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Биологический факультет

VI Межфакультетская студенческая  
научно-практическая конференция

# Life Sciences in the 21<sup>st</sup> Century: Looking into the Future

23–24 января 2023 г.  
Москва, МГУ



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старший преподаватель *Фурсова А. А.*

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23–24 января 2023 г. в МГУ состоялась V Межфакультетская студенческая научно-практическая конференция “Life Sciences in the 21<sup>st</sup> Century: Looking into the Future” (на английском языке), организованная кафедрой английского языка для естественных факультетов факультета иностранных языков и регионоведения МГУ имени М. В. Ломоносова совместно с биологическим факультетом и при активном участии еще четырех естественнонаучных факультетов университета – почвоведения, фундаментальной физико-химической инженерии, биотехнологического и фундаментальной медицины, а также биологического факультета совместного российско-китайского университета МГУ-ППИ в г. Шэньчжэне. На конференции были сделаны научные доклады, охватывающие широкий спектр направлений исследований в биологии и смежных науках, начиная от классических зоологических и ботанических наблюдений до использующих самые современные методические подходы экспериментов.

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## Foreword

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On 23–24 January 2023, the 6<sup>th</sup> annual student conference *Life Sciences in the 21st Century: Looking into the Future* took place at the Faculty of Biology of Lomonosov Moscow State University. Traditionally, the conference was organized and conducted by the Department of English for Natural Sciences of the Faculty of Foreign Languages and Area Studies in collaboration with the Faculty of Biology and with active participation of a number of other MSU faculties, namely those of Soil Science, Fundamental Medicine, Biotechnology, and Fundamental Physical and Chemical Engineering. Also, for the first time in its history, the conference was attended by several postgraduate students from the Faculty of Biology of the joint MSU-BIT University in Shenzhen (China).

The work of the conference proceeded in the following sections:

- General biology
- Biochemistry and molecular biology
- Genetics, embryology, histology
- Bioengineering and biophysics
- Physiology and neurobiology
- Ecology

The forum provided young life science researchers with a much-needed opportunity to discuss the results of their work with the peers and seniors, to exchange views and ideas on key issues in focused subject areas and to enhance the existing interdisciplinary, interdepartmental and interfaculty research network in Moscow University. With English being the only working language of the conference, its crucial pragmatic objective consisted in closely imitating the authentic format of professional communication at international scientific conferences, thus testing the adequacy of the students' operational knowledge of English as the global language of science and building their self-confidence.

It is not for nothing that the conference title emphasized its focus on the future: in their presentations, the new generation of life scientists most convincingly demonstrated to their proud teachers and all those present their vast scientific potential. From the plethora of wide-ranging conference materials, however, the present volume only contains abstracts of 6 plenary and 18 sectional papers whose authors scored the most points for their English (from 94 to 100).

In conclusion, on behalf of the conference organizing committee, I would like to thank many people, students and professors, who have provided help, support and advice during the conference.

*Professor Lydia Polubichenko*

*Dr. habil. in Philology*

*Head of the Department of English for Natural Sciences*

*Faculty of Foreign Languages and Area Studies*

# 2023 STUDENT CONFERENCE LIFE SCIENCES IN THE 21<sup>ST</sup> CENTURY: LOOKING INTO THE FUTURE

## Programme

January 23

<p>Plenary session 10.00–13.30</p> <p><b>Conference opening address and welcome speech</b> Lydia Polubichenko, Head of the Department of English for Sciences, Professor of the Faculty of Foreign Languages and Area Studies Join Zoom Meeting <a href="https://us02web.zoom.us/j/83014403719?pwd=ZnZMMXdWMEk2c0VFNjJxbFJnS0F5QT09">https://us02web.zoom.us/j/83014403719?pwd=ZnZMMXdWMEk2c0VFNjJxbFJnS0F5QT09</a> Meeting ID: 830 1440 3719 Passcode: 171087</p>	<p>Afternoon session 14.30–19.00</p> <p>Session 1. General biology Session 2. Biochemistry and molecular biology Session 4. Physiology and neurobiology Session 5. Genetics, histology, embryology Session 6. Ecology German session</p>							
<p><b>Plenary presentations</b></p> <p>1. <b>Gleb Degtyarenko</b>/ Дегтяренко Глеб Сергеевич Faculty of Fundamental Physical and Chemical Engineering Investigation of the surface of biocompatible nanocomposite carbon coatings deposited by an accelerated C60 ion beam (Исследование поверхности биосовместимых нанокompозитных углеродных покрытий, наносимых с использованием ускоренного пучка ионов C60)</p> <p>2. <b>Elizaveta Bakhchinyan, Anna Zinoveva</b>/ Бахчинян Елизавета, Зиновьева Анна Faculty of Fundamental Medicine Aging leads to changes in insulin signaling, as well as differentiation and proliferative potentials of MSCs (Старение приводит к изменению инсулиновой сигнализации, а также дифференцировочного и пролиферативного потенциалов МСК)</p> <p>3. <b>Galina Denisova</b>/ Денисова Галина Игоревна Faculty of Soil Science, Department of Erosion and Soil Protection Transformation and movement of soil phosphorus during soil erosion (Трансформация и перемещение фосфора в процессе эрозии почв)</p> <p>4. <b>Li Bowen</b>/ Ли Боуэн Faculty of Biology, Department of Bioengineering Electrophysiological analysis of the cardiac Kv channel with the Ala341Val mutation, found in the patient with LQTS (Электрофизиологический анализ сердечного канала кв с мутацией Ala341Val, обнаруженный у пациента с ЛКТС)</p> <p>5. <b>Philip Pavlovsky</b>/ Павловский Филипп Faculty of Biology, Department of Higher Nervous Activity Differences in STN activity in patients with Parkinson's disease with prominent clinical asymmetry (Различия в активности STN у пациентов с болезнью Паркинсона с выраженной клинической асимметрией)</p> <p>6. <b>Alexey V. Romanov</b>/ Романов Алексей Владимирович Faculty of Biology, Department of Vertebrate Zoology The mechanism of gill ventilation in chimaeras (Chimaeriformes) (Механизм дыхания химеровых рыб (Chimaeriformes))</p>	<p>Subsession 1.1 General biology</p> <p>L. Polubichenko, D. Kozlov</p>	<p>Subsession 1.2 General biology</p> <p>A. Foursova, E. Kozharskaya</p>	<p>Subsession 2.1 Biochemistry and molecular biology</p> <p>N. Glinskaya, S. Kazantseva, T. Surganova</p>	<p>Subsession 4.1 Physiology and neurobiology</p> <p>N. Morgoun, Z. Alkhasova</p>	<p>Subsession 5.1 Genetics, histology, embryology</p> <p>O. Kozlova, V. Ignatenko</p>	<p>Subsession 6.1 Ecology</p> <p>I. Alikhanova, A. Volkova</p>	<p>Subsession 6.2 Ecology</p> <p>O. Egorova, E. Mikheeva</p>	<p>German Session</p> <p>A. Yedlichko</p>
<p>Room 208, FFLAS</p>	<p>Room 226</p>	<p>Room 290</p>	<p>Room 199</p>	<p>Room 252</p>	<p>Room 254</p>	<p>Room 3Д</p>	<p>Room 288</p>	<p>Room</p>

## January 24

Morning session 10.00–13.00					
Session 1. General biology Session 2. Biochemistry and molecular biology Session 3. Biophysics, bioengineering, biotechnology Session 4. Physiology and neurobiology Session 6. Ecology Session 9. Biomedical Research					
Subsession 1.3 General biology  L. Polubichenko, O. Egorova, V. Ignatenko	Subsession 2.2 Biochemistry and molecular biology  Foursova, A. Volkova, T. Surganova	Session 3 Biophysics, bioengineering, biotechnology  O. Kozlova, A. Kazantseva, Z. Alkhastova	Subsession 4.2 Physiology and neurobiology  N. Morgoun, S. Agadganyan, D. Kozlov	Subsession 6.3 Ecology  I. Alikhanova, E. Mikheeva	Session 9 Biomedical Research  N. Glinskaya, E. Kozharskaya
Room 252	Room 290	Room 199	Room 298-A	Room M2	Room 254

## January 24

Afternoon session 14.00–18.00					
Session 6. Ecology Session 7. Fundamental Soil Science Session 8. Applied Soil Science					
Subsession 6.4 Ecology  O. Kozlova, E. Mikheeva, S. Agadganyan	Session 7 Fundamental Soil Science  S. Kazantseva, L. Polubichenko, A. Foursova	Session 8 Applied Soil Science  O. Egorova, I. Alikhanova, N. Morgoun			
Room 252	Room 290	Room 254			

**January 23**  
**Afternoon session 14.30–19.00**  
**Subsession 1.1 General biology**  
**Moderators: L. Polubichenko, D. Kozlov**  
**Room 226**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Андреевская Вероника	Veronika Andreevskaya	Faculty of Biology, Department of Mycology and Algology	Protection of Tomato from a Complex of Pests and Diseases in Greenhouse	Защита томата от комплекса вредителей и болезней в теплице
2.	Басалаева Дарья	Darya Basalaeva	Faculty of Biology, Department of Microbiology	Proteolytic enzymes of mycelial fungi, associated with insects	Протеолитические ферменты мицелиальных грибов, ассоциированные с насекомыми
3.	Гончарова Елена Дмитриевна	Elena Goncharova	Faculty of Biology, Department of Vertebrate Zoology	Current status of house sparrow ( <i>Passer domesticus</i> ) population in Moscow	Современное состояние популяции домового воробья ( <i>Passer domesticus</i> ) в Москве
4.	Ильина Полина Олеговна	Polina Iliina	Faculty of Biology, Department of Vertebrate Zoology	Movements Of The Baikal Seal ( <i>Pusa Sibirica</i> ) According To Satellite Tracking	Перемещения байкальских нерп ( <i>Pusa Sibirica</i> ) по дан- ным спутникового прослеживания
5.	Кислица Евгений	Evgeny Kislitsa	Faculty of Biology, Department of Ichthyology	Taste preferences and feeding behaviour in <i>Chindongo demasoni</i>	Изучение вкусовых предпочтений у цихлиды <i>Chindongo demasoni</i>
6.	Клюкин Никита	Nikita S. Kliukin	Faculty of Biology, Department of Vertebrate Zoology	Diversity and phylogeny of blind skinks of the family Dibamidae (Reptilia, Squamata)	Разнообразие и филогения червеобразных ящериц семейства Dibamidae (Reptilia, Squamata)
7.	Колесников Кирилл Артурович	Kirill Kolesnikov	Faculty of Biology, Department of Biological Evolution	Organization features of the oldest (Cambrian) crown-group Silicea sponges	Особенности организации древнейших (кембрийских) короновых кремниевых губок
8.	Мамедова Джамия Фархадовна	Dzhamilia Mamedova	Faculty of Biology, Department of Plant Physiology	Root photopatterning: role of light receptors	Фотопаттернинг корня: роль рецепторов света
9.	Неклюдов Борис Витальевич	Boris Neklyudov	Faculty of Biology, Department of Invertebrate Zoology	A New Phoronid Species, <i>Phoronis savinkini</i> sp. n., from the South China Sea and an Analysis of the Taxonomic Diversity of Phoronida	Новый вид форонид, <i>Phoronis savinkini</i> sp. n., из Южно- китайского моря и анализ таксономического разнообра- зия типа Phoronida
10.	Печенева Анастасия Алексеевна	Anastasiia Pecheneva	Faculty of Biology, Department of Vertebrate Zoology	The contact zone of the two forms of the Chiffchaff ( <i>Phylloscopus collybita caucasicus</i> – <i>Ph. lorenzii</i> ) in the North Caucasus	Зона контакта двух форм пеночки теньковки – <i>Phylloscopus collybita caucasicus</i> и <i>Ph. lorenzii</i> на Север- ном Кавказе
11.	Фетисова Александра Сергеевна	Alexandra Fetisova	Faculty of Biology, Department of Vertebrate Zoology	Hormonal and Behavioral Changes during Weaning Period in Four Species of Felidae	Изменения в гормональном статусе и поведении детены- шей кошачьих в период отлучения от матери
12.	Цао Юань	Yuan Cao	Faculty of Biology, Department of Microbiology	Formation of Fibrinolytic Enzymes by Zygomycetes	Образование фибринолитических ферментов зигомице- тами



**January 23**  
**Afternoon session 14.30–19.00**  
**Subsession 1.2 General biology**  
**Moderators: A. Foursova, E. Kozharskaya**  
**Room 290**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Анисимова Ольга Константиновна	Olga Anisimova	Faculty of Biology, Department of Synthetic biology	Identification and characterization of the thaumatin-like genes in garlic genome	Идентификация и характеристика тауматин-подобных генов в геноме чеснока
2.	Богданов Кирилл	Kirill Bogdanov	Faculty of Soil Science, Department of Soil Biology	Analysis and reconstruction of multi-species microbial biofilms formed on the surface of polyethylene	Анализ и реконструкция мультивидовых микробных биопленок, формируемых на поверхности полиэтилена
3.	Еребакан Иван	Ivan Erebakan	Faculty of Biology, Department of Biological Evolution	Evolution of the Eastern Paratethys fossil fishes	Эволюция ископаемых рыб Восточного Паратетиса
4.	Иконников Александр Сергеевич	Alexander Ikonnikov	Faculty of Biology, Department of Vertebrate Zoology	A comparative estimation of innate immunity development in Felidae	Сравнительная оценка развития врожденного иммунитета у кошачьих
5.	Королева Анна Сергеевна	Anna S. Koroleva	Faculty of Biology, Department of Invertebrate Zoology	Fine morphology of jaw apparatus of <i>Scoletoma fragilis</i> (Lumbrineridae, Annelida)	Тонкая морфология челюстного аппарата <i>Scoletoma fragilis</i> (Lumbrineridae, Annelida)
6.	Лапина Надежда	Nadezhda Lapina	Faculty of Biology	Flight kinematics of the miniature parasitoid wasp <i>Megaphragma viggianii</i>	Кинематика полета миниатюрного наездника <i>Megaphragma viggianii</i>
7.	Лунькова Мария Константиновна	Maria Lunkova	Faculty of Biology, Department of Plant Physiology	Growth and biosynthetic characteristics of the suspension cell cultures of <i>Panax vietnamensis</i> Ha & Grushv.	Ростовые и биосинтетические характеристики суспензионных культур клеток <i>Panax vietnamensis</i> Ha & Grushv.
8.	Мазакина Виолетта Владимировна	Violetta Mazakina	Faculty of Biology, Department of Genetics	Nematodes of genus <i>Alloionema</i> (Rhabditida, Alloionematidae) as ectoparasites of terrestrial gastropods (Mollusca, Gastropoda): inter- and intraspecific diversity and phylogenetic relationships	Нематоды рода <i>Alloionema</i> (Rhabditida, Alloionematidae) – эктопаразиты наземных брюхоногих моллюсков (Mollusca, Gastropoda): видовое и внутривидовое разнообразие, филогенетические связи
9.	Прокшина Анисия	Anisiia Prokshina	Faculty of Biology, Department of Vertebrate Zoology	Hierarchy of Migratory Bird Compass Systems on the Example of Garden Warbler <i>Sylvia borin</i>	Иерархия компасных систем мигрирующих птиц на примере садовой славки <i>Sylvia borin</i>
10.	Трофимец Алексей Викторович	Aleksei V. Trofimets	Faculty of Biology, Department of Vertebrate Zoology	Differentiation of the wide-ranged <i>Microhyla heymonsi</i> Vogt, 1911 (Amphibia: Microhylidae) species complex in space and time: to split or not to split?	Дифференциация широкоареального комплекса <i>Microhyla heymonsi</i> Vogt, 1911 (Amphibia: Microhylidae) во времени и пространстве: разделять или не разделять?
11.	Ходырева Дарья	Daria Khodyreva	Faculty of Biology, Department of Anthropology	A complex bioanthropological research of two new Huns' burials from the Crimea (the ancient settlement Ust-Alma, 4th-5th centuries AD)	Комплексное биоантропологическое исследование двух новых гуннских погребений из Крыма (некрополь Усть-Альминского городища, 4–5 вв. н. э.)
12.	Целлариус Федор	Fedor Tsellarius	Faculty of Biology, Department of Vertebrate Zoology	An effect of magnetic field manipulation on migratory orientation of Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Эффект магнитного поля на ориентацию лесного нетопыря ( <i>Pipistrellus nathusii</i> ) во время миграции в круговой арене

January 23

Afternoon session 14.30–19.00

Session 2.1 Biochemistry and molecular biology

Moderators: N. Glinskaya, S. Kazantseva, T. Surganova

Room 199

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Анисов Денис	Denis Anisov	Faculty of Biology, Department of Immunology	Effects of itaconate and dimethyl itaconate on cytokine production in lipopolysaccharide-induced inflammation in mice	Эффект итаконата и диметилитаконата на продукцию цитокинов в мышинной модели ЛПС-индуцированного воспаления
2.	Двуреченская Алина Андреевна	Alina Dvurechenskaya	Faculty of Biology, Department of Virology	Molecular Profile of Epstein-Barr Virus-Associated Nasopharyngeal Carcinoma in Russia	Молекулярный профиль ассоциированного с вирусом Эпштейна-Барр рака носоглотки в России
3.	Дя Герман	German Dya	Faculty of Biology, Department of Biochemistry	Investigation of PAPP-A-dependent IGFBP-4 proteolysis in neurons and astrocytes derived from human induced pluripotent stem cells	Изучение PAPP-A-зависимого протеолиза IGFBP-4 в нейронах и астроцитах, полученных из индуцированных плюрипотентных стволовых клеток человека
4.	Замятнина Ксения	Kseniia Zamiatnina	Faculty of Biology, Department of Molecular Biology	Kinetoplast nucleoid proteins of insect trypanosomatids	Белки нуклеоида кинетопласта инсектных трипаносоматид
5.	Корчагина Елизавета Романовна	Elizaveta Korchagina	Faculty of Biology, Department of Cell Biology and Histology	The Role of Minor Subpopulation of Mesenchymal Stromal Cells in Adipose Tissue Regeneration and Hormonal Sensitivity	Роль малой субпопуляции мезенхимных стромальных клеток в обновлении и гормональной чувствительности жировой ткани
6.	Малышева Анастасия	Anastasia D. Malysheva	Faculty of Biology, Department of Microbiology	Characterization of new thermostable glycosidases from the hyperthermophilic archaea <i>Thermofilum adornatum</i> 1910b	Характеристика новых термостабильных гликозидаз гипертермофильной археи <i>Thermofilum adornatum</i> 1910b
7.	Малюкова Анастасия Максимовна	Anastasia Malyukova	Faculty of Biology, Department of Plant Physiology	Role of phytochromes in regulation of gene expression of transcription apparatus of plastome during cytokinin-dependent de-etiolation in <i>Arabidopsis thaliana</i> (L.) Heynh.	Роль фитохромов в регуляции экспрессии генов аппарата транскрипции пластома в ходе цитокинин-зависимой деэтиоляции <i>Arabidopsis thaliana</i> (L.) Heynh.
8.	Постникова Юлия Николаевна	Yulia Postnikova	Faculty of Biology, Department of Virology	Influenza Viruses Isolated From Wild Ducks In Moscow: Phylogenetic Position In Overall Diversity Of Influenza Viruses	Филогенетическое положение вирусов гриппа, выделенных от диких уток в Москве, среди общего разнообразия вирусов гриппа
9.	Степанова Дарья Алексеевна, В.И. Чечехин, К.Ю. Кулебякин, П.А. Тюрин-Кузьмин	Stepanova Daria, Chechekhin V.I., Kulebyakin K.Yu., Tyurin-Kuzmin P.A.	Faculty of Fundamental Medicine, Department of Molecular Biology and Medicine	The Role of Paracrine Factors in the Development of Heterologous Sensitization in Mesenchymal Stem Cells	Вклад паракринных факторов в развитие гетерологической сенситизации мультипотентных мезенхимных стромальных клеток

**January 23**  
**Afternoon session 14.30–19.00**  
**Subsession 4.1 Physiology and neurobiology**  
**Moderators: N. Morgoun, Z. Alkhasova**  
**Room 252**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Бахтурин Андрей Витальевич	Andrey Bakhturin	Faculty of Biology, Department of Higher Nervous Activity	Spontaneous epileptiform activity in the cerebral cortex in rats with different susceptibility to audiogenic epilepsy	Спонтанная эпилептиформная активность в коре головного мозга у крыс с различной предрасположенностью к аудиогенной эпилепсии
2.	Буйницкая Светлана	Svetlana Buinitskaia	Faculty of Biology, Department of Neurobiology	Effect of mitochondrial-directed antioxidant SkQ on Parkinson-like signs in pharmacological and genetic mouse models	Влияние митохондриально-направленного антиоксиданта ПДТФ на паркинсоно-подобные признаки в фармакологической и генетической моделях у мышей
3.	Дегтярева Анастасия	Anastasia Degtyareva	Faculty of Biology, Department of Neurobiology	Objects permanence in domestic horses ( <i>Equus caballus</i> )	Исследование степени развития представления о «неисчезаемости» объектов у домашних лошадей ( <i>Equus caballus</i> )
4.	Диффинэ Екатерина	Ekaterina Diffine	Faculty of Biology, Department of Higher Nervous Activity	Experimental modeling and investigation of fast classification learning principles in biological intelligence systems	Экспериментальное моделирование и исследование принципов быстрого классификационного обучения в системах биологического интеллекта
5.	Мазеева Валерия	Valeriia Mazeeva	Faculty of Biology, Department of Human and Animal Physiology	Role of pannexin-1 in the pro-inflammatory activation of astrocytes	Роль паннексина-1 в провоспалительной активации астроцитов
6.	Новикова Маргарита	Margarita Novikova	Faculty of Biology, Department of Higher Nervous Activity	Research of the features of synaptic plasticity under the influence of caffeine in the CA1 subfield of the hippocampus in mice	Изучение свойств синаптической пластичности под влиянием кофеина в поле CA1 гиппокампа мыши
7.	Печкова Марта Германовна	Marta Pechkova	Faculty of Biology, Department of Human and Animal Physiology	Role of pannexin 1 in regulation of portal vein tone in mice with portal hypertension	Роль паннексина 1 в регуляции тонуса портальной вены при портальной гипертензии у мыши
8.	Пономарев Тимофей Дмитриевич	Timofey Ponomarev	Faculty of Biology, Department of Human and Animal Physiology	P300 in covert visual attention	П300 в условиях скрытого зрительного внимания
9.	Солдатова Анастасия	Anastasia Soldatova	Faculty of Biology, Department of Higher Nervous Activity	The Effects of X-ray Radiation on the Cognitive Flexibility and Memory of Adult Mice Revealed with IntelliCage Automated Behavior Monitoring System	Исследование эффектов лучевого воздействия на когнитивную гибкость и память взрослых животных в автоматизированной системе мониторинга поведения животных IntelliCage

January 23

Afternoon session 14.30–19.00

Subsession Subsession 5.1 Genetics, histology, embryology

Moderators: O. Kozlova, V. Ignatenko

Room 254

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Антонов Даниил	Daniil Antonov	Faculty of Biology, Department of Embryology	iPSC-Derived Macrophages: The Differentiation Protocol Affects Cell Characteristics	Получение макрофагов из iPSC: влияние протокола дифференцировки на характеристики клеток
2.	Городкова Екатерина	Ekaterina Gorodkova	Faculty of Biology, Department of Genetics	Transcription regulator Kaiso of human genes and chromatin: characteristics of interaction	Характеристика взаимодействия регулятора транскрипции генов человека Kaiso с хроматином
3.	Гук Елизавета Александровна	Elizaveta Guk	Faculty of Biology, Department of Genetics	Search and identification of genetic markers for the development of a test system for recognizing chum salmon belonging to different eco-forms	Поиск и идентификация генетических маркеров для разработки тест-системы распознавания принадлежности кеты к разным экоформам
4.	Дьяченко Анна	Anna Diachenko	Faculty of Biology, Department of Genetics	Genetic control of vitamin K metabolism in <i>Drosophila melanogaster</i>	Исследование генетического контроля метаболизма витамина К у <i>Drosophila melanogaster</i>
5.	Лебедина Алина Андреевна	Alina Lebedina	Faculty of Biology, Department of Embryology	Dynamics of ovarian folliculogenesis: clonal analysis on the Confetti mouse model	Динамика овариального фолликулогенеза: клональный анализ на модели Confetti-мышей
6.	Мазаева Александра Алексеевна	Aleksandra Mazaeva	Faculty of Biology, Department of Higher Plants	Methods for visualization of plasmodesmata in the endosperm of <i>Diospyros lotus</i> L. for the light microscopy	Методики визуализации плазмодесм в эндосперме <i>Diospyros lotus</i> L. для световой микроскопии
7.	Муратаев Рамиль	Ramil Murataev	Faculty of Biology	Genetic diversity of poplar populations in the city of Moscow	Генетическое разнообразие популяции тополей города Москвы
8.	Мышлявкина Татьяна Алексеевна	Tatiana Myshliavkina	Faculty of Biology, Department of Genetics	The use of ecogenetic marker complex for toxic effects of dioxins on bank voles <i>Clethrionomys glareolus</i> from the natural population near the municipal solid waste landfill "Lesnaya"	Применение комплекса эколого-генетических маркеров токсических эффектов диоксинов на рыжих полевках <i>Clethrionomys glareolus</i> из природной популяции, обитающих в окрестностях полигона ТБО «Лесная»
9.	Николаева Елена	Elena Nikolaeva	Faculty of Biology, Department of Genetics	Cloning and expression of genes encoding $\Delta$ FN3 proteins from <i>Bifidobacterium angulatum</i> GT102 and <i>Bifidobacterium bifidum</i> 791 in <i>Escherichia coli</i>	Клонирование и экспрессия генов, кодирующих белки $\Delta$ FN3 <i>Bifidobacterium angulatum</i> GT102 и <i>Bifidobacterium bifidum</i> 791, в клетках <i>Escherichia coli</i>
10.	Одегов Дмитрий Олегович	Dmitrii Odegov	Faculty of Biology	Evaluation of genetic diversity of <i>Darevskia raddei</i> lizards (Arribas, 1999) based on variability of microsatellite markers	Оценка генетического разнообразия ящериц <i>Darevskia raddei</i> (Arribas, 1999) по данным изменчивости микросателлитных маркеров
11.	Рубиновский Григорий	Grigorii Rubinovskii	Faculty of Biology, Department of Embryology	The Role of L-dioxyphenylalanine in the Regulation of Functional Activity of Mammalian Ovaries	Роль L-диоксифенилаланина в регуляции функциональной активности яичников млекопитающих
12.	Юдицкая Мария	Maria Iuditskaia	Faculty of Biology, Department of Genetics	Analysis of Autistic Spectrum Disorders Candidate Genes and Processes Using Data on Copy Number Variations (CNV)	Анализ генов и процессов-кандидатов аутистических расстройств на основе данных о вариациях числа копий последовательности ДНК (CNV)

**January 23**  
**Afternoon session 14.30–19.00**  
**Subsession 6.1 Ecology**  
**Moderators: I. Alikhanova, A. Volkova**  
**Room 3Д**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Клюшин Георгий	George Klyushin	Faculty of Soil Science, Department of Soil Biology	The structure and metabolic activity of microbial community in ancient Arctic permafrost under moisture deficiency	Структура и метаболическая активность микробного сообщества в древней мерзлоте Арктики в условиях дефицита влаги
2.	Лукиных Анастасия Ивановна	Anastasiya Lukinykh	Faculty of Biology, Department of Invertebrate Zoology	Biology of a new species of torquaratorids (Torquaratoridae, Enteropneusta, Hemichordata) from the Bering Sea	Биология нового вида торквараторид (Torquaratoridae, Enteropneusta, Hemichordata) из Берингова моря
3.	Лыкова Татьяна	Tatiana Lykova	Faculty of Biology, Department of Plant Physiology	Growth-inhibiting effect and distribution of nickel in plants <i>Noccaea caerulea</i> and <i>Microthlaspi perfoliatum</i>	Ростостановительное действие и распределение никеля в растениях <i>Noccaea caerulea</i> и <i>Microthlaspi perfoliatum</i>
4.	Макарова Анастасия Дмитриевна	Anastasia Makarova	Faculty of Biology, Department of General Ecology and Hydrobiology	Testate amoebae as indicators of the surface wetness of mire ecosystems in paleoecological	Раковинные амёбы как индикаторы поверхностной влажности болот в палеоэкологических исследованиях
5.	Никифорова Наталия Дмитриевна	Natalia Nikiforova	Faculty of Soil Science, Department of Land Resources and Soil Evaluation	Ecological assessment of the state of the lands of the Sverdlovsk region using remote sensing data	Экологическая оценка состояния земель Свердловской области с использованием данных дистанционного зондирования
6.	Савельева Ксения Владимировна	Ksenya Saveleva	Faculty of Soil Science, Department of Radioecology and Ecotoxicology	Effect of caesium-137 on seed germination and development of wheat ( <i>Triticum aestivum</i> L.)	Влияние цезия-137 на всхожесть семян и параметры развития пшеницы ( <i>Triticum aestivum</i> L.)
7.	Садыков Артем	Artem Sadykov	Faculty of Soil Science, Department of Physic and Melioration Soil	Micromorphological and hydrosorptive properties of urban dust in different soil-climatic zones	Микроморфологические и гидросорбционные свойства городской пыли разных почвенно-климатических зонах
8.	Сидорова Ирина	Irina Sidorova	Faculty of Soil Science, Department of Soil Geography	Evaluation of changes in the physicochemical properties of gray forest soil, ordinary chernozem and chestnut soil during their long-term plowing	Оценка изменения физико-химических свойств серой лесной почвы, чернозема обыкновенного и каштановой почвы при их длительной распашке
9.	Солодунова Дарья	Daria Solodunova	Faculty of Soil Science, Department of Radioecology and Ecotoxicology	Evaluation of the impact of microwave treatment on the toxicity of plastic-packed food components	Оценка воздействия микроволновой обработки на токсичность упакованных в пластик компонентов пищи
10.	Трифонова Виктория	Victoria Trifonova	Faculty of Soil Science, Department of General Soil Science	The Effect of temperature and moisture manipulation on biological activity of peat soils	Влияние температуры и влажности на биологическую активность торфяных почв
11.	Шкляева Дарья	Daria Shklyayeva	Faculty of Soil Science, Department of Soil Geography	Analysis of Land Degradation Dynamics in the Countries of Central Asia Based on Global Databases with the Implementation of the Land Degradation Neutrality Concept	Анализ динамики деградации земель в странах Центральной Азии по материалам глобальных баз данных с использованием концепции нейтрального баланса деградации земель
12.	Шутова Екатерина Николаевна	Ekaterina Shutova	Faculty of Soil Science, Department of Soil Geography	Environmental assessment of the consequences of mining in the area of Konduki in the Tula region	Экологическая оценка последствий угледобычи на территории района Кондуки Тульской области

**January 23**  
**Afternoon session 14.30–19.00**  
**Subsession 6.2 Ecology**  
**Moderators: O. Egorova, E. Mikheeva**  
**Room 288**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Багдасаров Илья	Ilya Bagdasarov	Faculty of Soil Science, Department of Soil Geography	Carbon stocks in coastal ecosystems of the Baltic and White seas	Запасы углерода в береговых экосистемах Белого и Балтийского морей
2.	Блынский Виктор	Victor Blynskiy	Faculty of Soil Science, Department of Land Resources and Soil Assessment	Approaches to establishment of reference soils in the land of protected natural areas and agricultural land (based on the example of sod-podzolic soils of the Odintsovo district)	Подходы к установлению эталонов почв на землях ООПТ и землях с/х назначения (на примере дерново-подзолистых почв Одинцовского района)
3.	Иванова Дарья Андреевна	Daria Ivanova	Faculty of Biology, Department of General Ecology and Hydrobiology	Comparison of the summer phytoplankton structure before and after the renewal of the bottom water in Kislo-Sladkoe lake, being gradually separated from the White Sea	Сравнение структуры летнего фитопланктона до и после обновления придонных вод озера Кисло-Сладкое, постепенно отделяющегося от Белого моря
4.	Игнатенко Александр Викторович	Alexander Ignatenko	Faculty of Soil Science, Department of Soil Biology	Hexavalent chromium bioreduction by different strains of <i>Halomonas</i> sp.	Биологическое восстановление шестивалентного хрома различными штаммами бактерий рода <i>Halomonas</i> sp.
5.	Котлярова Елизавета	Elizaveta Kotlyarova	Faculty of Biology, Department of Ecology and Plant Geography	Angiosperms colonization of lava flows on the Gorely volcano, the Kamchatka Peninsula	Заселение покрытосеменными растениями лавовых потоков вулкана Горелый (Камчатка)
6.	Крыленко Сергей	Sergey Krylenko	Faculty of Biology, Department of Hydrobiology and General Ecology	Structural Features of Macrozoobenthos Communities of Small Lakes in the Arctic Zone of Eurasia	Особенности строения сообществ макрозообентоса малых озер арктической зоны Евразии
7.	Лайкова Александра Алексеевна	Alexandra A. Laikova	Faculty of Biology, Department of Microbiology	Sequential single-reactor production of hydrogen and methane by the microbial community due to stimulation of hydrogenase activity by iron (II) ions and direct interspecies electron transfer by granular activated carbon	Последовательное одnoreакторное получение водорода и метана микробным сообществом за счет стимуляции гидрогеназной активности ионами железа (II) и прямого межвидового переноса электронов активированным углем
8.	Лоскутов Дмитрий	Dmitriy Loskutov	Faculty of Soil Science, Department of Land Resources and Soil Assessment	Ecological assessment of the state of land in the Orenburg region using Earth remote sensing data	Экологическая оценка состояния земель Оренбургской области с использованием данных дистанционного зондирования Земли
9.	Меркин Вадим Алексеевич	Vadim Merkin	Faculty of Biology, Department of Invertebrate Zoology	Effects of bleaching on population of obligate and facultative symbiotic coral crabs	Влияние обесцвечивания на структуру популяции крабов – облигатных и факультативных симбионтов кораллов
10.	Морозов Александр	Alexander Morozov	Faculty of Soil Science, Department of Soil Biology	Mycobiota in the zone of main destruction of organic detritus of eutrophic peat soils	Микобиота в зоне основной деструкции органического детрита эутрофных торфяных почв
11.	Стефаниди Кирилл Романович	Kirill Stefanidi	Faculty of Soil Science, Department of Land Resources and Soil Assessment	Ecological and agrochemical assessment of the fertilizer system in “climate neutral” agriculture	Эколого-агрохимическая оценка системы удобрений в «климатически нейтральном» земледелии
12.	Точиев Хасан Магомедович	Khasan Tochiev	Faculty of Soil Science, Department of Land Resources and Soil Evaluation	Environmental assessment of the condition of lands according to remote sensing data in the Republic of Bashkortostan (Russia)	Экологическая оценка состояния земель с использованием данных дистанционного зондирования Земли в Республике Башкортостан

**January 23**  
**Afternoon session 14.30–18.00**  
**German Session**  
**Moderators: A. Yedlichko**  
**Room**

	Name	Name und Vorname	Deutsch	Russisch
1.	Еремеева Елизавета	Eremeeva Elizaveta	Das Sekretom von pflanzlichen Zellsuspensionskulturen als Quelle für bioaktive Substanzen	Секретом суспензионных культур клеток растений как источник биологически активных веществ
2.	Аргентова Анастасия	Argentova Anastacia	Herstellung+D4 blockierender Nanoantikörper gegen Taq-DNA-Polymerase	Получение серии блокирующих нанотел к Taq-полимеразе
3.	Капитонова Анна	Kapitonova Anna	Struktureller Wechsel von menschlichem Nukleophosmin bei Phosphorylierung und Interaktion mit 14-3-3-Proteinen	Структурные переходы белка нуклеофосмина человека при фосфорилировании и взаимодействии с белками 14-3-3 человека
4.	Бойченко Вероника	Boichenko Veronika	Analyse der Expression von uPAR- und tPA-Genen im Mausgehirn als Reaktion auf die Erforschung einer neuen Umgebung	Анализ экспрессии генов uPAR и tPA в головном мозге мыши в ответ на освоение новой среды
5.	Богоцкой Кирилл	Bogotskoy Kirill	Die Rolle von Pannexin 1 bei globalen und lokalen Veränderungen des zerebralen Blutflusses bei Mäusen	Роль паннексина 1 в глобальных и локальных изменениях мозгового кровотока у мыши
6.	Лагоша Станислав	Lagosha Stanislav	Modellierung der Wiederaufnahme-Rolle von extrasynaptischen GABA durch Astrozyten bei der Regulierung des Hypocampus-Theta-Rhythmus	Моделирование роли обратного захвата экстраинаптической ГАМК астроцитами в регуляции гипокампального тета-ритма

January 24

Morning session 10.00–13.00

Session 1.3 General biology

Moderators: L. Polubichenko, O. Egorova, V. Ignatenko

Room 252

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Гайсин Никита	Nikita Gaisin	Faculty of Biology, Department of Mycology and Algology	Biodiversity of Representatives of the Genus <i>Fusarium</i> Link in Vietnam	Биоразнообразие представителей рода <i>Fusarium</i> Link во Вьетнаме
2.	Исакова Алина	Alina Isakova	Faculty of Biology, Department of Bioengineering	Production and study of DR5-B antitumor hybrid protein with iRGD effector peptide for targeted cancer therapy	Получение и исследование противоопухолевого гибридного белка DR5-B с эффекторным пептидом iRGD для таргетной терапии рака
3.	Ратновская Анна	Anna Ratnovskaya	Faculty of Biology	Mantle epithelia structure in brachiopod <i>Hemithiris psittacea</i> (Gmelin, 1791)	Строение мантийных эпителиев брахиоподы <i>Hemithiris psittacea</i> (Gmelin, 1791)
4.	Чертопруд Елизавета Михайловна	Elizaveta M. Chertoprud	Faculty of Biology, Department of Invertebrate Zoology	Groundwater microgastropods of the genus <i>Tschernomorica</i> (Gastropoda: Hydrobiidae) from Western Georgia: biodiversity, integrative taxonomy, and phylogeography	Микрогастроподы рода <i>Tschernomorica</i> (Gastropoda: Hydrobiidae) грунтовых вод Западной Грузии: состав фауны, интегративная таксономия и филогеография
5.	Широбок Виталий Александрович	Vitaliy Shirobokov	Faculty of Biology, Department of Higher Plants	The structure of the gynoeceum of representatives of the genus <i>Aconitum</i> L. in connection with the peculiarities of the growth of pollen tubes	Строение гинецея представителей рода <i>Aconitum</i> L. в связи с особенностями роста пыльцевых трубок
6.	Юдина Софья Всеволодовна	Sophia V. Yudina	Faculty of Biology, Department of Higher Plants	Evolution of mycoheterotrophic members of the order Dioscoreales and their photosynthetic relatives in the light of flower morphology and plastid genome structure	Эволюция микогетеротрофных представителей порядка Dioscoreales и родственных им фотосинтезирующих видов в свете данных по морфологии цветка и строению пластидных геномов



January 24

Morning session 10.00–13.00

Subsession 2.2 Biochemistry and molecular biology

Moderators: A. Foursova, A. Volkova, T. Surganova

Room 290

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Боровикова София	Sofiiia Borovikova	Faculty of Biology, Department of Molecular Biology	The Construction of Virus-like Particles with the Cas12a Protein for Gene Therapy of HIV Infection	Создание вирусоподобных частиц с Cas12a нуклеазой для генной терапии ВИЧ-инфекции
2.	Козобкова Наталия Валерьевна	Nataliya Kozobkova	Faculty of Biology, Department of Microbiology	Photosensitizers Activated by Short-range Infrared Radiation for Photodynamic Inactivation of <i>Mycobacterium sp.</i>	Исследование фотосенсибилизаторов, активируемых излучением ближнего инфракрасного диапазона, для фотодинамической инактивации <i>Mycobacterium sp.</i>
3.	Корчинская Виктория Юрьевна	Victoria Korchinskaya	Faculty of Biology, Department of Biochemistry	Identification of Proteins in the Multisubunit Translation Initiation Complex of the Potato Virus Y (PVY)	Идентификация белков, входящих в состав мультисубъединичного комплекса инициации трансляции Y вируса картофеля (PVY)
4.	Мангов Милорад	Milorad Mangov	Faculty of Fundamental Physical and Chemical Engineering	Study of the phosphines' influence on the activity of catalytic systems based on palladium complexes and organic co-catalysts in addition polymerization of norbornene	Изучение влияния фосфинов на активность каталитических систем на основе комплексов палладия и органических сокатализаторов в аддитивной полимеризации норборнена
5.	Назаренко Екатерина Алексеевна	Ekaterina Nazarenko	Faculty of Biology, Department of Virology	Comparison of Properties of Non-structural Protein 1 (NS1) of Tick-borne Encephalitis Virus of Different Isolates	Сравнение свойств неструктурного белка 1 (NS1) вируса клещевого энцефалита разных изолятов
6.	Панасюк Маргарита	Margarita Panasiuk	Faculty of Biology, Department of Virology	Nanobody-based immune polymerase chain reaction for quantitative detection of antigen	Использование однодоменных антител в методе иммуно-ПЦР для высокочувствительной детекции антигена
7.	Пекина Юлия Владимировна	Yulia Pekina	Faculty of Biology, Department of Molecular Biology	Study of the role of transcription factors E(var)3–9 and Odj in the regulation of transcription of heterochromatin genes in <i>Drosophila melanogaster</i>	Изучение роли транскрипционных факторов E(var)3–9 и Odj в регуляции транскрипции гетерохроматиновых генов <i>Drosophila melanogaster</i>
8.	Четверикова Мария Михайловна	Maria Chetverikova	Faculty of Biology, Department of Virology	Examining novel cathepsin-dependent apoptotic molecular pathways	Исследование новых молекулярных путей протекания апоптоза с вовлечением катепсинов

January 24

Morning session 10.00–13.00

Subsession 3.1 Biophysics, bioengineering, biotechnology

Moderators: O. Kozlova, A. Kazantseva, Z. Alkhastova

Room 199

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Вишневецкая Анна	Anna Vishnevskaya	Faculty of Biology, Department of Plant Physiology	Comparison of the structure and electron transfer in photosystem 1 from different organisms	Сравнение строения и переноса электрона в фотосистеме 1 из разных организмов
2.	Киселева Диана	Diana Kiseleva	Faculty of Biology, Department of Biophysics	Hyponatremia and cell swelling as a risk for inability of heart rhythm self-restoration in patients undergoing on-pump CABG	Влияние отека миокарда на восстановления сердечной деятельности во время аортокоронарного шунтирования на основе клинических данных
3.	Кристовский Николай	Nikolay Kristovski	Faculty of Biology, Department of Bioengineering	Efficiency evaluation of Forster resonance energy transfer by molecular modelling	Оценка эффективности Ферстеровского резонансного переноса энергии методом молекулярного моделирова- ния
4.	Мамчур Александра	Aleksandra Mamchur	Faculty of Biology, Department of Biophysics	Assessment of the conformational mobility of the SARS- CoV-2 spike protein's receptor-binding domain	Оценка конформационной подвижности рецептор- связывающего домена спайк белка вируса SARS-CoV-2
5.	Неугодов Артем Михайлович	Artem Neugodov	Faculty of Biology, Department of Bioengineering	Ion channelrhodopsin genes analysis in collection strains and natural isolates of Chlorophyta and Cryptophyta algae	Анализ генов ионных канальных родопсинов в коллек- ционных штаммах и природных изолятах водорослей Chlorophyta и Cryptophyta
6.	Павлов Всеволод	Vsevolod Pavlov	Faculty of Fundamental Physical and Chemical Engineering	Development of a new type of bioelectrocatalyst based on <i>Saccharomyces cerevisiae</i>	Разработка нового типа биоэлектрокатализатора на основе <i>Saccharomyces cerevisiae</i>
7.	Саулина Александра Александровна	Aleksandra Saulina	Faculty of Biology, Department of Bioengineering	Effects of WGR-domain of the protein PARP-2 on the structure of nucleosomes	Влияние WGR-домена белка PARP-2 на структуру нуклеосом
8.	Тагирова Алина	Alina Tagirova	Faculty of Biology, Department of Genetics	Expression of bacterial phytase <i>B. ginsengihumi</i> M2.11 in recombinant strains of <i>P. Pastoris</i>	Экспрессия бактериальной фитазы <i>B. ginsengihumi</i> M2.11 рекомбинантными штаммами <i>P. Pastoris</i>
9.	Эйгель Дария	Dariya Eygel	Faculty of Biology, Department of Biophysics	Molecular mechanisms of osmotic and chemical hemolysis	Молекулярные механизмы осмотического и химического гемолиза

January 24

Morning session 10.00–13.00

Subsession 4.2 Physiology and neurobiology

Moderators: N. Morgoun, S. Agadganyan, D. Kozlov

Room 298-A

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Бекетова Мария	Maria Beketova	Faculty of Biology, Department of Embryology	Molecular Mechanisms of the Effects of Fluoxetine on Functional Activity of the Mouse Ovary	Молекулярные механизмы эффектов флуоксетина на функциональную активность яичника мыши
2.	Пахлова Екатерина	Ekaterina Pakhlova	Faculty of Biology, Department of Human and Animal Physiology	Neuroimmune dysfunction in animals with prenatal alcohol intoxication	Нейроиммунные нарушения у животных с пренатальной алкогольной интоксикацией
3.	Сидоренко Дарья	Daria Sidorenko	Faculty of Biology, Department of Human and Animal Physiology	Physiological role of mitokines in functional unloading of postural muscle	Физиологическая роль митокинов при функциональной разгрузке постуральной мышцы
4.	Скальник Евдокия Вениаминовна	Evdokia Skalnik	Faculty of Biology, Department of Higher Nervous Activity	Acquisition of an operant conditioning tasks by rats in a Skinner box during formation of goal-directed behavior and habit	Динамика инструментального научения в камере Скиннера у крыс при формировании целенаправленного поведения и «привычки»
5.	Соболева Людмила Валерьевна	Liudmila Soboleva	Faculty of Biology, Department of Human and Animal Physiology	Study of the Pharmacological Effects of N-(6-Phenylhexanoyl)-Glycyl-D-Tryptophan Amide in a Cell Model of <i>Paramecium caudatum</i>	Изучение фармакологического воздействия Амид N-(6-фенилгексаноил)-глицил-D-триптофана на клеточной модели <i>Paramecium caudatum</i>
6.	Соловьева Анна Константиновна	Anna Soloveva	Faculty of Biology, Department of Neurobiology	Motor control and cognitive function recovery during forced awakening from slow-wave daytime sleep	Восстановление моторных и когнитивных функций при форсированном пробуждении из медленноволновой стадии дневного сна

**January 24**  
**Morning session 10.00–13.00**  
**Subsession 6.3 Ecology**  
**Moderators: I. Alikhanova, E. Mikheeva**  
**Room M2**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Парамонов Михаил	Mikhail Paramonov	Faculty of Biology, Department of General Ecology and Hydrobiology	Relationship between testate amoeba assemblages, environmental conditions, vegetation and ecosystem functions in mire ecosystems	Взаимосвязь между сообществами раковинных амёб, условиями среды, растительным покровом и функциями экосистем верховых болот
2.	Пастухова Юлия Александровна	Yuliya Pastukhova	Faculty of Biology, Department of General Ecology and Hydrobiology	Reconstruction of the Developmental Conditions of the Krivetskiy Mokh Mire Using a Multi-Proxy Paleoecological Approach	Реконструкция условий развития экосистемы болота Кривецкий мох по данным комплексного палеоэкологического анализа
3.	Разгоняева Василиса	Vasilisa Razgonyaeva	Faculty of Biology, Department of General Ecology and Hydrobiology	The temperature and light impact on the physiological characteristics of corals <i>Montipora digitata Dana, 1846</i>	Влияние температуры и освещенности на физиологические характеристики кораллов <i>Montipora digitata Dana, 1846</i>
4.	Рябенко Ольга Ивановна	Olga I. Riabenko	Faculty of Biology, Department of Ecology and Plant Geography	Classification, ecology and geography of hemiboreal larch forests of Tukuringra Range	Гемибореальные лиственничные леса хребта Тукурингра: классификация, экология и география
5.	Рязанцева Мария Игоревна	Maria Ryazantseva	Faculty of Soil Science, Department of General Soil Science	Methodological features of studying the biological activity of organogenic soil samples in laboratory incubation experiments	Методические особенности изучения биологической активности органогенных образцов почв в лабораторных инкубационных экспериментах
6.	Тамразова Анна Романовна	Anna Tamrazova	Faculty of Soil Science, Department of Radioecology and Ecotoxicology	Fractionation and distribution of heavy natural radionuclides in soddy-podzolic and gray soils	Формы нахождения и распределение тяжелых естественных радионуклидов в дерново-подзолистых и серых почвах
7.	Чамкина Анна	Anna Chamkina	Faculty of Biology, Department of General Ecology and Hydrobiology	Diatomic Phytobenthos Community Structure of Moskva River and Water Quality Assessment	Структура сообщества диатомового фитобентоса реки Москвы и оценка качества вод
8.	Шехурдина Светлана Витальевна	Svetlana V. Shekhurdina	Faculty of Biology, Department of Microbiology	The course of various types of direct interspecific electron transfer in biofilms during anaerobic fermentation of highly concentrated volatile fatty acids, depending on the inoculate and the conductivity of the carrier material	Протекание различных типов прямого межвидового переноса электронов в биопленках при анаэробном сбраживании высококонцентрированных летучих жирных кислот в зависимости от инокулята и электропроводности материала-носителя

**January 24**  
**Morning session 10.00–15.00**  
**Session 9 Biomedical Research**  
**Moderators: N. Glinskaya, E. Kozharskaya**  
**Room 254**

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Абдраймова Н.К.	Abdraimova N.K.	Faculty of Biology, Department of Microbiology	Combined Effects of Bacteriophage vB_SauM-515A1 and Antibiotics on the <i>Staphylococcus aureus</i> Clinical Isolates	Комбинированное воздействие бактериофага vB_SauM-515A1 и антибиотиков на клинические изоляты <i>Staphylococcus aureus</i>
2.	Алиева Рена	Rena Alieva	Faculty of Biology, Department of Biophysics	Characteristics of modular nanotransporter for activation of the Nrf2 antioxidant defense system	Характеристика модульного нанотранспортера для активации Nrf2-системы защиты от окислительного стресса
3.	Билык Степан Алексеевич	Stepan Bilyk	Faculty of Fundamental Physical and Chemical Engineering	Application of the pulsed field gradient nmr technique for the study of self-diffusion of water-soluble fullerene derivatives in mouse erythrocytes	Применение метода ямр с импульсным градиентом магнитного поля для исследования самодиффузии водорастворимых производных фуллерена в эритроцитах мыши
4.	Воронина Алиса	Alice Voronina	Faculty of Biology, Department of Allergology and Immunology	Analysis of the <i>Helicobacter cinaedi</i> proteome and study of its potential pathogenicity factors	Анализ протеома бактерии <i>Helicobacter cinaedi</i> и исследование ее потенциальных факторов патогенности
5.	Дубар Мэриам	Meriam Dubar	Faculty of Fundamental Medicine	Synthesis of 3-(4-methoxybenzylidene) 5-benzoylamino-2-oxindole and evaluation of its biological activity	Синтез 3-(4-метоксибензилиден)-5-бензоиламино-2-оксиндола и оценка его биологической активности
6.	Егоров Евгений	Evgeniy Egorov	Faculty of Fundamental Medicine	Pharmacy goods online – study of the features	Изучение особенностей дистанционной торговли товарами аптечного ассортимента
7.	Козлова Александра	Aleksandra Kozlova	Faculty of Fundamental Medicine	Myelitis associated with novel coronavirus infection: clinical, radiological, laboratory characteristics including serum and CSF cytokines and chemokines profiles	Миелиты, ассоциированные с новой коронавирусной инфекцией: клинические, радиологические и лабораторные особенности. Цитокиновый и хемокиновый профиль пациентов
8.	Кустова Дарья	Daria Kustova	Faculty of Biology, Department of Virology	Molecular Genetic Investigation of SARS-CoV-2 Lineages circulating in Moscow	Молекулярно-генетическая характеристика циркулирующих линий SARS-CoV-2 в Москве
9.	Милутинович Ксения	Kseniya Milutinovich	Faculty of Fundamental Medicine	Macrophage transdifferentiation as a method of IBD therapy	Трансдифференцировка макрофагов как метод терапии ВЗК
10.	Нягматуллина Виктория Рафаэльевна	Viktoriia Niagmatullina	Faculty of Fundamental Medicine, Department of Pharmaceutical Technology	Rationale and strategies for formulation development of drugs with saxagliptin	Обоснование и стратегии разработки составов лекарственных препаратов с саксаглиптином
11.	Рыбачук Виктория Александровна	Victoria Rybachuk	Faculty of Biology, Department of Immunology	Impact of relatively low doses of ionizing radiation on activated human lymphocytes	Воздействие относительно низких доз ионизирующего излучения на активированные лимфоциты человека
12.	Садовская Александра	Aleksandra Sadovskaya	Faculty of Biology, Department of Immunology	Multipotent mesenchymal stromal cells from bone marrow of patients at the onset of acute leukemia and after treatment	Мультипотентные мезенхимные стромальные клетки из костного мозга больных острыми лейкозами в дебюте заболевания и после лечения
13.	Фирко Егор Сергеевич	Egor Firko	Faculty of Biology, Department of Microbiology	Effect of macrophages on dormant state and synthesis of trehalose in <i>Mycobacterium tuberculosis</i> in experimental models in vitro and in vivo	Исследование влияния макрофагов на состояние покоя и синтез трегалозы у бактерий <i>Mycobacterium tuberculosis</i> в экспериментальных моделях in vitro и in vivo

January 24

Afternoon session 14.00–18.00

Subsession 6.4 Ecology

Moderators: O. Kozlova, E. Mikheeva, S. Agadganyan

Room 252

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Алексеева Мария	Maria Alekseeva	Faculty of Soil Science	How does temperature gradient affect oil degradation in contaminated chernozem?	Как градиент температур влияет на деструкцию нефти в загрязненном черноземе?
2.	Буденная Анастасия	Anastasia Budennaia	Faculty of Biology, Department of Microbiology	Antibacterial activity of <i>Streptomyces</i> sp.GA-5 strain isolated from the natural biomineral complex in the Caucasian Nature Reserve	Исследование антибиотической активности штамма <i>Streptomyces</i> sp.GA-5, выделенного из природного биоминерального комплекса Кавказского природного биосферного заповедника
3.	Жевнерёв Даниил	Daniil Zhevnerov	Faculty of Soil Science, Department of Soil Biology	Survivability of freeze-dried yeast cultures after long-term conservation	Жизнеспособность лиофилизированных культур дрожжей после длительной консервации
4.	Жиров Иван Андреевич	Ivan Zhirov	Faculty of Biology, Department of Molecular Biology	Factors affecting the variability of rust fungi <i>Puccinia graminis</i> and <i>Gymnosporangium sabinae</i> under climate change	Факторы, влияющие на вариабельность ржавчинных грибов <i>Puccinia graminis</i> и <i>Gymnosporangium sabinae</i> при изменении климата
5.	Старков Андрей	Andrey Starkov	Faculty of Fundamental Physical and Chemical Engineering	The effect of the composition of the working electrode material on the operability of sensors in the air during the reaction to hydrogen and carbon monoxide	Влияние содержания платины в материале рабочего электрода на свойства сенсоров на H <sub>2</sub> и CO
6.	Тимофеева Алина Александровна	Alina A. Timofeeva	Faculty of Biology, Department of General Ecology and Hydrobiology	Effect of hardness of water on zinc ions toxicity to crustaceans	Влияние жесткости воды на токсичность ионов цинка для ракообразных <i>Daphnia magna</i>
7.	Тюлебаева С.С.	Tyulebaeva S.S.	Faculty of Soil Science, Department of Soil Geography	Study of the self-purification of the Ural River below the town of Orenburg in the period from 2012 to 2021	Исследование самоочищения реки Урал ниже города Оренбург в период с 2012 по 2021 гг.
8.	Чулей Артемий	Artemii Chulei	Faculty of Biology, Department of General Ecology and Hydrobiology	Ecological and Geographical Factors Affecting Testate Amoeba Communities in Arcto-alpine Conditions	Экологические и географические факторы формирования сообществ раковинных амёб в арктоальпийских условиях

January 24

Afternoon session 14.00–18.00

Session 7 Fundamental Soil Science

Moderators: S. Kazantseva, L. Polubichenko, A. Foursova

Room 290

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Борзов Александр	Alexander Borzov	Faculty of Soil Science; Department of Soil Chemistry	Transformation of polycyclic aromatic hydrocarbons in the soil contaminated with pyrolysis products in a model experiment	Трансформация полициклических ароматических углеводородов в почве, загрязненной продуктами пиролиза в ходе модельного эксперимента
2.	Волокитин Святослав	Svyatoslav Volokitin	Faculty of Soil Science, Department of Soil Chemistry	Effect of humic acid and iron hydroxide on sorption of Pb(II) by kaolinite and muscovite	Эффект гуминовой кислоты и гидроксидов железа на сорбцию Pb(II)
3.	Деревенец Елизавета	Elizaveta Derevenets	Faculty of Soil Science, Department of Soil Geography	The effect of mineral fertilizers on greenhouse gas emissions from urban lawn soils	Влияние минеральных удобрений на эмиссию парниковых газов из почв городских газонов
4.	Ермакова София	Sofiia Ermakova	Faculty of Soil Science, Department of Soil Physics and Reclamation	Effect of anthropogenic load on the wettability of soils of different genesis	Влияние антропогенной нагрузки на смачиваемость урбаноземов и конструктороземов
5.	Звычайная Елизавета	Elizaveta Zvychnayaya	Faculty of Soil Science, Department of Soil Physics	Quantitative characteristics of ortstein pore space structure in agrogray soils using tomography	Количественная характеристика структуры порового пространства ортштейнов оглеенных агросерых почв методом томографии
6.	Овчинникова Ольга Юрьевна	Olga Ovchinnikova	Faculty of Soil Science, Department of Soil Biology	Localization of C cycle enzymes in arable and forest Phaeozems on micro-scale	Локализация ферментов цикла C в серой лесной почве пашни и леса на микроуровне
7.	Перебасова Полина Максимовна	Polina Perebasova	Faculty of Soil Science, Department of Erosion and Soil Conservation	The characteristics of the microbial complex of sod-podzolic soil of various erodibility	Особенности микробного комплекса дерново-подзолистой почвы разной степени смытости
8.	Смольский Егор	Egor Smolskiy	Faculty of Soil Science, Department of Soil Chemistry	Sorption of 2,4-dichlorophenoxyacetic acid on bentonite and organo-bentonite	Сорбция 2,4-дихлорфеноксиуксусной кислоты на бентоните и органо-бентоните
9.	Цомаева Елизавета	Elizaveta Tsomaeva	Faculty of Soil Science, Department of Agriculture and Agroecology	Compounds of non-silicate iron in the mineral-associated organic matter of slightly eroded agrochernozems	Соединения несиликатного железа в минерально-ассоциированном органическом веществе слабоэродированных агрочерноземов

January 24

Afternoon session 14.00–18.00

Session 8 Applied Soil Science

Moderators: O. Egorova, I. Alikhanova, N. Morgoun

Room 254

	Name in Russian	Name in English	Faculty, department	Title of paper in English	Title of paper in Russian
1.	Балашов Георгий	George Balashov	Faculty of Soil Science, Department of Agrochemistry and Plant Biochemistry	Influence of pre-planting cuttings treatment with succinic acid under reduced pressure for the growth and development of black currant ( <i>Ribes nigrum</i> L.)	Влияние предпосадочной обработки черенков янтарной кислотой в условиях разреженной среды на рост и развитие черной смородины ( <i>Ribes nigrum</i> L.)
2.	Грамастик Ксения	Ksenya Hramatyk	Faculty of Soil Science, Department of Agrochemistry and Plant Biochemistry	The effect of different forms of fertilizers and lighting conditions on the growth and development of vegetable pepper ( <i>Capsicum annuum</i> L.)	Влияние разных форм удобрений и условий освещения на рост и развитие растений Перца овощного ( <i>Capsicum annuum</i> L.)
3.	Грузденко Анастасия Алексеевна	Anastasiia Gruzdenko	Faculty of Soil Science, Department of Soil Chemistry	Evaluation of the possibility of using polyelectrolyte compounds to improve the properties of technosoil	Оценка возможности применения полиэлектролитных составов для улучшения свойств техногрунта
4.	Исакова София Александровна	Sofia Isakova	Faculty of Soil Science, Department of Soil Chemistry	Influence of ameliorants (peat and calcium peroxide) on the chemical and biological properties of reclaimed soils of the southern tundra of the Taimyr Peninsula	Влияние мелиорантов (торфа и пероксида кальция) на химические и биологические свойства рекультивируемых почв Южной тундры п-ова Таймыр
5.	Медова Екатерина	Ekaterina Medova	Faculty of Soil Science, Department of General Soil Science	Forest soils of the National Park Zavidovo	Лесные почвы национального парка «Завидово»
6.	Обришти Марк	Mark Obrishti	Faculty of Soil Science, Department of Management of Land Resources and Biological Control of Environment	Study of the anthropogenic impact on the mineral composition of water, bottom sediments and coastal soils in different parts of the Sukko River	Изучение антропогенного воздействия на минеральный состав воды, донных отложений и прибрежных почв на разных на разных участках реки Сукко
7.	Уваров Георг	Georg Uvarov	Faculty of Soil Science	Changes in the emission activity of greenhouse gases (CO <sub>2</sub> , N <sub>2</sub> O and CH <sub>4</sub> ) from non-black soil zone soils during the biochar application	Изменение активности эмиссии парниковых газов (CO <sub>2</sub> , N <sub>2</sub> O и CH <sub>4</sub> ) из почв нечерноземной зоны при внесении биочара
8.	Шабалина Дарья Михайловна	Daria Shabalina	Faculty of Soil Science, Department of Agriculture and Agroecology	Sensitivity analysis of the RothC model for the carbon sequestration potential assessing of the Rostov region arable lands	Анализ чувствительности модели RothC для оценки потенциала секвестрации углерода пахотных земель Ростовской области



## PLENARY PRESENTATIONS

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### ENGINEERING INVESTIGATION OF THE SURFACE OF BIOCOMPATIBLE NANOCOMPOSITE CARBON COATINGS DEPOSITED BY AN ACCELERATED C60 ION BEAM

### ИССЛЕДОВАНИЕ ПОВЕРХНОСТИ БИОСОВМЕСТИМЫХ НАНОКОМПОЗИТНЫХ УГЛЕРОДНЫХ ПОКРЫТИЙ, НАНОСИМЫХ С ИСПОЛЬЗОВАНИЕМ УСКОРЕННОГО ПУЧКА ИОНОВ C60

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Keywords: Nanocomposite carbon, surface effects, biocompatible coatings

It is well known that durability and corrosion resistance are of importance for medical implants: implants must retain their properties for many years, while being in an aggressive biological environment. Usually, modifications of device surfaces are used to protect it from various types of damaging effects, thus fixing the problem. Usage of corrosion- and wear-resistant carbon coatings (for example, DLCs, diamond-like carbon coatings) applied to the surface of surgical and dental implants has been gradually increasing in recent years. Carbon nanocomposite coatings prepared with deposition of an C60 ion beam on a substrate are designed as an alternative to overcome severe disadvantages of traditional DLC, such as high internal stress and sensitivity to ambient conditions. High wear-resistance, adhesive properties and biocompatibility of carbon nanocomposite coatings applied on Co/Cr and Ti alloys were studied extensively in [1]. However, further improvement of the methods of applying carbon coating to the substrate requires additional study of the physical and chemical processes occurring during the surface application – in particular, for ion beams accelerated to 8 keV or higher, surface sputtering was observed in [2], which negates the possibility of obtaining a carbon coating from high-energy ion beams. A sequence of experiments was carried out to reveal the dependence between the temperature of the substrate during the interaction with an ion beam and the observed surface effects, which includes the search for the sputtering point. This work aims to study the processes emerging on the substrate during the deposition of a carbon coating with a C60 ion beam.

The starting material for a carbon coating is fullerene C60 in a molecular form; in particular, C60 by “НеоТекПродакт” LLC (St. Petersburg) with 99.5% purity was chosen for the experiment. Before the deposition, initial purification of the fullerene was carried out using vacuum distillation. The study was performed at a pressure of about  $5 \cdot 10^{-6}$  Pa in an original vacuum unit. Heterogeneous oil-free pumping was used to create the working pressure. During the experiment, the application was carried out sequentially on three substrates at temperatures of 250 °C, 150 °C and 20 °C, respectively. The C60+ ion beam was generated by an ion source with a saddle-shaped electric field. The study of the substrate surface after interaction with the ion beam was investigated with an atomic force microscope (AFM) NT-MDT Solver Open in the contact mode.

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## **AGING LEADS TO CHANGES IN INSULIN SIGNALING, AS WELL AS DIFFERENTIATION AND PROLIFERATIVE POTENTIALS OF MSCS**

### **СТАРЕНИЕ ПРИВОДИТ К ИЗМЕНЕНИЮ ИНСУЛИНОВОЙ СИГНАЛИЗАЦИИ, А ТАКЖЕ ДИФФЕРЕНЦИРОВОЧНОГО И ПРОЛИФЕРАТИВНОГО ПОТЕНЦИАЛОВ МСК**

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Keywords: Aging, MSCs, adipogenic differentiation, proliferative activity

Aging is a biological process of gradual degradation of parts and systems of a human body and the consequences of this process. This is the only condition that acts as a risk factor for almost all major socially significant diseases.

In the progression of the aging an important role is played by the inevitable shrinkage of the stem cell pools, which leads to a decrease in their ability to maintain homeostasis, as well as to disruption of the functioning and reparation of tissues and organs. The purpose of our work was to assess the changes taking place with resident stem cells of adipose tissue – mesenchymal stem cells (MSCs) during aging.

To assess the proliferative activity of stem cells the immunohistochemical staining for the marker of proliferation – protein Ki67 was performed. The adipogenic differentiation potential of MSCs was evaluated using immunofluorescence staining of adipocyte lipid droplets and real-time polymerase chain reaction combined with reverse transcription for assessment of the expression of adipogenic differentiation marker genes. The activity of insulin-dependent intracellular signaling pathways that promote adipogenesis as well as regulate cell proliferation and survival during aging was evaluated using the method of Western blotting for determination of phosphorylation of protein kinases AKT and ERK. Fluorescent calcium dye Fluo-8 was used to analyze the calcium response to insulin.

Our results show that aging lead to a significant change in the properties of MSCs. The proliferative potential of cells from the group of elderly donors decreased by almost 30% compared to cells derived from healthy donors. MSCs from elderly donors as well as MSCs with induced senescence demonstrated long-term activation of the MAPK/ERK signaling cascade which may correlate to the activation of apoptotic pathways in senescent cells. Moreover, resident stem cells from many elderly donors showed a reduced ability to adipogenic differentiation, which was demonstrated in a decrease in the accumulation of lipid droplets and a decrease in the expression of adipogenic differentiation gene markers. Aging MSCs also demonstrated insulin resistance due to the high basal level of AKT phosphorylation. An increase in the amplitude of the calcium signal and the percentage of cells that

responded to insulin stimulation were shown in MSCs obtained from insulin resistant and elderly donors compared with cells from young patients.

Thus, all these processes may underlie the development of disturbances in the renewal and functioning of adipose tissue during aging.

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## **TRANSFORMATION AND MOVEMENT OF SOIL PHOSPHORUS DURING SOIL EROSION**

### **ТРАНСФОРМАЦИЯ И ПЕРЕМЕЩЕНИЕ ФОСФОРА В ПРОЦЕССЕ ЭРОЗИИ ПОЧВ**

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Keywords: Soil, phosphorous, erosion, soil aggregates, soil degradation

Phosphorous is one of the most essential macroelements in plant's life. For this reason, the reduction of phosphorus content in soils under the influence of water erosion is considered as a worldwide catastrophe [1]. Mobile forms of phosphorous and forms adsorbed on the surface of fine soil particles (especially clay particles) wash out and moves down the slope in the lakes and rivers, and eventually accumulate in the ocean. The return of phosphorus to land takes thousands of years [8,9]. Moreover, phosphorus increases the eutrophication of water bodies [2,5]. The use of fertilizers can provide plants with phosphorus, but will not solve the problem, since, firstly, fertilizers increase the mineralization of stable organic compounds, and secondly, for the most part, they remain untouched in the surface soil layer and are easily washed out by surface runoff. [3,4]. [3,4]. Finally, phosphorus sources are exhaustible, and farmers may face a shortage of phosphorus for plant growth and development already in the 21st century [1,6]. So, it is very important to investigate phosphorous transportation and accumulation and find ways to reduce phosphorous loss.

Thus, Vermic Chernozems with different land use were studied: mowed grassland, soil under the wood line, soil of perennial fallow, tillage and no-till farming and then arable Sod-Podzol with different location on the slope: on the top, in the middle, and at the bottom of the slop. All soil sample was divided into four groups of different-sized aggregates (> 5 mm, 5–2 mm, 2–1 mm and < 1 mm) by Savvinov dry sieving method. The content of organic carbon, mobile phosphorous, organic phosphorous, mineral phosphorous and total ratio of phosphorous was also determined.

Soil cultivation methods influence the transformation of phosphorous. In undisturbed soils, available (mobile) phosphorus content is low, and vegetation protects soil organic matter (particularly from mineralization). Tillage increases mineralization processes and availability of phosphorous and in addition induce phosphorous loss with water and small soil particles. Phosphorus is easily washed out from the slope and from the soil at the foot of the slope, especially from the slopes of southern [7] and eastern exposure (according to our observations), despite the fact that fine soil particles accumulated there. Mineral phosphorous of sod-podzolic soil was stable only in aggregates from 2 to 5 mm diameter.

It is obvious that tillage reduces amount of stable phosphorus compounds in soil and induces its loss with erosion. The distribution of soil particles and phosphorous on the slop leads us to conclusion, that it is easier to prevent erosion then to deal with the consequences.

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## **ELECTROPHYSIOLOGICAL ANALYSIS OF THE CARDIAC KV CHANNEL WITH THE ALA341VAL MUTATION, FOUND IN THE PATIENT WITH LQTS** **ЭЛЕКТРОФИЗИОЛОГИЧЕСКИЙ АНАЛИЗ СЕРДЕЧНОГО КАНАЛА КВ С МУТАЦИЕЙ ALA341VAL, ОБНАРУЖЕННЫЙ У ПАЦИЕНТА С ЛКТС**

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Keywords: LQTS, Kv7.1, KCNQ1 gene, patch clamp

Long QT syndrome type 1 has genetic and asymptomatic characteristics, which are both very important features. The main reason for this is that mutations in the KCNQ1 gene lead to changes in the structure and function of the potassium channel, and the protein channel encoded by the KCNQ1

gene is the Kv7.1 channel, whose main role is to regulate the I<sub>Ks</sub> potassium current, which is the main current that regulates cell repolarization. Therefore, mutations in the channel lead to a decrease in its conductance, which increases the time of ventricular repolarization and therefore triggers an irregular heartbeat. Therefore, the study of KCNQ1 point mutations and their aggregation are very important for the treatment of LQTS and for the knowledge of its mechanism.

Here, we have identified point mutations in the alpha subunit of the Kv7.1 channel associated with LQTS. We transfected the mutant KCNQ1 gene of c.1022 C-T plasmid into eukaryotes to express the Kv7.1 channel protein. Observe the single Kv7 channel conformation and current changes using the whole-cell clamp approach to investigate it. We want to look at the KCNQ1 gene, which is highly expressed in CHO cells, and find new ways to treat treatment-related disorders. The importance of further research into the involvement of the Kv7 potassium channel in the cardiovascular and neurological systems cannot be overstated. Kv7 potassium channels are abundantly expressed and have an impact on both the cardiovascular and neurological systems, as well as disease management. In the future, Kv7 channel research will be focused on this.

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## **DIFFERENCES IN STN ACTIVITY IN PATIENTS WITH PARKINSON'S DISEASE WITH PROMINENT CLINICAL ASYMMETRY**

### **РАЗЛИЧИЯ В АКТИВНОСТИ STN У ПАЦИЕНТОВ С БОЛЕЗНЬЮ ПАРКИНСОНА С ВЫРАЖЕННОЙ КЛИНИЧЕСКОЙ АСИММЕТРИЕЙ**

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Keywords: subthalamic nucleus, local field potential, spike train analysis, clinical asymmetry

Parkinson's disease (PD) is a widespread neurodegenerative disorder characterized by progressive malfunction of the basal ganglia. In the latter stages of the disease, the implantation of chronic stimulating electrodes (DBS – deep brain stimulation) into a patient's brain is used to tackle its symptoms. The subthalamic nucleus (STN) is one of the most common target structures. The widely accepted model [1] describes the hyperactivity of STN neurons in Parkinson's disease. Many works have also found an increase in beta-band (13–30 Hz) oscillation power in patients in this structure.

The purpose of this work was to study background STN activity in patients with prominent clinical asymmetry, i. e. those with unequal severity of motor symptoms along the bilateral symmetry axis. The severity of PD symptoms was assessed by a neurologist using the UPDRS scale. Seven patients aged 45–65 were included in this study. All of them underwent microelectrode recording (MER) of single-unit activity and recording of local field potentials (LFP) of the subthalamic nucleus during DBS implantation surgeries.

During the analysis, the recorded neurons were divided into two groups, according to their activity type – tonic and burst-like cells. A method of hierarchical clustering was used to do so. We have found that the activity of STN burst-like neurons in the “more affected” (corresponding to a greater symptom severity according to the UPDRS scale) hemisphere is characterized by an increased coefficient

of variation (cv), reduced asymmetry index (Ai) and a greater number of bursts. Altogether, this characterizes it as even more burst-like. No differences were found in the activity of tonic neurons, as well as in the firing rate of cells of both types, between hemispheres. We thus suggest that the pathological state of the STN is not characterized by hyperactivity, but instead by a change in the activity pattern of the burst-like neurons.

LFP analysis has shown that STN located in the “more affected” hemisphere possesses significantly reduced oscillation power in both the high- (21–30 Hz) and, to a lesser extent, the low-beta (13–20 Hz) band. This effect confirms the contemporary hypothesis [2] about the functionally different roles of oscillations belonging to these two sub-bands. However, it contradicts the common opinion concerning the rise in beta-oscillations in PD and therefore requires further research.

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## THE MECHANISM OF GILL VENTILATION IN CHIMAERAS (CHIMAERIFORMES)

## МЕХАНИЗМ ДЫХАНИЯ ХИМЕРОВЫХ РЫБ (CHIMAERIFORMES)

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Keywords: functional morphology, chimaeroids, visceral apparatus, gill valves, gill ventilation

Chimaeras are an ancient group of cartilaginous fish with a peculiar morphology. Since they are deep-sea creatures, the key aspects of their biology and ecology remain unclear. One of them is respiration. For a long time, the gill ventilation mechanism of chimaerids was considered to be similar to that of sharks or bony fish. The only special study of chimaeras respiration by Dean et al (2012) showed the asynchronous work of their respiratory pumps, so during each cycle some of the water should flow in the “wrong” direction. However, the proposed mechanism could not explain how exactly water pumps through the gills.

Our research is based on a study of the visceral apparatus of one *Chimaera monstrosa* specimen and two *Chimaera phantasma* specimens. The dissection was carried out using the classical method (Dzerzhinsky, 1972) under a CARL ZEISS SV6 binocular microscope. Each stage was outlined using camera lucida to avoid the distortion in proportions. On the basis of morphological data, we built a biomechanical model in order to propose a hypothesis explaining the respiratory cycle.

We discovered unique “gill valves” (mentioned only in Jollie’s work (1962)), which divide the pharyngeal cavity into two functional chambers – oropharyngeal cavity and cavities of gill pouches. The



parabranchial chamber is relatively small and lacks cartilaginous reinforcing structures (extraseptalia) which play a crucial role in most sharks' and rays' respiration. We also found out that the cartilaginous operculum is not able to actively bend away. It means that the visceral apparatus of chimeras does not allow them to breathe in the sharks or bony fish way. Based on the obtained morphological data, we proposed a new model of respiration in chimaerids. When the oropharyngeal cavity expands, it pushes water out of the gill pouches through the opercular opening, because they are located between the operculum and the expanding walls of the oropharyngeal cavity. The key role is played by gill valves that prevent the flow of water from the gill pouches into the oropharyngeal cavity (the flow in the "wrong" direction). In other words, the mechanism is based on the principle of a pump with a valve on the piston.

Our research could shed light on the earliest stages of gnathostome evolution. The respiration of the gnathostome common ancestor is believed to be similar to that of some modern sharks, so the reason chimaeras lost this ancestral mechanism is an interesting question that is yet to be answered.

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## SECTIONAL PRESENTATIONS

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### **INFLUENCE OF PRE-PLANTING CUTTINGS TREATMENT WITH SUCCINIC ACID UNDER REDUCED PRESSURE FOR THE GROWTH AND DEVELOPMENT OF BLACK CURRANT (*RIBES NIGRUM* L.)**

### **ВЛИЯНИЕ ПРЕДПОСАДОЧНОЙ ОБРАБОТКИ ЧЕРЕНКОВ ЯНТАРНОЙ КИСЛОТОЙ В УСЛОВИЯХ РАЗРЕЖЕННОЙ СРЕДЫ НА РОСТ И РАЗВИТИЕ ЧЕРНОЙ СМОРОДИНЫ (*RIBES NIGRUM* L.)**

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Keywords: Cuttings; succinic acid; reduced pressure

Quantitative and qualitative characteristics of fruit shrubs production are noticeably determined by the conditions of plant development in the initial periods. Moreover, preparation of planting stock is essential to the survival of the plant in protected ground for vegetative propagation methods such as cuttings. One of the limiting factors in the cultivation of cuttings is their ability to root. This leads us to the fact that pre-planting treatment is required to induce growth processes by mechanical and physiological methods.

The purpose of this research is definition of the effect of treating black currant (*Ribes nigrum* L.) cuttings with succinic acid in a low pressure environment. In contrast to high-grade commercial characteristics, the studied currant cultivar (Selechenskaya 2) has a low rooting rate, which determines the relevance of the selected topic. Thus, the object of investigation was subjected to pre-planting processing in 4 variants. Half of them were treated with succinic acid and distilled water under standard conditions, while the rest were exposed to reduced pressure.

At the next stage, the cuttings were rooted in a mixture of peat and sand for 30 days, after which they were transplanted into vegetation containers. On the 30th and 50th days of the experiment, morphometric measurements of the roots and leaf blades were carried out. After the end of the experiment, the content of chlorophylls a and b, the sum of carbohydrates, and the amount of flavonoids were evaluated in the dried leaf material using photometric methods. The values of these biochemical parameters can be considered indicators of the quality of plant production.

Taking into account the obtained results, treatment with succinic acid significantly enhances the number and length of roots. In addition, the reduced pressure variant showed a positive effect on root formation towards the end of the vegetation period. It could be explained by the exposure of plant tissues under reduced pressure and their gradual regeneration. It is supposed that the values of qualitative characteristics of cuttings correlate with morphometric ones. To prove this hypothesis, it is necessary to carry out a larger number of repetitions of determinations.



Eventually, using of cuttings pre-planting treatment is crucial for rooting and creating high-quality plant products. Succinic acid has proven to be an efficient and inexpensively growth regulator while the effect of reduced pressure on growth processes requires additional researches.

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## **ANALYSIS OF THE *HELICOBACTER CINAEDI* PROTEOME AND STUDY OF ITS POTENTIAL PATHOGENICITY FACTORS**

### **АНАЛИЗ ПРОТЕОМА БАКТЕРИИ *HELICOBACTER CINAEDI* И ИССЛЕДОВАНИЕ ЕЕ ПОТЕНЦИАЛЬНЫХ ФАКТОРОВ ПАТОГЕННОСТИ**

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Keywords: Atherosclerosis, foam cells, macrophages, *Helicobacter cinaedi*, proteomics

Cardiovascular diseases occupy the first place in the structure of mortality in both developed and developing countries. Among heart and vascular diseases, atherosclerosis makes the greatest contribution to mortality. According to the lipoprotein theory of pathogenesis, atherosclerosis may be induced by unregulated uptake of modified low-density lipoproteins (LDL) and very low-density lipoproteins by the intact endothelium of the vascular wall. A number of studies have been published, according to which disruption of LDL metabolism in macrophages can be caused by an intracellular pathogen, microorganism *Helicobacter cinaedi*, but the role of *H. cinaedi* in pathology development is not conclusively proved [Khan et al. // Microbiol Immunol, 2012; Khan et al. // Scientific Reports, 2014]. *Helicobacter* is a genus of spiral Gram-negative enterohepatic bacteria whose members can cause bacteremia in humans. The most common causative agent of this disease is *H. cinaedi*.

In the published works it is shown that *H. cinaedi* when interacting with macrophages causes changes in cell morphology (transition to the so-called “foam cells”). The aim of our study is to examine in detail the changes that occur at the protein level after infection of macrophages with the bacterium *H. cinaedi*. Since there are currently no published proteomic studies for *H. cinaedi*, we performed a mass spectrometric analysis of the *H. cinaedi* proteome on a Q Exactive HF-X Hybrid Quadrupole-Orbitrap Mass Spectrometer to achieve our goal.

A special problem when working with *H. cinaedi* is the selection of cultivation conditions, since this microorganism is characterized by high requirements for the composition of the atmosphere. In the course of our work, we tested various approaches to the cultivation of the bacterium on solid and liquid media and determined the most favorable for *H. cinaedi* media compositions and the most effective methods of creating the required atmosphere.

To identify protein factors that may contribute to the pathogenesis of *H. cinaedi*, we performed proteome analysis of the bacterium before and after contact with macrophage cells. As a result of the analysis of the bacterial proteome we found that this microorganism has a number of mechanisms for survival under stress conditions, such as contact with immune cells or exposure to certain antibiotics.

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# MOLECULAR PROFILE OF EPSTEIN-BARR VIRUS-ASSOCIATED NASOPHARYNGEAL CARCINOMA IN RUSSIA

## МОЛЕКУЛЯРНЫЙ ПРОФИЛЬ АССОЦИИРОВАННОГО С ВИРУСОМ ЭПШТЕЙНА-БАРР РАКА НОСОГЛОТКИ В РОССИИ

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Keywords: Epstein-Barr virus; nasopharyngeal carcinoma; LMP-1 oncogene

Epstein-Barr virus (EBV), also known as human herpes virus 4 (HHV4), is a double-stranded DNA virus belonging to the Herpesviridae family. EBV is estimated to infect up to 95% of the global adult population over their lifetime [1].

Infection with the virus in early childhood is typically not accompanied by severe clinical symptoms. In certain people, primary infection that is postponed until adolescence or early adulthood can result in a more severe case of infectious mononucleosis. Besides being the etiological agent of infectious mononucleosis, EBV has been linked to a variety of lymphoid and epithelial malignant neoplasms, such as Burkitt's lymphoma, Hodgkin's lymphoma, a number of non-Hodgkin's lymphomas, gastric carcinoma, and nasopharyngeal carcinoma [2]. Nasopharyngeal carcinoma is characterized firstly by its distinct histology with a prominent lymphocytic infiltrate giving the tumor a lymphoepithelial-like appearance, and secondly by its unique epidemiology with an unusual age peak in 40–60-year-old males and strikingly different incidence rates across the world [3].

According to molecular biological research, the transforming and oncogenic properties of EBV are mediated by nine latent viral proteins, six of which are nuclear and three of which are membrane proteins. Each of these proteins contributes to virus-associated carcinogenesis, but the transforming capacity of latent membrane protein 1 (LMP-1) prevails [1]. LMP-1 plays a key role in the oncogenesis of nasopharyngeal carcinoma. It is involved in B-cell transformation, induction of surface adhesion molecules, and enhancement of anti-apoptotic Bcl-1 proteins, and production of IL-6 and IL-8 [5]. Variants in LMP-1 in different geographic regions were classified into several main groups that differed with their key amino acid substitutions compared to the prototypic B95.8 variant [1]. Researchers also classify EBV into two main genotypes, type 1 and type 2, distinguished by the differences in the sequence of the genes that code for the EBV nuclear antigens (EBNA), mostly in the EBNA-2 gene [4].

The aim of this study is to characterize the molecular profile of Epstein-Barr virus-associated nasopharyngeal carcinoma in Russia. The study assesses the distribution of strains and types of the Epstein-Barr virus in patients of different nationalities, and also estimates age and sex prevalence in patients with EBV-associated nasopharyngeal carcinoma. The study is carried out using standard molecular biology techniques such as total DNA isolation, polymerase chain reaction, amplicon isolation from agarose gel, and sequencing.

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## THE EFFECT OF MINERAL FERTILIZERS ON GREENHOUSE GAS EMISSIONS FROM URBAN LAWN SOILS

## ВЛИЯНИЕ МИНЕРАЛЬНЫХ УДОБРЕНИЙ НА ЭМИССИЮ ПАРНИКОВЫХ ГАЗОВ ИЗ ПОЧВ ГОРОДСКИХ ГАЗОНОВ

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Keywords: greenhouse gas emissions, complex mineral fertilizers, urban lawn soils

Along with other ecological functions soils can serve as a sink and a source of climatically active gases in urban ecosystems. The importance of studying the role of urban soils in climate change mitigation is reflected in the global climate agenda and the state development strategy. A large proportion of urban spaces are occupied by soils under lawns, which deposit carbon, including carbon dioxide and methane. According to many researchers, one of the factors influencing the emission of greenhouse gases from soils are fertilizers. Applied to increase the productivity and stability of lawns, fertilizers can affect the formation of CO<sub>2</sub> and CH<sub>4</sub> flows. However, currently the role of soils in this case has not been studied enough, therefore search for a mechanism of greenhouse gas emission control in urban ecosystems is relevant.

The effect of mineral fertilizers on CO<sub>2</sub> and CH<sub>4</sub> emissions from urban lawn soils was investigated in 2021–2022 at the experimental plot in the MSU Botanical garden. 4 types of complex mineral fertilizers with different ratios of nutrients in higher and lower doses have been applied to the soils under urban lawns. Soddy soils on technogenic sediments contaminated with heavy metals were studied.

Field sampling of soil and soil air and laboratory studies were carried out at 8 sites with fertilizers applied and a control site. Greenhouse gas emissions were investigated by static chamber method with quantitative analysis on a gas chromatograph, the main soil properties were studied by conventional

methods. Laboratory incubation experiments involving microbial respiration and the potential formation and oxidation of methane were conducted by kinetic methods. Seasonal dynamics of research should be highlighted.

According to the results, it was found that the seasonal dynamics of CO<sub>2</sub> emissions from soils reflects the seasonal temperature change, which is consistent with literature data. Presumably, due to the large amount of nutrients needed to activate plant growth in the spring, soil CO<sub>2</sub> emissions at the sites with fertilizers applied were 2–6 times higher than control levels. Conversely, the opposite was observed in the autumn.

It should be noted that large doses of fertilizers did not always lead to greater greenhouse gas emissions from soils. Most often the minimum values were revealed for “Nitroammophoska” type of fertilizers at a high dose. To conclude, the data obtained could be used to develop recommendations for the creation and maintenance of urban lawns in order to absorb greenhouse gases by soils.

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## **SEQUENTIAL SINGLE-REACTOR PRODUCTION OF HYDROGEN AND METHANE BY THE MICROBIAL COMMUNITY DUE TO STIMULATION OF HYDROGENASE ACTIVITY BY IRON (II) IONS AND DIRECT INTERSPECIES ELECTRON TRANSFER BY GRANULAR ACTIVATED CARBON**

## **ПОСЛЕДОВАТЕЛЬНОЕ ОДНОРЕАКТОРНОЕ ПОЛУЧЕНИЕ ВОДОРОДА И МЕТАНА МИКРОБНЫМ СООБЩЕСТВОМ ЗА СЧЕТ СТИМУЛЯЦИИ ГИДРОГЕНАЗНОЙ АКТИВНОСТИ ИОНАМИ ЖЕЛЕЗА (II) И ПРЯМОГО МЕЖВИДОВОГО ПЕРЕНОСА ЭЛЕКТРОНОВ АКТИВИРОВАННЫМ УГЛЕМ**

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Keywords: Biohydrogen, biomethane, anaerobic digestion, direct interspecies electron transfer, hydrogenase activity

Two-stage anaerobic digestion involving hydrogen-producing bacteria and methanogenic archaea is a promising way to increase the efficiency of decomposition of organic waste. Previous studies demonstrated that addition of distinct concentrations of iron compounds or conductive materials stimulates hydrogenase activity or direct interspecies electron transfer (DIET), respectively, thereby increasing hydrogen and methane yield [1]. However, spatial separation of stages makes this technology less economically attractive. In this work, we studied a model of two-stage anaerobic digestion with stages separated in time in one reactor. We used a combination of bioaugmentation with a hydrogen-producing *Thermoanaerobacterium thermosaccharolyticum* SP-H2, resistant to low pH, setting a low initial pH (5.5) to reduce the activity of methanogens, supplementing additives in the form of soluble iron (II) and granular activated carbon (GAC). For comparison, two methanogenic inoculums with

different dominant microbial groups and initial iron concentrations were used. A study was made of the dynamics of pH, composition of the gas phase and volatile fatty acids. Hydrogenase activity was measured by the method of reduction of methyl viologen with sodium dithionite. The basis of the microbial community of the inoculums was represented by electroactive and syntrophic groups *Coprothermobacter*, *Clostridia D8A-2*, *Dictyoglomus*, *DTU014*, and methanogenic archaea of the genera *Methanosaeta* and *Methanosarcina*. With the simultaneous addition of GAC and iron (II), sequential production of hydrogen and methane was observed for both methanogenic inoculums. In the experiment with inoculum 1, the microbial community showed the sequential production of hydrogen (up to 14.2 ml) at the beginning of the experiment and methane (up to 0.5 ml) at the end. In the experiment with inoculum 2, up to 21.0 ml of hydrogen and up to 0.6 ml of methane were produced. The two-stage process was recorded in both cases. Without addition of GAC, methane formation was practically not observed, which, apparently, indicated the impossibility of syntrophic degradation of acidogenesis products due to the high partial pressure of hydrogen and the absence of a conductive material for activation of DIET. The effect of soluble iron (II) on hydrogenases was revealed. The two-stage feasibility is consistent with the kinetic parameters of the duration of the lag phase of hydrogen and methane production. Thus, this strategy is promising for further study and application, including using real substrates. Further studies are needed to confirm the stability of the proposed single-reactor two-stage anaerobic digestion system in a semi-continuous mode.

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**NEMATODES OF GENUS ALLOIONEMA (RHABDITIDA, ALLOIONEMATIDAE) AS ECTOPARASITES OF TERRESTRIAL GASTROPODS (MOLLUSCA, GASTROPODA): INTER- AND INTRASPECIFIC DIVERSITY AND PHYLOGENETIC RELATIONSHIPS**  
**НЕМАТОДЫ РОДА ALLOIONEMA (RHABDITIDA, ALLOIONEMATIDAE) – ЭКТОПАРАЗИТЫ НАЗЕМНЫХ БРЮХОНОГИХ МОЛЛЮСКОВ (MOLLUSCA, GASTROPODA): ВИДОВОЕ И ВНУТРИВИДОВОЕ РАЗНООБРАЗИЕ, ФИЛОГЕНЕТИЧЕСКИЕ СВЯЗИ**

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Keywords: Parasitic nematodes, *Alloionema appendiculatum*, nucleotide sequences

Parasitic and pathogenic nematodes of terrestrial mollusks have not been studied enough, despite the cases of the application of some species in agriculture – especially for population control of slugs and snails (Laznik et al., 2010). *Alloionema appendiculatum* (Schneider, 1859) is often used as the



reference research object, so this species is of interest. The aforementioned species was found in Western and Central Europe, Australia (Nermut et al., 2015) and their larva stages are parasitic on gastropods and have a free-living generation in the soil. The presence of this species in the Russian Federation has not been confirmed yet in previous studies, likewise, the taxonomic diversity of the genus *Alloionema* has not been investigated. Thus, studying the diversity and phylogeny of the nematodes of the genus *Alloionema* (Rhabditida, Alloionematidae) of the European part of Russia and the phyletic relationships of Alloionematidae family is the purpose of this research.

As a result of the study, sequences of three genes (CO1 mtDNA, ITS rRNA, LSU rRNA) of five different populations of nematodes were obtained. Speaking about these populations found in the European part of Russia, the polymorphic DNA sites (ITS) were cloned, and the phylogenetic trees were constructed. The assumption that the nematode population from Adygea is a new species of the genus was verified by the results of analysis of nucleotide sequences which demonstrates significant differences from other *Alloionema* populations from Russia. The remaining representatives of the populations are similar to each other and to the previously studied ones from Europe as confirmed by using light and scanning electron microscopy during the analysis of the external structure of individuals from territory of Moscow Agricultural Academy in comparison with the representatives from Western and Central Europe.

Several single-nucleotide substitutions and insertions were found in the sequences of spacer sites (ITS) of the rRNA gene of respective four populations, which indicates haplotypic intraspecific diversity. The mitochondrial DNA of this nematode is a single ring molecule with a length of 15,660 bp. This fact was estimated by annotation of this genome. According to the results of the data proceeding, 30 genes were identified, including two rRNA genes, 18 tRNA genes and ten protein-coding genes.

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## **ROLE OF PHYTOCHROMES IN REGULATION OF GENE EXPRESSION OF TRANSCRIPTION APPARATUS OF PLASTOME DURING CYTOKININ-DEPENDENT DE-ETIOLATION IN *ARABIDOPSIS THALIANA* (L.) HEYNH.**

## **РОЛЬ ФИТОХРОМОВ В РЕГУЛЯЦИИ ЭКСПРЕССИИ ГЕНОВ АППАРАТА ТРАНСКРИПЦИИ ПЛАСТОМА В ХОДЕ ЦИТОКИНИН-ЗАВИСИМОЙ ДЕЭТИОЛЯЦИИ *ARABIDOPSIS THALIANA* (L.) HEYNH.**

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Keywords: *Arabidopsis thaliana*, de-etiolation, phytochromes, cytokinin

Plant growth and development is determined by the genetic program and regulated by a complex signaling network integrating the effects of endogenous and exogenous factors. Light is the main exogenous factor initiating de-etiolation, the morphophysiological process of transition from dark-growing (etiolation) to light-growing. The key event of de-etiolation is the formation of photosynthetically active chloroplasts, requiring the coordinated expression of the nuclear and plastid genomes. One mechanism of light-dependent changes in plastid gene expression is regulation through components of the transcription apparatus (TA), which includes NEP, represented by two enzymes

RPO<sub>Tp</sub> and RPO<sub>Tmp</sub>, and PEP, comprising core subunits (rpo's) and sigma-factor (SIG1-6). In addition to light, de-etiolation is regulated by phytohormones, in particular cytokinins, which stimulate chloroplast biogenesis, however, the molecular mechanism remains unclear. We assumed cytokinins regulate the expression of TA genes through light signaling components – phytochromes (phyA-E).

The study was conducted on wild type (WT) and double knockout mutant phyAphyB of *Arabidopsis thaliana*. Seeds were sterilely sown on Petri dishes in liquid 1/2 Murashige-Skoog medium without cytokinin or with the addition of 1  $\mu$ M trans-zeatin. After seed stratification for 3 days at +4 °C, the plants were transferred to dark conditions in a climatic chamber at +21 °C. On the 4th day after germination, seedlings were fixed in liquid nitrogen after 0, 3, 6, 9, and 16 hours of exposure to red narrow-band light (maximum 660 nm;  $120 \pm 10 \mu\text{mol} \cdot \text{s}^{-1} \cdot \text{m}^{-2}$ ). Transcript levels were measured by real-time PCR after reverse transcription using UBIQUITIN10 as a reference gene.

According to our results, red light positively regulated the mRNA levels of TA genes (RPO<sub>Tp</sub>, rpoB, SIG1, SIG2, SIG5, SIG6) in both WT and phyAphyB seedlings. However, the deficiency of functional phytochromes A and/or B in the mutant in most cases altered the expression profile of the studied genes during de-etiolation. Cytokinin treatment also affected transcript levels in seedlings: hormone stimulated mRNA accumulation of RPO<sub>Tp</sub>, rpoB, SIG1 and SIG2, suppressed mRNA accumulation of SIG5 and had no effect on SIG6. Comparing transcript levels in WT and phyAphyB seedlings, we found that regulation of rpoB and SIG5 genes expression by trans-zeatin during de-etiolation was mediated by phyA and/or phyB.

This study provides evidence for the involvement of phytochromes A and/or B in the regulation of TA genes expression during cytokinin-dependent de-etiolation of *A. thaliana* under red light. The interaction of light and hormonal signaling contributes to the genomes reprogramming and promotes photomorphogenesis.

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## ROOT PHOTOPATTERNING: ROLE OF LIGHT RECEPTORS ФОТОПАТТЕРНИНГ КОРНЯ: РОЛЬ РЕЦЕПТОРОВ СВЕТА

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Keywords: lateral root formation, phytochromes, light

Soil is the heterogeneous environment where plant roots are often exposed to local gradients of nutrients, water and oxygen. Plants respond to these gradients by changing the root system architecture to optimize their fitness. Root development is also affected by light which is a crucial environmental stimulus controlling plant morphogenesis. Light beams can penetrate upper layers of the soil surface thus creating spatial gradients which roots can respond to. Our scientific interest is centered around the effect of light on lateral root formation.

We germinated seedlings of the model plant *Arabidopsis thaliana* in Petri dishes containing solidified Murashige&Skoog growth medium. In our setup, *Arabidopsis* main roots grew along a horizontal transparent barrier and were illuminated with white light from the top or from the bottom. In both cases,

lateral roots formed predominantly on the side of the main root that is opposite to the light source. The same effect was observed in *Amaranthus sp.* plants. We named the phenomenon of asymmetry in lateral roots distribution on the shaded and illuminated sides of asymmetrically illuminated main root “lateral root photopatterning”. To identify which type of photoreceptor determines this phenomenon we asymmetrically illuminated *Arabidopsis* seedlings with red light and observed normal photopatterning. It indicates that photopatterning is dependent on light perception by phytochromes because they are the only receptors in higher plants sensitive to red light. Double mutant plants lacking both phytochromes A and B demonstrated no photopatterning, whereas in single mutants *phyA* and *phyB* it took place, indicating that phytochromes A and B are interchangeable.

According to recent data, phytochromes in the shoot can respond to far-red light and induce expression of transcription factor HY5, a positive regulator of photomorphogenesis, which moves from the shoot to the root where it promotes lateral root initiation. Mutant plants lacking HY5 showed no photopatterning and hence this transfactor participates in the molecular mechanism underlying this phenomenon.

We conducted several experiments with root or shoot shading to identify which plant organ responds to light and causes root photopatterning. When the shoot was shaded with non-transparent material and the root was asymmetrically illuminated, photopatterning of lateral roots took place. In the opposite setup, normal photopatterning was not observed indicating that light is perceived by phytochromes in the root. Thus, phytochromes A and B activate transfactor HY5 in the root to regulate photopatterning.

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## **RECONSTRUCTION OF THE DEVELOPMENTAL CONDITIONS OF THE KRIVETSKIY MOKH MIRE USING A MULTI-PROXY PALEOECOLOGICAL APPROACH**

## **РЕКОНСТРУКЦИЯ УСЛОВИЙ РАЗВИТИЯ ЭКОСИСТЕМЫ БОЛОТА КРИВЕЦКИЙ МОХ ПО ДАННЫМ КОМПЛЕКСНОГО ПАЛЕОЭКОЛОГИЧЕСКОГО АНАЛИЗА**

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Keywords: paleoecological reconstruction, mire, Holocene

Paleoecological reconstructions allow studying the long-term dynamics of ecosystems and the environment on the basis of physical-chemical and biological indicators, preserved in the bottom sediments of water bodies and peat deposits of bogs. As an example of biological indicators, we can consider Cladocera, testate amoebae, and chironomid larvae, which quickly respond to changes in climate and environmental conditions. Of particular interest are the patterns of hydroserial “reservoir-bog” succession, during which the processes of ecosystem functioning change significantly. The aim of the work is to study dynamics of cladocera and testate amoebae during wetland succession using paleoecological analysis of peat deposits of the Krivetsky mokh mire formed in the Holocene. The Krivetsky mokh mire is located at the boundary between mixed and boreal forests on the Valdai Upland of Russia.



The results of radiocarbon dating showed that the accumulation of organic deposits began 8330 years BC. Overall, we identified six main zones (KM1-6) in the history of mire formation:

Zone KM1 (8330–3000 BC): lake stage. Cladocera remains were abundant. In contrast, testate amoebae were few and represented mostly by aquatic species.

Zone KM2 (3000–840 BC): early stages of terrestrialization. Aquatic vegetation was rapidly developing as evidenced by the predominance of macrophyte associated among Cladocera remains. The number of testate amoebae also increased at this stage.

Zone KM3 (840 BC-130 AD): fen stage. Cladocera remains became less abundant, pelagic species disappeared. Testate amoebae communities were formed by both freshwater and Sphagnum-dwelling taxa.

Zone KM4 (130–640 AD): early bog stage. The abundance of Cladocera at this stage decreased sharply, confirming the conclusion about the reduction of aquatic habitats. Testate amoebae communities were dominated by Sphagnum-dwelling taxa.

Zone KM5 (640–1350 AD): wet bog stage. Remains of cladocera were not found, starting from this zone. Taxa Sphagnum-dwelling dominated in testate amoeba communities.

Zone KM6 (1350–2018 AD): dry bog stage. At this zone, Sphagnum dominated, and remnants of pine and birch were also found, indicating the transition to the dry raised bog stage and the development of woody vegetation.

The ecosystem went through a series of classical successional stages from the lake ecosystem to the mire ecosystem. Each stage was characterized by clear changes in the diversity of organisms responding mainly to internal factors in the lake stage and to external factors in the bog stage.

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## **P300 IN COVERT VISUAL ATTENTION**

### **П300 В УСЛОВИЯХ СКРЫТОГО ЗРИТЕЛЬНОГО ВНИМАНИЯ**

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Keywords: P300, event-related potential (ERP), covert visual attention, brain-computer interface (BCI)

P300 is an event-related potential (ERP) that occurs approximately 300 ms after a stimulus presentation. It is associated with stimulus categorization, working memory and attention, in particular visual spatial attention, which consists of overt and covert forms [1]. In the overt form the focus of attention coincides with the direction of gaze, whereas in covert attention they differ [2]. There is a hypothesis that P300 may vary across the aforesaid conditions. However, the vast majority of P300 experiments were conducted only in the overt attention paradigm. Thus, the purpose of our research is to identify P300 characteristics in case of covert visual attention.

To study this phenomenon, we chose classical neurophysiological methods: electroencephalography (EEG) and eye tracking. We have developed a visual environment that consists of 3 circles of 9 letters. In order to make peripheral stimuli more visible, the size of the letters increased with the distance from the center of the screen. Stimulation process included flashes of 18 triads of letters once every 75 ms with the

duration of 25 ms. Each stimulus cycle (trial) included successive random flashes of all triads. Seventeen people aged 18–25 years took part in the experiment. Subjects were instructed to count flashes of target letters while looking at the letter or at the center of the screen (overt and covert attention respectively). A total of 20 trials were recorded for each subject for each experimental condition.

EEG data were preprocessed and divided into target and non-target epochs according to the moment of stimulus presentation. The epochs contaminated with artifacts were excluded. Next, we calculated difference waves (target minus non-target epochs) to isolate P300 from non-specific signals and compared them between overt and covert series. Eye tracking data were analyzed by calculating the percentage of fixations within the regions of interest, which were arbitrarily defined as circles around letters.

Statistical analysis showed no difference in P300 latencies; however, a strong trend in amplitude was found ( $p=0.063$ ). Eye tracking data confirmed that in all cases subjects indeed looked at proper areas (median more than 70%). Our results suggest that P300 has different characteristics in case of covert visual attention, expanding fundamental knowledge about this ERP. Moreover, the obtained data may be directly applied to improve brain-computer interface technologies based on P300. In future research we will increase the sample size and focus on more precise structure of P300 subcomponents in case of covert and overt visual attention.

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## **MULTIPOTENT MESENCHYMAL STROMAL CELLS FROM BONE MARROW OF PATIENTS AT THE ONSET OF ACUTE LEUKEMIA AND AFTER TREATMENT**

## **МУЛЬТИПОТЕНТНЫЕ МЕЗЕНХИМНЫЕ СТРОМАЛЬНЫЕ КЛЕТКИ ИЗ КОСТНОГО МОЗГА БОЛЬНЫХ ОСТРЫМИ ЛЕЙКОЗАМИ В ДЕБЮТЕ ЗАБОЛЕВАНИЯ И ПОСЛЕ ЛЕЧЕНИЯ**

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Keywords: Acute leukemia, Multipotent mesenchymal stromal cells, Mesenchymal stem cells, Bone marrow microenvironment

Acute leukemia is a disease caused by hyperproliferation of malignant progenitors of white blood cells (blasts). Recent evidence points to the extremely important role of microenvironment in cancer development, implying cancer cells may recruit normal cells to their aid, prompting these cells to secrete growth factors and remodel the extracellular matrix to suit the tumor's needs. In the bone marrow,

where most hematologic malignancies, including acute leukemia, originate, the microenvironment is represented by stroma. Bone marrow stroma consists of a wide variety of cell types, such as adipocytes, osteoblasts and specialized types of stromal cells. All of those regulate the activity of hematopoietic stem cells as well as leukemic cells in case of leukemia. Bone marrow stromal cells originate from mesenchymal stem cells (MSCs). MSCs actively communicate with surrounding cells by both secreting paracrine factors and cell contacts. This communication is crucial for bone marrow functioning. MSCs can also interact with the immune system. In particular, their immunosuppressive abilities make them a putative cell therapy agent for inflammatory diseases. Leukemic blasts are able to recruit MSCs, thus promoting the creation of a pro-leukemic microenvironment.

However, mesenchymal stem cells do not retain their stem properties in culture. In order to study them *in vitro*, researchers use multipotent mesenchymal stromal cells (MMSCs) that do not have the self-renewal capacity of the true stem cells, but can be easily cultured. MMSCs are defined as plastic-adherent cells derived from mesenchymal tissue, and their properties are extrapolated on mesenchymal stem cells.

In the present study, we investigated the surface phenotype (proteins on the surface of the cell membrane) of the MMSCs by flow cytometry and relative expression of certain genes by reverse-transcription PCR (RT-PCR). We compared the data obtained from patients first diagnosed with acute leukemia, patients in remission and healthy donors. Both the surface phenotype and gene expression patterns were altered in patients compared to healthy subjects. The results suggest a partial loss of ability of patients' MMSCs to maintain stem cells' quiescent state, as well as a decrease in immunosuppressive properties and misbalanced differentiation predisposition. Not all of these were restored upon achieving remission. Further studies are needed to better understand the role of MSCs in acute leukemia. As our next aim, we intend to study MMSCs' response to cytokines and use mass-spectrometry in order to investigate the proteins secreted by MMSCs.

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## **EVALUATION OF THE IMPACT OF MICROWAVE TREATMENT ON THE TOXICITY OF PLASTIC-PACKED FOOD COMPONENTS**

### **ОЦЕНКА ВОЗДЕЙСТВИЯ МИКРОВОЛНОВОЙ ОБРАБОТКИ НА ТОКСИЧНОСТЬ УПАКОВАННЫХ В ПЛАСТИК КОМПОНЕНТОВ ПИЦЦИ**

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Keywords: plastic packaging, cytotoxicity, microwave treatment, *Allium* test

Plastic is used in almost all areas of human activities, including the food industry. Plastic packaging classifies into several types according to their properties and recyclability. Most plastic food containers contain intentionally added substances (IAS) that improve the properties of polymeric materials. Under extreme processing conditions, e. g., high temperatures or electromagnetic radiation, these IAS can migrate into foods resulting in possible human exposures. In this regard, the aim of the research was to

study the effect of microwave treatment of plastic containers on the toxicity of food packaged in plastic. To achieve the aim, the Allium test method was applied with the pre-germination of the bio tester. This method allows to detect toxicity by cell division pathology and correlates well with tests on human cells.

During the experiment, the water in 7 different plastic containers was heated in the microwave until boiling in two repetitions. The same volume of water for the control sample was heated under the same conditions in a glass beaker. Calibrated according to their size, the bulbs were placed over test tubes containing the liquid for three days in order to be tested. After the treatment and germination of *Allium cepa* onion roots, the standard technique of Allium test was performed. Subsequently, the mitotic and phase indices of the samples were determined, and the received data was subjected to statistical analysis.

The results of the research showed that the mitotic indices of plastics labeled 2, 3 and 7 were significantly higher than the mitotic index of the control sample. Therefore, these types of plastic packaging can be toxic when processed in the microwave oven. In addition, chromosomal aberrations of onion meristem cells of some samples were detected. In contrast, the mitotic indices of plastics labeled 1 and 5 were the closest in value to the control ones. It is noticeable that in the given conditions it is impossible to identify which constituent of the plastic had a cytotoxic effect on the cells in the process of mitosis. However, it is possible to deduce the toxicity of microwave heated materials based on the proliferative activity and chromosomal aberrational spectrum of the samples relative to the control sample.

In conclusion, plastics labelled 1 and 5 proved to be the least toxic, while the samples labelled 2, 3 and 7 demonstrated the highest toxicity. The results largely confirm the literature data on the possible toxicity of plastic packaging.

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## THE EFFECT OF TEMPERATURE AND MOISTURE MANIPULATION ON BIOLOGICAL ACTIVITY OF PEAT SOILS

### ВЛИЯНИЕ ТЕМПЕРАТУРЫ И ВЛАЖНОСТИ НА БИОЛОГИЧЕСКУЮ АКТИВНОСТЬ ТОРФЯНЫХ ПОЧВ

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Keywords: Peat soils, temperature, moisture, microbial respiration,  $Q_{10}$

Wetland ecosystems play a significant role in organic carbon conservation; one meter layer of peat soils stores over 30 percent of terrestrial organic carbon (Lal, 2008). Ecosystems have different sensitivity to climate change in different nature zones (IPCC, 2022) due to various moisture and temperature regime. Soils on the border of natural zones are of the greatest interest, especially the soils of the permafrost zone.

The aim of this work is to define the effect of temperature and moisture on the mineralization rate of peat soils in Northern and Southern taiga.

The samples of Cryic Histosol (WRB, 2022) and Fibric Histosol (WRB, 2022) were taken from Northern Taiga and Southern Taiga respectively. In laboratory conditions, the samples were brought

to certain soil moisture levels (SM): 30, 60, 80, 100% of water holding capacity (Gritsch, 2015), the temperature of incubation was ranging from 5 to 25 ° C (equal-time method). Coefficient Q10 was applied as a statistical basis (Kirschbaum, 1995), the higher the value of this coefficient, the more sensitive the soils will be to the temperature factor.

In all the cases, microbial respiration (MR) accelerated with the increasing of temperature and moisture. The samples of Cryic Histosol were more sensitive to changes in hydrothermal regime. MR varies from  $0.58 \pm 0.26$  (30% SM and 5 ° C) to  $13.53 \pm 0.22$  mg C-CO<sub>2</sub>/g/h (100% SM and 25 ° C). Q10 coefficient varies from 4.64 to 2.82 respectively. For the samples of Fibric Histosol, MR alter from  $0.75 \pm 0.01$  (30% SM and 5 ° C) to  $6.14 \pm 0.26$  mg C-CO<sub>2</sub>/g/h (100% SM and 25 ° C). Q10 coefficient varies from 2.70 to 2.18 respectively.

The influence of moisture and temperature on biological activity in all the cases, was statistically confirmed (RStudio 9.0), but the interaction of factors is significant only for Cryic Histosol. According to the results, Cryic Histosol is more sensitive to temperature and moisture change, than Fibric Histosol. Peat soils in the northern area are subjected to more rapid organic carbon mineralization after a change of hydrothermal regime, than southern peat soils. In conclusion, Q10 coefficient variation indicated that soils with low moisture level are more sensitive to temperature changes.

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## **EFFECT OF MACROPHAGES ON DORMANT STATE AND SYNTHESIS OF TREHALOSE IN *MYCOBACTERIUM TUBERCULOSIS* IN EXPERIMENTAL MODELS IN VITRO AND IN VIVO**

### **ИССЛЕДОВАНИЕ ВЛИЯНИЯ МАКРОФАГОВ НА СОСТОЯНИЕ ПОКОЯ И СИНТЕЗ ТРЕГАЛОЗЫ У БАКТЕРИЙ *MYCOBACTERIUM TUBERCULOSIS* В ЭКСПЕРИМЕНТАЛЬНЫХ МОДЕЛЯХ IN VITRO И IN VIVO**

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Keywords: Macrophages, mycobacteria, *Mycobacteria tuberculosis*, tuberculosis

*Mycobacterium tuberculosis* (Mtb) is the causative agent of tuberculosis (TB), the disease which led to the infection of a quarter of humanity, among which from 10 percent will develop active disease and 5–10 percent – latent TB, resulting in about 1 million deaths worldwide annually. Mycobacteria enter lungs by airborne droplets and become engulfed by alveolar macrophages. If not being killed by them, Mtb can turn to a dormant state. It was shown that gradual acidification of growth media, the condition equal to that within the phagolysosome, results in the formation of dormancy, characterized by accumulation of free trehalose. The mechanisms of acquiring dormancy and subsequent reactivation within the macrophages are still poorly understood. For this reason, we decided to study the factors underlying trehalose accumulation and utilization on behalf of transition to a resting or reactivating state in experimental models in vitro and in vivo. To this end, first we established the microbicidal ability of murine linear macrophage culture cells RAW 264,7 against mycobacteria by assessing mycobacterial



activity via measuring the [3H]-uracil incorporation into bacteria cocultured with macrophages at different MOI ratio. Our analysis revealed that Mtb activity is suppressed by macrophages with the MOI 5 compared to control axenic bacteria in 5 days of coculture – CPM has decreased almost 2 times from 5217,1 to 2807,7. At that time point, we extracted RNA from bacteria for the subsequent q-PCR analysis to investigate the gene expression OtsAB and TreY, TreZ, that are responsible for the synthesis of Mtb trehalose during infection of macrophages. In parallel experiments, we decided to investigate the influence of spleen and lung macrophages on Mtb in a murine model of tuberculosis in vivo. First, we infected resistant to TB C57Bl/6 mice with the virulent strain of mycobacteria *Mycobacterium tuberculosis* H37Rv in two ways: aerosol and intravenous. At week 3 post infection, in the beginning of antimycobacterial adaptive immune response, we isolated spleen and lung macrophages to determine the numbers of bacteria within the cells, and RNA from bacteria derived from spleen and lung macrophages were extracted in order to assess the level of gene expression responsible for the trehalose biosynthesis. We will perform the procedure at week 8 post infection when bacteria are under the pressure of the host immune response. In addition, we plan to evaluate the activity level of this protein in Mtb from infected lung and spleen macrophages at weeks 3 and 8 post infection.

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## **AN EFFECT OF MAGNETIC FIELD MANIPULATION ON MIGRATORY ORIENTATION OF NATHUSIUS' PIPISTRELLE *PIPISTRELLUS NATHUSII***

### **ЭФФЕКТ МАГНИТНОГО ПОЛЯ НА ОРИЕНТАЦИЮ ЛЕСНОГО НЕТОПЫРЯ (*PIPISTRELLUS NATHUSII*) ВО ВРЕМЯ МИГРАЦИИ В КРУГОВОЙ АРЕНЕ**

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Keywords: Bat migration, Orientation, Magnetic compass

Bats are the only mammals capable of active flight. Just like other aerial vertebrates – birds, bats can perform long-distant annual migrations. However, bats' migrations usually happen on a smaller scale. The majority of records in distance belong to bats from the Vespertilionidae family. One of the record holders, Nathusius' bat (*Pipistrellus nathusii*) is abundant in the temperate zone. Therefore it is a perfect model object for researching bats' abilities to navigate on the migratory route.

What sources of information bats are using for navigation and orientation during migration, remains mainly unknown. On the other hand, sensory aspects of bird navigation during migration are relatively well studied. Global cues birds use for orientation can be divided into two groups: astronomical cues, e. g. sun and stars, and magnetic cues. It is well known that birds are able to use the Earth's magnetic field for orientation. Such knowledge became possible to obtain mostly due to the existence of the so-called behavioral paradigm, which allowed scientists to research birds' migratory orientation under controlled laboratory conditions: Emlen funnels. In the past few years, a similar method was suggested for bats.

We aimed to perform a series of experiments on Nathusius' pipistrelle (*Pipistrellus nathusii*) to ensure that they are capable to use the geomagnetic field for orientation. Bats were tested under two different

conditions: in the geomagnetic field and the field, rotated 120° CW. To determine the takeoff direction and analyze behaviour in different magnetic conditions, we used the modified circular release box (CRBox) and a mini camera with IR LEDs. Helmholtz magnetic coils were used to manipulate the magnetic field.

Bats were captured during migration through the Courish spit (Kaliningrad region, Russia). Totally 90 bats were tested during August and September 2021 and 2022. We observed some directional trends in the data obtained in 2021, which disappeared after the improvement of the experimental setup in 2022. However, the recordings of released bats clearly show that they have some specific directional preferences. Although we are still not able to conclude whether bats are using the magnetic field or not, the obtained results are already sufficient for a productive discussion.

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## **ECOLOGICAL AND GEOGRAPHICAL FACTORS AFFECTING TESTATE AMOEBA COMMUNITIES IN ARCTO-ALPINE CONDITIONS**

### **ЭКОЛОГИЧЕСКИЕ И ГЕОГРАФИЧЕСКИЕ ФАКТОРЫ ФОРМИРОВАНИЯ СООБЩЕСТВ РАКОВИННЫХ АМЕБ В АРКТОАЛЬПИЙСКИХ УСЛОВИЯХ**

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Keywords: Testate amoeba communities; arctic ecosystems; species richness; alpine assemblages; species structure; microbial spatial distribution; biogeographic patterns; quaternary climate change

The terrestrial arctic and the mountain alpine ecosystems are particularly sensitive to ongoing climate changes. In order to understand how natural habitats would react to the transformations of environmental conditions, it is crucial to figure out what factors affect the structure of biodiversity. Microorganisms play a significant role in soil communities in the arctic and alpine areas, while their spatial distribution and biogeographic patterns remain controversial [1, 2].

The aim of this work is to determine ecological and geographical factors, influencing the formation of species richness and structure of soil-dwelling testate amoebae communities in arcto-alpine conditions. For the examination of the tundra zone, surface soil and sphagnum samples were collected in three ecoregions of arctic tundra on the Kola, Yugorsky and Chukchi peninsulas [4]. For the analysis of the high mountain assemblages, the samples were selected from the periglacial zone of the Tseysky glacier.

The laboratory preparation of soil specimens was carried out in accordance with the standard methodology, which is based on the concentration and probe filtration with subsequent mixing in the universal shaker and light microscopy [3].

Our analysis revealed 75 species of testate amoebae from 29 genera in the arctic region. Based on this data, species accumulation curves were plotted in the R program and ecoregions and biotopes with two extremes of the range were defined. The highest species richness was found on the Chukchi Peninsula (61 species) and the lowest on the Yugorsky Peninsula (50 species). Among plant associations, most species were found in bogs (64 species) and fewest in the shrub-lichen tundra (46 species). Furthermore, in the periglacial zone of glacier, 47 species of testate amoeba were identified.

The results of additive analysis indicate a significant contribution of abiotic factors to shaping species diversity at a regional scale. The principal component analysis shows the connection between the structure of communities and ecoregions. For instance, the Kola Peninsula assemblages and swamp communities statistically differ from the other types.

In conclusion, large-scale geographical spatial factors play the key role in the development of testate amoebae species richness in the arcto-alpine region, which also demonstrates the presence of biogeographical patterns among shell amoebae.

The study explains the influence of climate factors on the arctic and alpine communities, which is crucially important for forecasting and monitoring changes in these ecosystems in relation to global warming.

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## **SENSITIVITY ANALYSIS OF THE ROTHC MODEL FOR THE CARBON SEQUESTRATION POTENTIAL ASSESSING OF THE ROSTOV REGION ARABLE LANDS**

### **АНАЛИЗ ЧУВСТВИТЕЛЬНОСТИ МОДЕЛИ ROTHC ДЛЯ ОЦЕНКИ ПОТЕНЦИАЛА СЕКВЕСТРАЦИИ УГЛЕРОДА ПАХОТНЫХ ЗЕМЕЛЬ РОСТОВСКОЙ ОБЛАСТИ**

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Keywords: carbon sequestration, soil organic carbon stock, carbon-saving practices

One of the current human activities to mitigate global climate change is to compensate for greenhouse gas emissions through soil carbon sequestration. The term “soil carbon sequestration” implies removal of atmospheric carbon dioxide by plants and storage of fixed carbon as soil organic matter. Within the framework of COP21, an agreement was drawn up with “4 ppm”. Under sustainable



management arable soils can be served as a reservoir of organic carbon. A 4% annual increase in global soil organic matter stocks can offset global greenhouse gas emissions due to anthropogenic sources.

In 2020, the UN FAO Global Soil Partnership initiated the global soil organic carbon sequestration potential map – GSOCseq. It presents the prediction of the organic carbon stock in the soil layer 0–30 cm in tC/ha in 2040. All maps are made according to a unified methodology developed on the basis of the RothC model (Rothamsted Long-Term Field Experience Carbon Model).

In this research, the rates of carbon sequestration potential were estimated in arable lands of Rostov region based on the four different scenarios: conservation of existing land use practices (business as usual – BAU) and three scenarios with the application of sustainable soil management carbon-saving practices of different intensity: with an increment in organic matter input by 5% – (SSM1), by 10% – (SSM2) and by 20% – (SSM3). The work was carried out with satellite data of agricultural soils of Rostov Oblast. The soil cover of Rostov Oblast is dominated by common and southern chernozems and chestnut soils. There is a small emission (–0.005 t C/ha per year) with maintaining of existing land use practices (BAU).

Application of carbon-saving practices of various intensities will advance the rate of carbon fixation and in the most favourable scenario (SSM3) it will grow up to 0.127 tC/ha annually for the Rostov region. There was also a tendency to increase the range of 95% confidence intervals with improving intensity of carbon-saving practices. Further work on the master's thesis will include mapping the sequestration potential of arable land in Rostov Oblast, using regional data from Rosstat and the Agrochemical Service and analyzing the sensitivity of carbon fixation projections in the soil to input data variation. Therefore, the potential and the rate of carbon sequestration in soils of the Rostov region with improving intensity of carbon-conservation practices will be evaluated by the results of the research.

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## **THE COURSE OF VARIOUS TYPES OF DIRECT INTERSPECIFIC ELECTRON TRANSFER IN BIOFILMS DURING ANAEROBIC FERMENTATION OF HIGHLY CONCENTRATED VOLATILE FATTY ACIDS, DEPENDING ON THE INOCULATE AND THE CONDUCTIVITY OF THE CARRIER MATERIAL**

### **ПРОТЕКАНИЕ РАЗЛИЧНЫХ ТИПОВ ПРЯМОГО МЕЖВИДОВОГО ПЕРЕНОСА ЭЛЕКТРОНОВ В БИОПЛЕНКАХ ПРИ АНАЭРОБНОМ СБРАЖИВАНИИ ВЫСОКОКОНЦЕНТРИРОВАННЫХ ЛЕТУЧИХ ЖИРНЫХ КИСЛОТ В ЗАВИСИМОСТИ ОТ ИНОКУЛЯТА И ЭЛЕКТРОПРОВОДНОСТИ МАТЕРИАЛА-НОСИТЕЛЯ**

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Keywords: Syntrophy, methanogenesis, anaerobic digestion, direct interspecies electron transfer (DIET)

The activation of the process of direct interspecific electron transfer (DIET) in methanogenic microbial communities can occur under different conditions, including high concentrations of volatile fatty acids.

This work is devoted to the study of the effect of various materials used to provide DIET on the anaerobic digestion of volatile fatty acids (VFA) at an ultra-high concentration of 12.5 g/l with two types of inoculates: thermophilically fermented sewage sludge and cattle manure. Carbon felt and stainless steel mesh were used as conductive materials, and their inert analogues were represented by polyester felt and fiberglass mesh.

The potential yield of methane for sewage sludge (SS) used as an inoculum was the best for vials with the addition of carbon felt and stainless steel mesh, which is 25 and 29% more than in case of control. The maximum rate of methane formation for carbon felt and stainless steel mesh was 3.3 and 4.4 times higher than in terms of control, respectively. The rate of removal of VFA was also higher for these variants, by the day 11 the degree of removal of acetate, butyrate and propionate exceeded the control twice. The biofilm formed on the stainless steel mesh was more electroactive in comparison with the inert analog, and the biofilm on the carbon felt had an additional oxidative peak, absent from the inert analog. For vials with cattle manure (CM) as an inoculum, the potential methane yield was better for polyester felt and stainless steel mesh, which is 52 and 50% more compared with the control. The electroactivity of biofilms on stainless steel and fiberglass mesh did not differ, however, the electroactivity on biofilm on polyester felt was slightly higher than on carbon felt. For the SS inoculum, biofilms on carbon and polyester felt were enriched with microorganisms of the genus *Coprothermobacter* and the class *Limnochordia*. Representatives of the genus *Ureibacillus* and the class *Limnochordia* dominated in biofilms on stainless steel. The bases of the microbial community of all biofilms for CM were presumably electroactive representatives of the class *Limnochordia MBA03* and the genus *Hydrogenispora*.

Thus, the combination of kinetic, electrochemical and molecular data on the microbial community allowed tracing a noticeable correlation between the characteristics of the anaerobic digestion process and the type of material, which indicated the current of not only the DIET- C type for SS, but also A and B for CM.

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