter: Aljya A. A., 1<sup>st</sup> - year postgraduate student,

Research advisor: Prof. Chistyakov V. A.; Language consultant: Prof. Safronenko O. I.

Bacterial cells have a very short lifecycle, it makes them the most preferable object for any biomodeling and cell experiment in general. The purpose of research is to improve the methods of biomodeling using GMO strains of bioluminescent bacteria, namely, bacilli. They are well-studied and grow easily on different substratums than the most of other strains. They are modified by GFP-gene that makes them well-visible in habitats, both natural and artificial.

Methods of the work, such as placing these strains in different habitats and conditions to monitor their behavior, biochemistry and lifecycles, were used to study the object of research in every detail. The data obtained from these experiments will be used to create many types of biomodels for both contagious medicine and industrial microbiology. These data can also be useful for theoretical science too. Luminous cells help to create the most precise biomodels because of their direct visibility. The correlation between bioluminescence and cell state can track their sensitivity (or stability) in different habitats and conditions. Bioluminescent bacteria can also show possible difference between wild and GMO bacterial strains. Thus we can prove, whether this method is objective or not.

### **3. TECHNOGENIC POLLUTION OF SOILS IN THE BOTANICAL GARDEN OF SOUTHERN FEDERAL UNIVERSITY**

Presenter: Barakhov A.V., 1st –year postgraduate student

Research advisor: Assoc. Prof. Goncharova, L. Yu.; Language consultant: Prof. Safronenko O.I.

This research is devoted to the study of technogenic pollution of the protected area – the Botanical garden of Southern Federal University (SFU BG). 75 monitoring sites were established to assess soil contamination in the Botanical garden. These sampling points were selected using the Qgis program in accordance with the slope, exposure, soil map and elevation map of the Botanical garden. The radionuclide composition of soil samples in the layer of 0-2 cm was determined with the scintillation gamma spectrometer "Progress-gamma" and sample counting geometries – Marinelli 1 litre, 0.5 litre Marinelli. Natural radionuclides in the soil layer of 0-2 cm in the territory of the SFU Botanical garden are distributed evenly, without significant variations of specific activity. The average contents of <sup>226</sup>Ra, <sup>232</sup>Th and <sup>40</sup>K, <sup>137</sup>Cs are 27.0, 34.0, 447.1, 18.0 BK/kg respectively.

#### 4. MOLECULAR GENETIC ANALYSIS OF RESISTANCE FOR TUBERCULOSIS PATHOGENS

Presenter: Berezhnoy S. A., 1st-year postgraduate student.

Research advisor: Prof. Shkurat T. P. ; Language consultant: Prof. Safronenko O. I.

Tuberculosis is an infectious disease characterized by defeat of various organs and tissues. A wide spread of tuberculosis infection in the world makes it one of the important problems in modern medicine. Drug resistance has been studied. Risk factors for tuberculosis have been established. The developed algorithms to diagnose the causative agent of tuberculosis will increase the effectiveness of the patient's treatment.

#### 5. THE BIOLOGY OF THE AUSTRALIAN REDCLAW CRAYFISH *CHERAX QUADRICARINATUS* IN THE INDUSTRIAL AQUACULTURE.

Presenter: Gobelkov P.V., 1st-year postgraduate student

Research advisor: Assoc. Prof. Dydkin S.I.; Language consultant: Prof. Safronenko O.I.

The introduction of new aquaculture facilities has a favorable effect both on endemic populations and the economic development of the region. Results of the tropical species introduction of the crustaceans, particular *Cherax quadricarinatus* into the conditions of a closed water supply system were studied. During the observation, the behavioral characteristics were identified, and new methods of breeding were applied. The observation results are the data of the intensive growth, depending on various aspects.

#### 6. BIOLOGICAL PROPERTIES OF CARBON NANOPARTICLES ON BACTERIAL BIOSENSORS

Presenter: Emelyantsev S.A., 1<sup>st</sup>- year postgraduate student

Research advisor: Prof. Chistyakov V. A.; Language consultant: Prof. Safronenko O. I.

Biological properties of carbon nanoparticles have long been of interest because of their potentially high antioxidant and toxic properties, depending on the conditions of preparation and solvents. The results of the C60 fullerene suspensions effect studies on the parameters of oxidative stress in a model with *Esherichia coli* are presented. Conditions for solubilization of fullerene C60 in 2 % aqueous solution of TWEEN 80 using ultrasound have been established, aggregate sizes and mass concentrations of C60 in the final solution were measured. Bioluminescent tests on *E. coli* strain MG1655 pKatG-lux (Lux-biosensor of hydroxide radical anion) were carried out. The results obtained with bacterial biosensor can be applied to mitochondria of eukaryotes. Due to the ability of fullerene C60 to penetrate into biological membranes, be a proton carrier and interact with free radicals, it can be considered as a mitochondrial-directed antioxidant

#### 7. IMAGING ULTRASOUND-GUIDED SUPRACLAVICULAR BRACHIPLEX BLOCK

Presenter: Zalevskiy V.G., 1st -year postgraduate student

Research advisor: Prof. Dudarev I.V. Language consultant: Prof. Safronenko O.I.

In recent decades, due to its relative simplicity, safety and economic feasibility, application of regional anesthesia techniques has become predominant as compared to other anesthesia techniques. To increase the quality of this type of anesthesia, the real time nerve trunk imaging technique is required. The aim of the research is to assess the efficiency of ultrasound-guided regional anesthesia as compared to a traditional one .All clinic-based studies were carried out within 2 months on the basis of anaesthesiology and reanimation department of Municipal Hospital №1, Rostov-on-Don. In the course of research, two groups were formed: study and control group, with the patients treated for injuries and arm hurts. To do anesthesia, an

ultrasound scanner was used in the studied group; and to do brachiplex regional anesthesia in the control group, traditional technique – a paresthesia search - was applied. To define the advantages of the used brachiplex block techniques, comparison by several criteria was carried out.

According to the results of the conducted research, anesthesia was considered to be successful, not demanding additional anesthesia at 95% of patients in the studied group and 77.5% of patients in the control group. Thus, it has been clinically proved that when performing supraclavicular brachiplex block the use of ultrasound scanning increases the block efficiency and safety up to 95%, reduces the risk of unintentional vasopuncture and allows one to reveal misplaced brachiplex structures.

#### 8. OPTIMIZATION OF WINTER WHEAT NUTRITION PERFORMED ON THE BASIS OF CHERNOZEM ORDINARY AT NO-TILL CULTIVATION

Presenter: Ilchenko Ya.I., 1st-year postgraduate student

Research advisor: Prof. Biryukova O.A. ; Language consultant: Prof. Safronenko O.I.

The aim of the work is to study the effect of mineral fertilizers on the yield and quality of winter wheat on chernozem ordinary with no-till technology. Rostov region maintains the position of one of the largest grain-producing regions in Russia and a supplier of high-quality grain. At present, the world and domestic practice of intensive agriculture proves that fertilizers serve the material basis of the quantitative and qualitative improvement of the crop production, as well as a source of biogenic elements for plants. Nowadays optimization of the grain crops supply in the No-till system is of particular significance. The "No-Till" system is the most reasonable approach to crop production, from the ecology and economics point of view. This approach eliminates mechanical effect on the soil. Direct seeding is carried out on the crop residues with the minimal disturbance of the soil structure.

#### 9. DEVELOPMENT OF THE SOIL ASSESSMENT CRITERIA TO PROTECTION LAND RESOURCES.

Presenter: Kolesnikova N.A., 1st-year postgraduate student

Research advisor: Prof. Minkina T.M., Language consultant: Professor Safronenko O.I.

There are no unambiguous and objective criteria to assess the composition and properties of soils. The purpose of the study performed is to integrate various soil assessment methods, including environmental, judicial, legal and other ones to create a universal scale for estimating land resources. The results of the study will allow us to use this scale in monitoring the measures for the protection and conservation of soils and lands

#### 10. THE STATE OF THE BLACK SEA SPRAT POPULATION IN THE PRESENT ECOLOGICAL CONDITIONS.

Presenter: Perevalov O. A., 1<sup>st</sup>- year postgraduate student

Research advisor: Assoc. prof. Dudkin S. I.; Language consultant: Prof. Safronenko O.I.

Sprat is one of the most massive species of fish in the Black Sea. This species is the basis of a food chain which determines the productivity of the population of predatory fish and dolphins. The novelty of the topic is substantiated by the collection, analysis and generalization of materials about sprat population in the context of interaction between natural and anthropogenic factors in the sprat habitat. This area has not been generalized since the 80-s of the last century. This study will allow us to identify and quantify new dependencies that explain fluctuations in the population of the Black Sea sprat in the present environmental conditions.

#### 11. ANALYSIS OF SIGNAL REGULATORS: AMPK / MTOR / STAT3 IN THE MOLECULAR RESPONSE OF NEURONS AND GLIAL CELLS TO AXOTOMY

Presenter: Pitinova M.A., 1st-year postgraduate student

Research advisor: Prof. Uzdenski A.B.; Language consultant: Prof. Safronenko O. I.

Stroke is the second most common cause of death in the world. It is difficult to give the necessary medical care at the onset of stroke. It is essential to provide neuroprotective treatment when the stroke is recognized and the patient delivered to the hospital. Patient's survival and extent, to which s/he is able to restore physiological functions, greatly depend on this treatment. Unfortunately, it is not reliable and safe yet. Deep understanding of biochemical changes that occur in the damaged neurons and glial cells is required to design such neuroprotective medications. The influence of signal regulators AMPK / mTOR / STAT3 on neuron's and glial cells survivability during axotomy have been studied.

#### 12. BIOLOGY AND ECOLOGY OF THE BLACK SCORPIONFISH SCORPAENA PORCUS LINNAEUS, 1758 FROM THE CAUCASUS AND CRIMEAN SHORE OF THE BLACK SEA.

Presenter: Polin A.A. 1st-year postgraduate student

Research advisor: Prof. Denisova T.V. Language consultant: Prof. Safronenko O.I.

In recent years, attention to ecology of non-commercial fish-species from the Black sea has greatly increased. It was a result of the changes in the fish community of the studied water area. At the present time the highest-number predator in the Black sea bay is presented by the black scorpionfish. The predatory way of life and almost complete absence of the enemies put the black scorpionfish to the top of the trophic chain of energy storage. Because of the changes taking place in its ecosystem, the study of the current state of the populations of this species is of particular interest. The purpose of research is comparative analysis of the black scorpionfish from different water areas of the Russian coast of the Black sea biological and ecological characteristics. Specimens of the black scorpionfish are collected in different water areas of the Caucasus and Crimean shore of the Black Sea. All samples are studied with classic ichthyological methods. Besides fishes characteristics, habitat indicators are analyzed. Strong connectivity between habitat indicators and population characters is most predictable.

#### 13. COMPARATIVE ASSESSMENT OF ECOTOXICITY AND RANKING OF HEAVY METALS BY THEIR DANGER FOR SOIL

Presenter: Sudina L.V., 1st-year postgraduate student

Research advisor: Prof. Kolesnikov S. I.; Language consultant: Prof. Safronenko O.I.

At present, chemical elements are ranked into three hazard classes in relation to the human health. However, in terms of the effect on soil conditions, many elements do not correspond to this classification of danger. The main sources of soil contamination were studied. It is planned to determine the quantitative coherence of the studied elements in the chernozem. Hazard classes of the heavy metals in soil will be developed. The results obtained can be used for monitoring and diagnostics of soil pollution as well as for assessing the risk of natural and man-made disasters.

#### 14. EEG STUDY AT DIFFERENT LEVELS OF WAKEFULNES IN TYPICALLY DEVELOPING (TD) CHILDREN AND WITH INFANTILE AUTISM (IA).

Presenter: Khatlamadzhiyan V.R., 1st-year postgraduate student

Research advisor: Prof. Aydarkin E.K. Language consultant: Prof. Safronenko O.I.

In recent years, the incidence of infantile autism has grown rapidly, which can be explained by thorough research on etiology and modification of diagnostic methods. However, the universal

criteria of diagnostics and reliable ways of treatment are still not developed. The advantages of the method being used in the present research are high temporal resolution of the record and its duration. The preliminary results obtained are the following: in the state of quite wakefulness, spectral power of  $\alpha$ - and  $\theta$ -rhythms in autistic children was decreased, compared to healthy peers; in the 2-d stage of the sleep increased frequency of  $\alpha$ -rhythm, likely reflecting sleep spindles exaltation, is observed; in the state of deep sleep, the frequency in  $\Delta$ -1-band is decreased. A small number of studies using EEG-videomonitoring, especially in the age group of children 3-4 years old, determines the novelty of the present research; the results obtained allow us to check some hypotheses on autism etiology and pathogenesis, specifying theoretical significance of the research. The practical significance consists in the ability to apply the features of amplitude-power and frequency EEG characteristics as the basis, while developing diagnostic criteria. It is planned to expand the sample size and clarify of the results obtained, especially the frequency of the main EEG rhythms in the state of deep sleep.

#### 15. ASSESSMENT OF THE TEMERNIK RIVER ECOLOGY BY PLANT PIGMENTS OF THE PHYTOPLANKTON AND HIGHER AQUATIC PLANTS IN THE BOTTOM SEDIMENTS.

Presenter: Ekilik V.S., 1st-year postgraduate student

Research advisor: Prof. Denisova T. V., Language consultant: Prof. Safronenko O.I.

Photosynthetic pigments in water and bottom sediments in water bodies are the markers of the organic matter synthesized by phytoplankton, phytobenthos, higher aquatic vegetation, purple and green bacteria. Therefore, their composition and quantity in the thickness of the bottom sediments reflects the development of the reservoir. They can be used as indicators of the present and previous trophic conditions. At the same time, the determination of photosynthetic pigments in bottom sediments has not become as widespread as the measurement of the chlorophyll content in water. Taking into account that observations on water bodies are not always carried out regularly and assessment of their trophic and ecological state is complicated, the measurement of photosynthetic pigments in the bottom sediments is one of the promising express methods in this area.