

Московский государственный университет имени М.В. Ломоносова

Факультет иностранных языков и регионоведения

Биологический факультет

IV Межфакультетская студенческая научно-практическая конференция «Life Sciences in the 21st Century: Looking into the Future»

22-23 января 2021 г.

МАТЕРИАЛЫ

Life Sciences in the 21st Century: Looking into the Future

IV Межфакультетская студенческая научно-практическая конференция

(22-23 января 2021 г., Москва, МГУ)

УДК 57:58:59:61:63

ББК 28

L 70

ISBN

*Рекомендовано к опубликованию решением Ученого
и Учебно-методического советов биологического факультета
Московского государственного университета имени М. В. Ломоносова*

Редакционная коллегия: д.ф.н., профессор Полубиченко Л.В., к.ф.н., доцент Моргун Н.Л., старший преподаватель Фурсова А.А.

22-23 января 2021 г. в МГУ состоялась IV Межфакультетская студенческая научно-практическая конференция «Life Sciences in the 21st 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. На конференции было сделано 125 научных докладов, охватывающих широкий спектр направлений исследований в биологии и смежных науках, начиная от классических зоологических и ботанических наблюдений до использующих самые современные методические подходы экспериментов.

Contents:

| | |
|---|----|
| Foreword | 6 |
| Organising Committee | 8 |
| Programme Committee | 9 |
| Programme | 10 |
| Plenary presentations | 30 |
| Lidia Bobrovnikova | 30 |
| Neochlorella semenenkoi IPPAS C-1210 — insight in cultivation and potential | |
| Vladislav Sidorov | 32 |
| Utilizing amorphous ferromagnetic microwires as magnetic tweezers for biological applications | |
| Anzhelina Shmeleva | 34 |
| The nesting of the Grey Heron (<i>Ardea cinerea</i>) on the territory of Vladimir region: its role and place in the forest ecosystems | |

| | |
|--|-----------|
| Sectional presentations..... | 37 |
| Aishat Arguyanova | 37 |
| Using brain-computer interfaces technologies for communication and rehabilitation: a new frontier for patients with aphasia | |
| Kseniia Baranova | 38 |
| Ontogenetic basis for the formation of a variety of sympatric forms of charr <i>Salvelinus malma</i> from Lake Kronotskoe | |
| Nikita Belishev | 40 |
| Generating intrafusal muscle fibre in vitro: effect of gelatine and neuregulin-1 on C2C12 cell line differentiation | |
| Georgiy Dolgalev | 41 |
| Response of cancer cells to action of ribonuclease binase | |
| Dmitrii Fedorov | 42 |
| Effect of ouabain and marinobufagenin on the proteome of human umbilical vein endothelial cells | |
| Ilia Gimaev | 44 |
| Cross reactive, microbiota-derived monoclonal IgA antibodies bind to the brain antigens and ameliorate LPS-induced acute systemic inflammation | |
| Anna Glushkevich | 46 |
| Transcriptome of model plant <i>Physcomitrium patens</i> using direct RNA sequencing | |

| | |
|---|----|
| Jain Mark | 48 |
| Liquid biopsy in diagnosis of bladder cancer: a pilot study | |
| Dmitry A. Ruchkin | 49 |
| IR family receptors used as chemogenetic instrument | |
| Diana Salnikova | 51 |
| New steroidal imidazopyridines: synthesis and evaluation of antiproliferative effects | |
| Alexandra Saynchuk | 53 |
| Methods of preservation of tropical micromycetes | |
| Evgeniya Solomatina | 54 |
| Myosin II in focal adhesion regulation in cancer cells | |
| Valentina Volkova | 56 |
| Comparative analysis of taxonomic diversity in <i>Microgecko</i> Nikolsky, 1907 (Squamata, Gekkonidae) | |
| Svetlana Zhukova | 57 |
| CYP450 9e2 and odorant receptor expression in black garden ant <i>Lasius niger</i> under conditions with different anthropogenic load | |
| Alexandra Yakimova | 58 |
| Maternal behavior and mother-infant relationships in northern fur seal, <i>Callorhinus ursinus</i> | |

Foreword

On 22 - 23 January 2021, the 4th 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. 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.

The conference brought together about 160 participants. The organizing committee received 139 submissions, 125 presentations were made by students from the 5 science faculties mentioned above. The plenary session encompassed 6 topics as diverse as cultivation of *Neochlorella semenkoi* IPPAS C-1210, chloride homeostasis of mice cortical neurons under brain trauma, the mechanisms regulating stem cell osteogenic differentiation by mesenchymal stromal cell-derived extracellular matrix components, the amorphous ferromagnetic microwires used as magnetic tweezers for biological applications, the influence of the invasive plant *Solidago gigantea* on the structure of soil arthropod communities, and the role and place of the Grey Heron in the forest ecosystems.

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 3 plenary and 15 sectional papers whose authors scored the most points for their English (from 92 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

Organising Committee

Lydia Polubichenko (Chairperson), PhD in Philology, Professor, Head of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

Sergey Shoba, PhD in Biology, Professor, President of the Soil Science Faculty, Corresponding Member of the Russian Academy of Sciences, Academician of the Russian Academy of Natural Sciences

Alexander Osmolovsky, PhD in Biology, Associate Professor, Deputy Dean for Academic Affairs of the Faculty of Biology

Nurshat Gaifullin, PhD in Medical Science, Associate Professor, Deputy Dean for Research of the Faculty of Fundamental Medicine

Ludmila Grigorieva, PhD in Physics and Mathematics, Associate Professor, Deputy Dean for Academic Affairs of the Faculty of Fundamental Physical and Chemical Engineering

Olga Shpanchenko, PhD in Chemistry, Associate Professor, Deputy Dean for Academic Affairs of the Faculty of Biotechnology

Alexandra Fursova (coordinator), Senior Lecturer of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

Programme Committee

Galina Molchanova (Chairperson), PhD in Philology, Professor, Acting Dean of the Faculty of Foreign Languages and Area Studies, Head of the Department of Linguistics, Translation Studies and Intercultural Communication

Alexander Kim, PhD in Biology, Professor, Deputy Dean for Teaching Methodology and Supplementary Education of the Faculty of Biology

Andrey Kitashov, PhD in Biology, Associate Professor, Deputy Dean for International Cooperation of the Faculty of Biology

Nelly Glinskaya, PhD in Philology, Associate Professor of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

Olga Yegorova, PhD in Cultural Studies, Associate Professor of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

Maria Kochetova, PhD in Philology, Associate Professor, Head of the Department of English for the Humanities Faculties, Faculty of Foreign Languages and Area Studies

Lyudmila Frolova, PhD in Philology, Associate Professor, Deputy Dean for Extracurricular Activities of the Faculty of Biotechnology

Oxana Kozlova, PhD in Biology, Senior Lecturer of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

Tatyana Surganova, PhD in Philology, Senior Lecturer of the Faculty of Fundamental Physical and Chemical Engineering

Sona Agadzhanyan, PhD in Philology, Teacher of the Department of English for Natural Sciences, Faculty of Foreign Languages and Area Studies

2021 Student Conference Life Sciences in the 21st Century: Looking into the Future

Programme

January 22

| | | | |
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| Plenary session 10.00-13.30 | Afternoon session 14.00-19.00 | | |
| <p>Conference opening address and welcome speech</p> <p>Lydia Polubichenko, Head of the Department of English for Sciences, Professor of the Faculty of Foreign Languages and Area Studies</p> | <p>Session 1. General biology</p> <p>Session 2. Biochemistry and molecular biology</p> <p>Session 3. Biophysics, bioengineering, biotechnology</p> <p>Session 4. Physiology and neurobiology</p> <p>Session 5. Genetics, histology, embryology</p> <p>Session 6. Ecology</p> | | |
| <p>Plenary presentations</p> <p>1. Lidia Bobrovnikova/ Бобровникова Лидия Faculty of Biotechnology</p> <p>Neochlorella semenenkoi IPPAS C-1210 — insight in cultivation and potential (Neochlorella semenenkoi IPPAS C-1210 — обзор культивирования и потенциала)</p> <p>2. Natalia Lizunova/ Лизунова Наталья Владимировна Faculty of Biology, Department of Human and Animal Physiology</p> <p>Chloride homeostasis of mice cortical neurons under brain trauma (Гомеостаз кортикальных нейронов мыши в условиях травмы мозга)</p> <p>3. Irina G. Milovskaya/ Миловская Ирина Георгиевна Faculty of Biology, Department of Biochemistry</p> <p>The identification of the mechanisms regulating stem cell osteogenic differentiation by mesenchymal stromal cell-derived extracellular matrix components (Установление механизмов регуляции остеогенной дифференцировки стволовых клеток компонентами внеклеточного матрикса, продуцируемыми мезенхимальными стромальными клетками)</p> <p>4. Vladislav Sidorov/ Сидоров Владислав Львович</p> | <p>Subsession 1.1 General biology</p> <p>N.Glinskaya</p> <p>E.Mikheeva</p> <p>I. Alikhanova</p> | <p>Subsession 2.1 Biochemistry and molecular biology</p> <p>L.Polubichenko</p> <p>V.Ignatenko</p> | <p>Session 3 Biophysics, bioengineering, biotechnology</p> <p>S.Agadzhanian</p> <p>L.Frolova</p> |

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|--|--|--|--|
| <p>Faculty of Fundamental Physical and Chemical Engineering</p> <p>Utilizing amorphous ferromagnetic microwires as magnetic tweezers for biological applications (Использование аморфных ферромагнитных микропроводов в качестве магнитных пинцетов для биологических применений)</p> <p>5. Elena Ustinova/ Устинова Елена Faculty of Biology, Department of Biological Evolution</p> <p>Influence of invasive plant <i>Solidago gigantea</i> (Asteraceae) on the structure of soil arthropod communities (Влияние инвазивного растения <i>Solidago gigantea</i> (Asteraceae) на структуру населения почвенных членистоногих)</p> <p>6. Anzhelina Shmeleva/ Шмелева Анжелина Faculty of Soil Science, Department of Soil Geography</p> <p>The nesting of the Grey Heron (<i>Ardea cinerea</i>) on the territory of Vladimir region: its role and place in the forest ecosystems (Гнездование серой цапли (<i>Ardea cinerea</i>) на территории Владимирской области: роль и место в лесных экосистемах)</p> | | | |
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January 23

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|--|---|---|--|--|
| Morning session 10.00 – 15.00 | | | | |
| <p>Session 1. General biology</p> <p>Session 2. Biochemistry and molecular biology</p> <p>Session 4. Physiology and neurobiology</p> <p>Session 5. Genetics, histology, embryology</p> <p>Session 6. Ecology</p> <p>Session 7. Biology (на немецком языке)</p> | | | | |
| <p>Subsession 1.2 General biology</p> <p>A.Foursova Z. Alkhastova</p> | <p>Subsession 2.2 Biochemistry and molecular biology</p> <p>N.Morgoun O.Egorova</p> | <p>Subsession 4.2 Physiology and neurobiology</p> <p>Subsession 5.2 Genetics, histology, embryology</p> | <p>Subsession 6.2 Ecology</p> <p>Subsession 2.3 Biochemistry and molecular biology</p> <p>L.Polubichenko</p> | <p>Sessi Biolog A. Ed</p> |

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| | | O.Kozlova E.Mikheeva I. Alikhanova | V.Ignatenko | |
|--|--|--|-------------|--|

January 22

Afternoon session 14.00-19.00

Subsession 1.1 General biology

Moderators: N.Glinskaya, E.Mikheeva, I. Alikhanova

| | Name | Name | Faculty, department | Title of paper in English |
|----|-------------------------|------------------------|--|---|
| 1. | Ермилова Анна | Anna Ermilova | Faculty of Biology, Department of Vertebrate Zoology | Ontogeny of vocalization of avian brood parasites by the example of the common (<i>Cuculus canorus</i>) and oriental (<i>C. optatus</i>) cuckoos. |
| 2. | Кейси Алекс | Aleks Keisi | Faculty of Biology, Department of Mycology and Algology | Cultivated micromycetes on furr and in burrows of small mammals in Vietnam |
| 3. | Крупницкая Нелля | Nellya Krupitskaya | Faculty of Biology, Department of Invertebrate Zoology | Analysis of the dietary spectrum of nudibranch molluscs (Gastropoda: Nudibranchia): experience of the using of metabarcoding. |
| 4. | Польковская Александра | Alexandra Polykovskaia | Faculty of Fundamental Medicine | Comparative marketing analysis of drugs and dietary supplements registered in Russian Federation |
| 5. | Сильверстов Никита | Nikita Silverstov | Biological Faculty, Department of Vertebrate Zoology | The influence of hormones on the ontogeny of birds singing on the example of the Russian canine song |
| 6. | Сухова Мария Алексеевна | Mariya Sukhova | Faculty of Biology, Department of Vertebrate Zoology | Factors affecting the choice of nesting habitats and nesting success of the Far Eastern Curlew in Eastern Kamchatka |
| 7. | Цветкова Юлия | Yulia Tsvetkova | Faculty of Biology, Department of Mycology and Algology | Intraspecific variability of plant pathogenic fungus <i>Colletotrichum nymphaeae</i> on strawberry plants. |

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|-----|---------------------------------|---------------------|--|--|
| 8. | Цой Юлия | Julia Tsoi | Faculty of Biology, Department of Vertebrate Zoology | Role of landmarks from the lower part of the visual field in learning the location of a goal by the common toad, <i>Bufo bufo</i> L., 1758 |
| 9. | Ширинкина Людмила Игоревна | Lyudmila Shirinkina | Faculty of Biology, Department of Microbiology | Microbial degradation of polystyrene and its intermediates |
| 10. | Якимова Александра Владимировна | Alexandra Yakimova | Faculty of Biology, Department of Vertebrate Zoology | Maternal behavior and mother-infant relationships in northern fur seal, <i>Callorhinus ursinus</i> |

January 22

Afternoon session 14.00-19.00

Subsession 2.1 Biochemistry and molecular biology

Moderators: L.Polubichenko, V.Ignatenko

| | Name | Name | Faculty, department | Title of paper in English | Title of paper in Russian |
|----|----------------------------------|------------------------|---|--|--|
| 1. | Барышникова Анастасия Максимовна | Anastasia Baryshnikova | Faculty of Biology, Department of Immunology | Doxycycline sensitive two-promoter integrator based on the TET-ON 3G transactivator. | Доксициклин-чувствительный регулятор на основе транзактиватора TET-ON 3G |
| 2. | Виговский Максим Александрович | Maksim Vigovskiy | Faculty of Fundamental Medicine, Department of Biochemistry and Molecular Medicine | Extracellular matrix as one of the EndoMT inducers. | Внеклеточный матрикс как один из индукторов ЭндомТ. |
| 3. | Вьюшков Владимир Сергеевич | Vladimir S. Viushkov | Faculty of Biology, Department of Molecular Biology | Application of the ANCHOR system for MYC locus visualization | Применение системы ANCHOR для визуализации локуса MYC |
| 4. | Гимаев Илья | Iliia Gimaev | Faculty of Biology, Department of Immunology | Cross reactive, microbiota-derived monoclonal IgA antibodies bind to the brain antigens and ameliorate LPS-induced acute systemic inflammation | Кросс-реактивные моноклональные антитела IgA, полученные из микробиоты, связываются с антигенами мозга и уменьшают тяжесть острой системной воспалительной реакции, индуцированной LPS |

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| 5. | Долгалев Георгий Владимирович | Georgiy Dolgalev | Faculty of Biology, Department of Molecular Biology | Response of cancer cells to action of ribonuclease binase | Ответ зл рибонукл |
| 6. | Иванова Софья Дмитриевна | Sofia Ivanova | Faculty of Biology, Department of Molecular Biology | Genetic basis of primary immunodeficiencies: the search for new pathogenic mutations and diagnostic markers | Первичны патологич |
| 7. | Мусабилов Антон Альфредович | Anton Musabirov | Faculty of Biology, Department of Molecular Biology | Investigation of the transcription factors interactions during activation of the immune response genes of <i>Drosophila melanogaster</i> | Исследов транскрип <i>Drosophila</i> |
| 8. | Сальникова Диана Игоревна | Diana Salnikova | Faculty of Fundamental Medicine, Department of Pharmacy | New steroidal imidazopyridines: synthesis and evaluation of antiproliferative effects | Синтез и новых ст |
| 9. | Селезнева Елизавета | Elizaveta Selezneva | Faculty of Biology | Study of degradation of natriuretic peptides under the action of NEP and NEP2 metalloproteases and their detection in rat tissues. | Исследов пептидов и детекци |
| 10. | Устюжанина Мария Олеговна | Maria Ustiuzhanina | Faculty of Biology, Department of Immunology | Retroviral transduction of the telomerase catalytic subunit gene leads to an increase in proliferative activity of human NK cells. | Ретровир субъектин пролифер |

January 22

Afternoon session 14.00-19.00

Session 3 Biophysics, bioengineering, biotechnology

Moderators: S.Agadzhanian, L. Frolova

| | Name | Name | Faculty, department | Title of paper in English | T |
|----|------------------|------------------|--|---|-----|
| 1. | Андреева Татьяна | Tatiana Andreeva | Faculty of Biology, Department of Bioengineering | Effect of EGCG, quercetin and genistein on nucleosomal DNA conformation | Е к |

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|-----|---------------------------------|-----------------------|--|--|------------------|
| 2. | Белишев Никита Владимирович | Nikita Belishev | Faculty of Biology | Generating intrafusal muscle fibre in vitro: effect of gelatine and neuregulin-1 on C2C12 cell line differentiation | C i Д |
| 3. | Богдан Ксения Викторовна | Xenia Bogdan | Faculty of Biology, Department of Biophysics | Quantum calculations for ion molecular complexes bond energy for mass spectra descriptions | F M C |
| 4. | Боткина Полина | Polina Botkina | Faculty of Fundamental Physical and Chemical Engineering | Novel receptor materials for the OFET-based gas sensors | F У C |
| 5. | Васюченко Екатерина | Ekaterina Vasyuchenko | Faculty of Biology, Department of Biophysics | Study of conformational rebuildings of heme cytochrome c and c ₁ during the formation of the complex by methods of molecular modeling | И п C M |
| 6. | Имамутдинова Арина | Arina Imamutdinova | Faculty of Fundamental Physical and Chemical Engineering | Thermal, hydrolytic and bacterial destruction of thermoplastic polyurethane based on PBA and MDI for medical purposes | T Б п M |
| 7. | Конюхова Алина | Alina Konyukhova | Faculty of Fundamental Physical and Chemical Engineering | Hydrolysis products of cationic tetranitrosyl iron complexes with aliphatic thioamines | П т а |
| 8. | Ручкин Дмитрий Алексеевич | Dmitry A. Ruchkin | Faculty of Biology, Department of Bioorganic Chemistry | IR family receptors used as chemogenetic instrument | F ж |
| 9. | Слущкая Екатерина Александровна | Ekaterina Slutskaya | Faculty of Biology, Department of Biophysics | A genetically encoded fluorescent temperature sensor derived from the photoactive Orange Carotenoid Protein (OCP) | П C C Б |
| 10. | Старостина Арина Алексеевна | Arina Starostina | Faculty of Fundamental Physical and Chemical Engineering | Thioamides as a promising class of ligands for NO-donating nitrosyl iron complexes | T Д Д |
| 11. | Тихонова Нина Александровна | Nina Tikhonova | Faculty of Biology, | Use of multimeric Nrf2 peptides in activation of the Nrf2 / ARE signaling system | И Д |

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|-----|-----------------------|---------------|--|---|
| | | | Department of Biophysics | |
| 12. | Шанк Михаил Андреевич | Mikhail Shank | Faculty of Biology, Department of Biophysics | Biological effects of nanoparticles in urban areas |
| 13. | Якушин Илья Олегович | Ilya Yakushin | Faculty of Fundamental Physical and Chemical Engineering | Effect of the composition of the Fe-Mo/MgO catalyst on the yield of carbon products of catalytic pyrolysis of methane |

January 22

Afternoon session 14.00-19.00

Subsession 4.1 Physiology and neurobiology

Moderators: N.Morgoun, O.Egorova

| | Name | Name | Faculty, department | Title of paper in English |
|----|------------------------------------|-----------------------|---|---|
| 1. | Бирюкова Наталья | Natalia Biriukova | Faculty of Biology, Department of Human and Animal Physiology | Effect of salt loading on renovascular hypertension in normal and gonadectomized female rats |
| 2. | Близнюкова Екатерина Александровна | Ekaterina Blizniukova | Faculty of Biology, Department of Higher Nervous Activity | «Motivational and reinforcing properties of the neural systems of hunting («aggressive») behaviour in rats». |
| 3. | Гизатулина Альбина | Albina Gizatulina | Faculty of Biology, Department of Human and Animal Physiology | Expression of opsins in eye tissues of male and female three-spined sticklebacks <i>Gasterosteus aculeatus</i> during spawning season |
| 4. | Джуманиязова Ирина Хамрабековна | Irina Dzhumaniiazova | Faculty of Biology, Department of Human and Animal Physiology | Temperature tolerance of the cardiac sodium current in zebrafish (<i>Danio rerio</i>) and rainbow trout (<i>Oncorhynchus mykiss</i>) depends on channel protein isoforms and lipid environment. |
| 5. | Павлов Александр | Alexander Pavlov | Faculty of Biology, Department of | Study of evoked synchronization / desynchronization of EEG rhythms during preparation and inhibition of the saccadic |

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|-----|------------------------------|---------------------|---|--|
| | | | Higher Nervous Activity | response in normal and early stages of schizophrenia. |
| 6. | Печерица Максим | Maxim Pecheritsa | Faculty of Biology, Department of Human and Animal Physiology | Influence of fatigue on indicators of human systemic hemodynamics during static contractions of limb muscles |
| 7. | 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. |
| 8. | Хлыбова Александра Сергеевна | Alexandra Khlybova | Faculty of Biology, Department of Human and Animal Physiology | Efficacy study of low-molecular-weight NGF mimetic GK-2 against diabetic neuropathy in streptozotocin-induced diabetic mice model |
| 9. | Цыба Евгения | Evgeniya Tsyba | Faculty of Biology, Department of Human and Animal Physiology | Absence epilepsy |
| 10. | Шилов Михаил | Mikhail Shilov | Faculty of Biology, Department of Higher Nervous Activity | The influence of daytime sleep inertia on auditory recognition of hardly distinguishable sounds |

January 22

Afternoon session 14.00-19.00

Subsession 5.1 Genetics, histology, embryology

Moderators: O.Kozlova, A.Ziyatdinova

| | Name | Name | Faculty, department | Title of paper in English |
|----|--------------------------------|--------------------|--|---|
| 1. | Иванова Анастасия Вячеславовна | Anastasiia Ivanova | Faculty of Biology, Department of Cell Biology and Histology | Effects of Zmpste24 inhibitors on cell proliferation and migration in vitro |
| 2. | Клименко Марина Сергеевна | Marina Klimenko | Faculty of Biology, | Cell composition of the immune infiltrate of various inoculated tumors of laboratory mice |

| | | | | |
|-----|--------------------------------|----------------------|--|---|
| | | | Department of Immunology | |
| 3. | Красина Марина Евгеньевна | Marina Krasina | Faculty of Biology, Department of Cell Biology and Histology | Regenerative potential of multipotent mesenchymal stromal cells in vivo on myocardial infarction model in rats |
| 4. | Меньшикова Наталья | Natalya Menshikova | Faculty of Biology, Department of Embryology | Construction and xenotransplantation of artificial ovary prototype |
| 5. | Огнивцев Александр | Alexander Ognitsev | Faculty of Biology, Department of Embryology | The influence of extracellular matrix components on human pluripotent cell stemness and differentiation |
| 6. | Ревокатова Дарья Петровна | Daria Revokatova | Faculty of Biology, Department of Embryology | Parallel osteogenic and endothelial differentiation of cells in ADSC-derived spheroids. |
| 7. | Сазонова Елизавета Алексеевна | Elizaveta Sazonova | Faculty of Biology, Department of Embryology | Human pluripotent stem cells' paracrine status |
| 8. | Салугина Виктория | Viktoriia Salugina | Faculty of Biology, Department of Embryology | Prenatal correction of reproductive system disorders with immunoglobulins (IgG) in male mice developing under systemic condition inflammation |
| 9. | Соломатина Евгения Сергеевна | Evgeniya Solomatina | Faculty of Biology, Department of Cell Biology and Histology | Myosin II in focal adhesion regulation in cancer cells |
| 10. | Чурсанова Екатерина Николаевна | Ekaterina Chursanova | Faculty of Biology, Department of Cell Biology and Histology | The role of neutrophils and eosophils in the development of allergic airway inflammation |

January 22

Afternoon session 14.00-19.00

Subsession Subsession 6.1 Ecology

Moderators: A.Foursova, Z. Alkhastova

| | Name | Name | Faculty, department | Title of paper in English |
|----|--------------------------------------|------------------------------------|--|--|
| 1. | Баранникова Лада Владимировна | Lada Barannikova | Faculty of Fundamental Physical and Chemical Engineering | Influence of equatorial ligands on the magnetic properties of pentagonal-bipyramidal Er (III) complexes |
| 2. | Большакова Алиса | Alisa Bolshakova | Faculty of Biology, Department of Vertebrate Zoology | Space use and social relations in males of <i>Darevskia valentini</i> (Boettger, 1892) |
| 3. | Глухарева Ирина Дмитриевна | Irina Glukhareva | Faculty of Biology, Department of Microbiology | Associative microorganisms of the roots of leafless tropical orchids |
| 4. | Жукова Светлана | Svetlana Zhukova | Faculty of Biology, Department of Biological Evolution | CYP450 9e2 and odorant receptor expression in black garden ant <i>Lasius niger</i> under conditions with different anthropogenic load |
| 5. | Лазарева Анна Максимовна | Anna Lazareva | Faculty of Biology, Department of General Ecology and Hydrobiology | Influence of the day time on the biotesting results at the moment of the toxicant addition |
| 6. | Мищенко Анастасия | Anastasia Michshenko | Faculty of Soil Science | Rheological properties of agricultural soils in Vladimirsky Opolye |
| 7. | Мохамед Эльсайед Эльсайед Али Исмаил | Mohamed Elsayed Elsayed Ali Ismail | Faculty of Biology, Department of Vertebrate Zoology | Paired-laser photogrammetry as a simple and accurate system for measuring the body size of free-ranging spinner dolphin <i>Stenella longirostris</i> in the Red Sea, Egypt |
| 8. | Решетникова Радислава Андреевна | Radislava Reshetnikova | Faculty of Soil Science, Department of Geography of Soils | Changes in the ecological conditions of the Middle and Lower Volga region in the historical time (based on soil properties) |

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| 9. | Тиморшина Светлана Наильевна | Svetlana Timorshina | Faculty of Biology, Department of Microbiology | Extracellular keratinolytic proteases produced by <i>Aspergillus giganteus</i> |
| 10. | Щербакова Полина Александровна | Polina Shcherbakova | Faculty of Biology, Department of Microbiology | Microbiomes of annelids <i>Terebellides</i> sp. and <i>Scoloplos</i> sp. of the Kandalaksha bay, White sea |

January 23

Morning session 10.00-15.00

Subsession 1.2 General biology

Moderators: A.Foursova, Z. Alkhastova

| | Name | Name | Faculty, department | Title of paper in English | Ti |
|----|---------------------------------------|-------------------------|--|---|----------------|
| 1. | Аверьянова Анастасия Дмитриевна | Anastasia Averianova | Faculty of Biology, Department of Virology | Competence of <i>Ixodes persulcatus</i> and <i>Ixodes ricinus</i> tick hybrids as vectors of tick-borne encephalitis virus | Кр ре ви |
| 2. | Баранова Ксения Ивановна | Kseniia Baranova | Faculty of Biology, Department of Ichthyology | Ontogenetic basis for the formation of a variety of sympatric forms of charr <i>Salvelinus malma</i> from Lake Kronotskoe | Ор па Са |
| 3. | Бобровникова Лидия | Lidia Bobrovnikova | Biotechnological faculty | <i>Neochlorella semenenkoi</i> IPPAS C- 1210 — insight in cultivation and potential | Не ку |
| 4. | Волкова Валентина | Valentina Volkova | Faculty of Biology, Department of Vertebrate Zoology | Comparative analysis of taxonomic diversity in <i>Microgecko</i> Nikolsky, 1907 (Squamata, Gekkonidae) | Ср па Ни |
| 5. | Глушкевич Анна Ильинична | Anna Glushkevich | Faculty of Biology, Plant Physiology | Transcriptome of model plant <i>Physcomitrium patens</i> using direct RNA sequencing | И: Пр пр |
| 6. | Койнова Александра Сергеевна | Alexandra Koynova | Faculty of Biology, Department of Invertebrate Zoology | Analysis of the regeneration from small body fragment in <i>Leucosolenia cf. variabilis</i> | Ан Ле ф |

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|-----|------------------------------|---------------------|--|---|---------------|
| 7. | Кузнецов Петр | Petr Kuznetsov | Faculty of Biology, Department of Invertebrate Zoology | New data on echiuran anatomy and histology: the case of <i>Lissomyema mellita</i> (Annelida: Thalassematidae) | Н э (А |
| 8. | Кузьмичева Татьяна | Tatiana Kuzmicheva | Faculty of Biology, Department of Ichthyology | Generalized data on the species composition and spatial distribution of ichthyoplankton in the Kara Sea. | О пр их |
| 9. | Никитенко Екатерина | Ekaterina Nikitenko | Faculty of Biology, Department of Invertebrate Zoology | Ontogenetic changes in spicule complex of Nudibranchia the example of <i>Onchidoris muricata</i> (O. F. Muller, 1776) | О ко т |
| 10. | Панченко Павел Львович | Pavel Panchenko | Faculty of Biology, Department of Biological Evolution | Influence of microbiome on adaptation of <i>Drosophila melanogaster</i> to unfavorable growth medium | В т с |
| 11. | Роккина Анна | Anna Rokkina | Faculty of Biology, Department of Anthropology | Polymorphism of UCP1-3 and FTO genes with regard to predisposition for obesity in South Siberian adults | А Ф вз |
| 12. | Сайнчук Александра Денисовна | Alexandra Saynchuk | Faculty of Biology, Department of Mycology and Algology | Methods of preservation of tropical micromycetes | М м |
| 13. | Семенова Марина Андреевна | Marina Semenova | Faculty of Biology, Department of Mycology and Algology | The effect of culture conditions on the mycelial growth and luminescence of bioluminescent fungi | В св |
| 14. | Федотов Алексей | Aleksei Fedotov | Faculty of Biology, Department of Higher Plants | Establishment of several <i>Curio</i> species as model objects for investigation of the leaf development morphogenetic pathways | П ка м |
| 15. | Царелунга Алексей Алексеевич | Alexey Tsarelunga | Faculty of Biology, Department of Mycology and Algology | Epiphytic micromycetes species diversity of the Moscow region | В м |

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|-----|-------------------------------------|---------------------------|---|---|---------------|
| 16. | Щербакова Виктория Дмитриевна | Viktorija Shcherbakova | Faculty of Biology, Department of Ichthyology | Population diversity and identification of hybrid forms of the beluga (<i>Huso huso</i> L., 1758) | По ги |
| 17. | Ющенко Платон Васильевич | Platon Yushchenko | Faculty of Biology, Department of Vertebrate Zoology | Phylogeny, historical biogeography and diversity of colubroid snakes of the genus <i>Oligodon</i> Fitzinger, 1826 (Squamata, Colubridae) | Ф па Fi |
| 18. | Ярмеева Мария | Maria Yarmeeva | Faculty of Biology, Department of Mycology and Algology | Populations of phytopathogenic fungus <i>Rhizoctonia solani</i> J.G. Küch in Russia | По со |

January 23

Morning session 10.00-15.00

Subsession 2.2 Biochemistry and molecular biology

Moderators: N.Morgoun, O.Egorova

| | Name | Name | Faculty, department | Title of paper in English |
|----|---|---------------------------|--|--|
| 1. | Афонин Дмитрий | Dmitry A. Afonin | Faculty of Biology, Department of Molecular Biology | A complimentary model of mitochondrial mRNA expression in a hybrid trypanosomatid <i>Vickermania ingenoplastis</i> |
| 2. | Балагуров Константин Игоревич | Konstantin Balagurov | Faculty of Biology, Department of Molecular Biology | The mechanism and functional significance of the interaction of proteins containing the BTB-domain with the sumoylation apparatus |
| 3. | Василец Юлия | Yulia Vasilets | Faculty of Fundamental Medicine, Department of Biochemistry and Molecular Medicine | Urokinase receptor (uPAR) regulates the assembly of 3D cardiac spheroid |
| 4. | Гаджикурбанов Магомед Набигуллаевич | Magomed Gadzhikurbanov | Faculty of Biology, | Molecular biology of a virus from the Chuviridae family |

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|-----|-------------------------------|----------------------|--|--|
| | | | Department of Virology | |
| 5. | Ермолаева Диана Романовна | Diana Ermolaeva | Faculty of Biology, Department of Bioorganic Chemistry | Study of specificity of influenza virus using glycan array |
| 6. | Колесникова Ольга Андреевна | Olga Kolesnikova | Faculty of Biology, Department of Immunology | Magnetic nanoparticles for the treatment of HER2-positive tumors |
| 7. | Кормухина Александра Юрьевна | Alexandra Kormukhina | Faculty of Fundamental Physical and Chemical Engineering | Decomposition of the nitrosyl iron complex with N-ethylthiourea and penicillamine ligands in aqueous solutions with serum bovine albumin |
| 8. | Крюк Мария | Mariya Kryuk | Faculty of Biology, Department of Microbiology | Study of a new probable 3'-secondary mRNA structure and its role in overexpression of target genes in <i>Rhodococcus rhodochrous</i> |
| 9. | Лендел Анастасия | Anastasiya Lendel | Faculty of Biology, Department of Virology | Biochemical properties of the endolysins, encoded by bacteriophages of Gram-negative bacteria |
| 10. | Мороз Ирина Валерьевна | Irina Moroz | Faculty of Biology, Department of Bioengineering | Role of long-term nitrogen storages in microalgae cells. |
| 11. | Мухутдинова Рената Рустамовна | Renata Mukhutdinova | Faculty of Biology, Department of Bioorganic Chemistry | Cloning and expression of genes encoding muscle nicotinic acetylcholine receptor subunits of domestic sheep (<i>Ovis aries</i>) |
| 12. | Панина Светлана | Svetlana Panina | Faculty of Biology, Department of Cell Biology and Histology | Segregation of nuclear bodies: morphological descriptions and mechanisms |
| 13. | Федина Марья Павловна | Maria Fedina | Faculty of Biology, Department of Virology | Alternation of tick-borne encephalitis and Powassan virus properties during persistence in <i>Dermacentor reticulatus</i> ticks |

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|-----|---------------------------|-----------------|--|---|
| 14. | Федоров Дмитрий Андреевич | Dmitrii Fedorov | Faculty of Biology, Department of Biochemistry | Effect of ouabain and marinobufagenin on the proteome of human umbilical vein endothelial cells. |
| 15. | Хозов Андрей | Andrey Khozov | Faculty of Biology, Department of Microbiology | Analysis of the effect of blocking the uptake of L-threonine on its production by <i>E.coli</i> strain. |

January 23

Morning session 10.00-15.00

Subsession 4.2 Physiology and neurobiology

Subsession 5.2 Genetics, histology, embryology

Moderators: O.Kozlova, E.Mikheeva, I. Alikhanova

| | Name | Name | Faculty, department | Title of paper in English |
|---|---------------------------------|-------------------------|---|--|
| Subsession 4.2 Physiology and neurobiology | | | | |
| 1. | Аргуянова Айшат Руслановна | Aishat Arguyanova | Faculty of Biology, Department of Human and Animal Physiology | Using brain-computer interfaces technologies for communication and rehabilitation: a new frontier for patients with aphasia |
| 2. | Кременчугская Татьяна Андреевна | Tatiana Kremenchugskaya | Faculty of Fundamental Medicine, Department of Surgery | Development of Postoperative Inflammatory Complications Prognosis in Patients with Acute Abdominal Disease |
| 3. | Надточеева Виктория | Viktoriya Nadocheeva | Faculty of Fundamental Medicine, Department of Physiology and General Pathology | Clinical-diagnostic and prognostic value of the determination of antineutrophilic cytoplasmic antibodies, the level of cryofibrinogen, KL-6 in patients with systemic scleroderma with lung damage |
| 4. | Панченко Вера | Vera Panchenko | Faculty of Fundamental medicine, | Oxidative homeostasis in twins and fetuses with growth restriction pregnancies |

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|----|---------------------------------|-----------------------|---|---|
| | | | Department of Obstetrics and Gynecology | |
| 5. | Рябкова Татьяна Сергеевна | Tatyana Ryabkova | Faculty of Biology, Department of Neurobiology | Brain mechanisms of structural ambiguity resolution within a reading process |
| 6. | Струтынский Владислав Андреевич | Vladislav Strutynskiy | Faculty of Fundamental Medicine | The comparative value of X-ray and CT in the diagnosis of suspected lung disease in elderly and senile patients with comorbid pathology |
| 7. | Тимошина Юлия | Julia Timoshina | Faculty of Biology, Department of Higher Nervous Activity | Intracerebroventricular injection of diazepam causes mania-like behaviour in C57BL/6 mice. |
| 8. | Шеденко К.Ю | Ksenia Shedenko | Faculty of Biology, Department of Higher Nervous Activity | Interest modulated eye-movements and reading behavior in reading texts with or without pictographs |

Subsession 5.2 Genetics, histology, embryology

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|----|-------------------------------|---------------------|--|--|
| 1. | Джайн Марк | Mark Jain | Faculty of Fundamental Medicine, Department of Multidisciplinary Clinical Training | Liquid biopsy in diagnosis of bladder cancer: a pilot study |
| 2. | Нурмуқанова Варвара Армановна | Varvara Nurmukanova | Faculty of Biology, Department of Microbiology | Role of the conjugative plasmid pALWED1.1 in antibiotic gene transfer between ancient and modern acinetobacteria strains |
| 3. | Овсяникова Ольга | Olga Ovsyanikova | Faculty of Biology, Department of Immunology | Anti-leukemic effect of drugs based on extracts from <i>Taxus baccata</i> and <i>Ganoderma sp.</i> |
| 4. | Панявина Мария | Maria Panyavina | Faculty of Biology, Departments of | The role of nucleolus in replicative stress-induced cell response |

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|----|--------------------|---------------------|---|--|
| | | | Cell Biology and Histology | |
| 5. | Яковлева Анастасия | Anastasia Iakovleva | Faculty of Biology, Department of Invertebrate Zoology | Microscopic anatomy and ultrastructure of the epithelia of <i>Beroe cucumis</i> Fabricius, 1780 (Ctenophora: Nuda) |

January 23

Morning session 10.00-15.00

Subsession 6.2 Ecology

Subsession 2.3 Biochemistry and molecular biology

Moderators: L.Polubichenko, V.Ignatenko

| | Name | Name | Faculty, department | Title of paper in English | |
|-------------------------------|-----------------------------|---------------------|--|---|------------------|
| Subsession 6.2 Ecology | | | | | |
| 1. | Кожевникова Юлия | Julia Kozhevnikova | Faculty of Biology, Department of Vertebrate Zoology | Comparative analysis in pup ultrasonic isolation calls in six Gerbillinae rodents | C y r |
| 2. | Мищанчук Ксения | Ksenia Mishchanchuk | Faculty of Biology, Department of Ecology and Plant Geography | Assessment of the state of reindeer pastures in Yamal in the context of expanding anthropogenic activity | C y r d |
| 3. | Старостин Алексей Данилович | Aleksey Starostin | Faculty of Fundamental Physical and Chemical Engineering | Oxycracking of ethane-ethylene mixture | C |
| 4. | Шабает Александр | Alexander Shabaev | Faculty of Biology, Department of Microbiology | Alteration of the <i>Drosophila melanogaster</i> microbiome during adaptation of flies to unfavorable food substrates | I / P |

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|--|--------------------------------|-------------------|--|---|
| 5. | Шматин Иван Ильич | Ivan Shmatin | Faculty of Fundamental Physical and Chemical Engineering | Design of polymer solar cells as renewable energy sources |
| Subsession 2.3 Biochemistry and molecular biology | | | | |
| 1. | Ворожцов Артем Павлович | Artem Vorozhtsov | Faculty of Fundamental Physical and Chemical Engineering | Photochemical synthesis of the [2.2]metacyclophane derivative from the supramolecular complex of biscrown-containing 1,3-distyrylbenzene with diammonioethane |
| 2. | Зайцева Виктория Александровна | Victoria Zaitceva | Faculty of Fundamental Medicine, Department of Pharmacy | The role of BNIP3 in cellular response to hypoxia and in necroptosis induction |
| 3. | Монакова А.О. | A.O. Monakova | Faculty of Basic Medicine | A perspective on application of mesenchymal stromal cell secretome for treating male infertility |
| 4. | Муравлев Владимир Игоревич | Vladimir Muravlev | Faculty of Biology, Department of Biophysics | Intercellular calcium signaling in hippocampal astrocytes |
| 5. | Ханнанов Ринат Асхатович | Rinat Khannanov | Faculty of Biology | The fine regulation of mitochondrial translation in baker's yeast cells |
| 6. | Шмитко Анна Олеговна | Anna Shmitko | Faculty of Biology, Department of Virology | Expression regulation of the telomeric retrotransposon TART by the piRNA-silencing system in Drosophila germline |

January 23

Morning session 10.00-15.00

Session 7 Biology (на немецком языке)

Moderators: A. Edlichko

| | Name | Name | Faculty, department | Title of paper in German |
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| 1. | Астахова Екатерина | Ekaterina Astakhova | Биологический факультет, кафедра иммунологии | Virusneutralisierende Antikörperaktivität genesener COVID-19-Patienten |
| 2. | Балашов Николай | Nikolai Balashov | Биологический факультет, кафедра высших растений | Anatomischer, morphologischer und zytogenetischer Vergleich von vier Wermutarten im Südosten Russlands (<i>Artemisia campestris</i> , <i>Artemisia tscherniaviana</i> , <i>Artemisia marschalliana</i> , <i>Artemisia arenaria</i>) |
| 3. | Бирюкова Наталья | Natalia Biriukova | Биологический факультет, кафедра физиологии человека и животных | Einfluss der Salzfracht auf die Entwicklung renovaskulärer Hypertonie bei normalen und ovariectomierten weiblichen Ratten |
| 4. | Каримова Марьяна | Mariana Karimova | Биологический факультет, кафедра эмбриологии | Modifikation des Transkriptionsprofils von menschlichen Speicheldrüsenzellen zur Verstärkung der Expression von Pankreasmarkern |
| 5. | Селезнёва Елизавета | Elizaveta Selezneva | Биологический факультет, кафедра биохимии | Vergleichende Analyse des Abbaus von natriuretischen Peptiden durch Nephilysin- und Nephilysin-2-Proteasen |
| 6. | Смолярова Дарья | Daria Smolyarova | Биологический факультет, кафедра биохимии | Fluorogener Biosensor zur Messung von Wasserstoffperoxid |
| 7. | Терещук Василиса | Vasilisa Tereshchuk | Биологический факультет, кафедра молекулярной биологии | Identifikation intrazellulärer Stoffwechselwege auf Basis proteomischer Daten von oxidativem Stress unterschiedlicher Natur |
| 8. | Федорова Мария | Mariia Fedorova | Биологический факультет, кафедра энтомологии | Lernen und Gedächtnis von kleinen Hautflüglern und Thripsen |
| 9. | Хлыбова Александра | Aleksandra Khlybova | Биологический факультет, кафедра физиологии человека и животных | Die Effizienz des niedermolekularen NGF-Mimetikums GK-2 gegen diabetische Neuropathie im Streptozotocin-induzierten diabetischen Mausmodell |
| 10. | Черкашина Ольга | Olga Cherkashina | Биологический факультет, кафедра клеточной биологии | Einfluss der Alpha-Liponsäure auf Differenzierungsprozesse und Morphogenese der Epidermis |

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| 11. | Шамсиев Ильдар | Ildar Shamsiev | Биологический факультет, кафедра высшей нервной деятельности | Parameterveränderungen der Augenbewegungen von Affen nach der hochenergetischen Protonenbestrahlung |
| 12. | Шепелюк Мария | Mariia Shepeliuk | Биологический факультет, кафедра физиологии человека и животных | Wenig erforschte mitochondriale Peptide im transgenen Mausmodell |
| 13. | Юракова Таисия | Taisiia Iurakova | Биологический факультет, кафедра иммунологии | Die Veränderung des Makrophagen-Immunmetabolismus als Reaktion auf die Aktivierung durch Allergene |

Plenary presentations

Neochlorella semenenkoi IPPAS C-1210 — insight in cultivation and potential

Neochlorella semenenkoi IPPAS C-1210 — обзор культивирования и потенциала

Lidia Bobrovnikova

Biotechnological faculty

Keywords: *Microalgae, lipid-producer, optimal cultivation conditions, mixotrophic growth*

Microalgae have a tremendous potential in many industrial areas such as food industry, energetics, cosmetology and pharmacy due to their numerous valuable compounds. In our research we have investigated ecophysiological and biochemical characteristics of a new *Chlorella*-like species *Neochlorella semenenkoi* strain IPPAS C-1210. The strain was isolated from the freshwater Lake Issyk in Kazakhstan. The response of the culture to changes of various cultivation parameters (pH; temperature; salinity, nitrogen source; carbon source; nitrogen, phosphorus, sulfur, magnesium and iron starvation) was studied. The growth rate, productivity and biochemical composition (starch, protein, lipid and pigment content) of the IPPAS C-1210 cells were estimated.

As a result, the optimal cultivation conditions were selected in order to maximize biomass productivity. The optimal growth temperature was found to be around 30° C, optimal pH — slightly alkaline, in the range of 8-9. The highest biomass productivity was observed in the medium with urea as the nitrogen source. The strain was able to grow in mixotrophic and heterotrophic conditions using glucose or acetate as a carbon source. Furthermore, it was determined that under nitrogen starvation conditions the cells of IPPAS C-1210 strain switch their metabolism from starch to lipid accumulation. The opposite was observed under magnesium starvation conditions: the amount of starch in chloroplasts in the cells was increased while lipid content remained low.

Based on our results we believe that *Neochlorella semenenkoi* strain IPPAS C-1210 can be a good lipid-producer suitable for usage in the biotechnological industry.

Utilizing amorphous ferromagnetic microwires as magnetic tweezers for biological applications

Использование аморфных ферромагнитных микропроводов в качестве магнитных пинцетов для биологических применений

Vladislav Sidorov

Faculty of Fundamental Physical and Chemical Engineering

Keywords: *ferromagnetic, microwires, magnetic tweezers, domain structure, amorphous shell, hysteresis*

In this paper amorphous ferromagnetic microwires' properties are thoroughly analyzed with regard to magnetic tweezers requirements, which are unsophisticated, yet crucial for the successful performance. Essentially, magnetic tweezers consist of a copper wire coil wrapped around a cylindrical ferromagnetic core possessing a sharp tip. Moreover, the core should demonstrate a rectangular hysteresis, therefore confirming its capability for easier and less energy-consuming magnetization reversal. Currently, RE-TM-B alloys (RE - rare earth metals, TM - transition metals, B - Boron) are widespread in industrial machinery production and are generally characterized by a high values of the magnetic energy stored - a desirable property in magnetic tweezers development. For that reason ferromagnetic microwires with crystal α -Fe core and amorphous PrDyFeCoB shell (coating) became an object of our interest. Microwire samples with such structure were obtained using a melted drop extraction (MDE) method. During MDE, the end of PrDyFeCoB rod is subjected to a powerful electron beam. This local heating process creates a hanging melted alloy drop, which then falls onto a rapidly spinning water-cooled brass drum, thus fabricating a microwire with a crystal core and amorphous shell. The structure becomes more evident if we consider that core has a slower cooling rate and acquires enough time for crystal structure formation. It should be mentioned, that microwire diameters range and depend exactly on the brass drum's rotation speed. A specific difference in sample diameter establishes two distinct structures with single or multiple magnetic domains when microwire is subjected to external field. Magneto optical indicator films were relied on to visualize domains with opposite magnetization and to define the conditions of multidomain structure

emergence. Nevertheless single domain microwires are observed to be more reliable when manufacturing magnetic tweezers. To achieve better accuracy and efficiency it is required for the microwire tip to be sharpened. Thereby the property of the amorphous coating to dissolve into acid solution faster than crystal core was accommodated to conduct the sharpening process. In the end sharp and very fine microwire tip gains a concentrated magnetic force gradient, thus allowing it to capture and relocate alive cells marked with a magnetic bead. It is assumed that the act of attaching or detaching the cell can be reasonably controlled by applying the current to the copper coil around the microwire.

“The nesting of the Grey Heron (*Ardea cinerea*) on the territory of Vladimir region: its role and place in the forest ecosystems”

«Гнездование серой цапли (*Ardea cinerea*) на территории Владимирской области:
роль и место в лесных экосистемах»

Anzhelina Shmeleva

Faculty of Soil Science, Department of Soil Geography

Keywords: *Colonial nesting, forest ecosystems, Grey Heron, biocenoses transformation, spatial structure*

Birds nesting congregates formed by many wetland species particularly by Grey Herons are known to significantly affect their breeding habitat. Mechanical and geochemical pressure of nesting birds appears to be a serious challenge for the local ecosystem and often leads to a complete change of previously formed biocenosis [1, 3]. This research is aimed to study the resilience and transformation of forest ecosystems in conditions of colonial birds nesting on the example of the Grey Heron colonies on the territory of Vladimir region.

There are at least four annually functioning colonies of the Grey Heron known for the region located on different types of forests, the two of them (1), (2) have been observed by us annually since 2016 and the biggest one (3) – since 2018:

- The Glazovskaya colony (56.503450N, 40.479884E) – located on the middle-aged pine culture (*Pinus sylvestris*) near the Glazovskoye reservoir. Discovered in 2006 [5];
- The Mstyorskaya colony (56.361825N, 41.932533E) – on the coniferous-small-leaved woodland near Zarechny village. The nest trees are mainly *Pinus sylvestris*. Discovered in 2011 [5];
- The Kurilovskaya colony (56.076889N, 39.977806E) – on the small-leaved woodland near the two ponds of the Vorsha fish farm. The nest trees are mainly *Populus tremula*. Discovered in 2006 [2].

To define the colonies spatial structure digital maps were charted on the basis of distance and azimuth measurements between pre-marked nest trees using ColonMap and QGIS 3.6 software. The assessment of nest location in tree crowns was performed in accordance with our own classification which includes 18 disposition types. Soil analysis included the measurements of nitrate and ammonium nitrogen content, microbial biomass and numbers of its main functional groups [4]. The studied colonies have a complex dynamically changing through years spatial structure. The formation of subcolonies is often accompanied by their further fusion into a single form. The numbers of breeding pairs of the colonies are stable to the date and are about 80-100 pairs for the Glazovskaya, 150-160 pairs for the Mstyorskaya and 210-230 pairs for the Kurilovskaya colonies. The preliminary data of soil analysis showed the increase in nitrate nitrogen indices and a significantly higher number of microorganisms using ammonium and nitrate nitrogen, and especially cellulolytic organisms, on the territory of the Glazovskaya colony comparing to control areas [4]. Forest vegetation is being widely replaced by ruderal nitrophilous species in Glazovskaya and Mstyorskaya colonies. In the places of the highest concentrations of nests the complete disappearance of vegetation was noticed [6].

The obtained results are the basis for the further study of biocenotic changes on the territories of the colonies and modelling of succession processes. The data can be used in the annual monitoring of the Grey Heron number as the species is included in the Appendix of the Red book of Vladimir region [7].

References:

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Sectional presentations

Using brain-computer interfaces technologies for communication and rehabilitation: a new frontier for patients with aphasia

Использование технологий интерфейсов мозг-компьютер для коммуникации и реабилитации: новый рубеж для пациентов с афазией

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Keywords: aphasia; brain-computer interfaces; rehabilitation; evoked potentials, P300

Communication is a fundamental function that has a major impact on quality of life. Unfortunately, a variety of neurologic conditions can impair the ability to communicate verbally. Restoring communication in case of aphasia is a key challenge for neurotechnologies. Communication systems controlled directly by brain signals have started to be developed to overcome the problem of lost motor functions.

This concept has been pioneered by Farwell and Donchin who proposed a spelling device based on the evoked potential P300 [1], a method that has since been used successfully by patients to communicate [2]. The P300 signal is a type of event-related potential (ERP). Specifically, it is a positive deflection of brain activity which occurs about 300 ms after an odd stimulus presentation. The aim of our work was to study the ability of post-stroke patients with aphasia to acquire the BCI control skill.

A total of 10 subjects aged 43-57 years took part in the study. Identical stimulus conditions were used in all experimental series. A matrix of 36 cells was displayed on a computer screen, each cell containing a symbol (33 letters of the alphabet and three service commands). Participants were seated approximately 70 cm away from the screen. Stimuli consisted of flashes of the rows and columns of the symbol matrix of duration 180 msec with 100-msec intervals between the end of one flash and the beginning of the next. Each column and each row flashed 10 times in random order in each stimulus cycle. The goal for patients was to silently count flashes of target

cell (both in rows or columns) in order to copy-spell their own words. Finally, patients should be able to use the free-spelling mode such that they spelled without the experimenter knowing the target word. Participants were instructed to free-spell words that contained at least three letters.

This study showed a significant increase in the following indicators by the 10th day of training: the accuracy and speed of text input and the total number of letters entered during the session. An increase of the P300 amplitude across presentation modes was also found in all patients. We found that stroke patients diagnosed with mainly speech production deficits can successfully use a P300 based BCI after implementation of individualized adaptations and some training sessions.

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Ontogenetic basis for the formation of a variety of sympatric forms of charr *Salvelinus malma* from Lake Kronotskoe

ОНТОГЕНЕТИЧЕСКИЕ ОСНОВЫ ФОРМИРОВАНИЯ РАЗНООБРАЗИЯ СИМПАТРИЧЕСКИХ ФОРМ
МАЛЬМЫ *Salvelinus malma* озера Кроноцкое

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Keywords: *early development, ontogenesis, charr, geometric data analysis, heterochrony*

Charrs of the genus *Salvelinus* are a diverse group of fish and an important object of evolutionary and biological research. A bunch of endemic sympatric forms of charr *Salvelinus malma* inhabit Lake Kronotskoye (Russia, Kamchatka). The study of early

ontogenesis is of great importance for understanding the mechanisms of formation of these forms.

According to the accumulated literature data, sympatric forms of charr differ significantly in morphology, genetics, timing and place of spawning. However, it remains unclear at what stage of ontogenesis these differences are laid in these ecological forms. The task was set to investigate the early ontogenesis of charrs from the moment of hatching to the juvenile stage. Since mature individuals differ significantly in the proportions of the head, it was decided to investigate the early development of the jaw bones of the larvae. Several skull bones were selected for analysis. The main goal of this work is to highlight the presence or absence of heterochronies in the early development of charrs.

To conduct accurate ontogenetic studies samples of fertilized eggs from 3 of the most distinct ecological forms of charr (long-headed, white and nosed) were collected. In the course of the experiment, the fertilized eggs were incubated in the laboratory at temperatures simulating natural until the larvae hatched. According to the calculated formula, samples of larvae were taken on certain days. These samples were stained for bone and cartilage with specific dyes according to the method. The stained larvae were dissected and preparations were made.

A geometric data analysis of the shape of each bone has to be carried out. In addition, a comparison how the bone shape changes during ontogenesis within each ecological form has to be made. It is also necessary to make a pairwise comparison of the different groups with one another. Based on the data obtained, a covariance analysis and a principal component analysis have to be performed. In the case when there is a divergence of groups in different clusters, it can be concluded that heterochronies are present in the early development of these forms.

This work has a great fundamental importance. The results of this study can significantly change the modern understanding of the evolutionary origin of ecological forms, as well as the processes that cause sympatric morphogenesis.

Generating intrafusal muscle fibre in vitro: effect of gelatine and neuregulin-1 on C2C12 cell line differentiation

Создание интрафузальных мышечных волокон *in vitro*: Эффект желатина и неурегулина-1 на дифференцирование клеточной линии C2C12

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Keywords: *muscle physiology, stem cells, stretch reflex arc*

Proprioception is a crucial component of a skeletal muscle movement and impairment of proprioceptive feedback may lead to poor motor function and significantly affect quality of life. Proprioceptive feedback can be worsened due to various factors, such as ageing, peripheral nerve injury and post-surgical complications. Poor proprioception was also associated with Parkinson's disease, Huntington's disease, Autism, Multiple Sclerosis and Schizophrenia. Muscle spindles (MSs) provide information about spatial position of multiple body parts. Intrafusal fibres (IF) are proprioceptive fibres that constitute MS. The key to understand and control proprioception on a molecular level is to develop a suitable stretch reflex arc model in vitro. IFs are a key component of generating the proprioceptive signal to CNS and understanding the factors that induce their specialisation from progenitor cells during myogenesis is extremely important. C2C12 myoblast cell line demonstrate homogenic population, which makes it a great candidate for in vitro modelling of in vivo stretch reflex arc. However, these cells demonstrate enhanced cell detachment from an untreated cell culture surface after a short period of differentiation cycle resulting in formation of less mature multinucleated structures called myotubes. Cell culture surface modification with gelatine coating was associated with improved cell survival and therefore prolonged differentiation durability. Neuregulin-1 (NRG1) is an important epidermal growth factor (EGF) in MS development and was strongly correlated to enhancement of IF population during myogenesis. This study aimed to assess the effects of aforementioned factors on the IF development in C2C12 cell line via morphological analysis of the formed myotubes. A time course experiment was performed in order to assess the necessary growth phase duration of C2C12 cells prior to differentiation. Separately, the C2C12 myoblasts were grown on a plate, containing a gelatine coated (Attachment Factor (AF) group) and untreated groups. Furthermore, C2C12 cells were grown in a plate, containing NRG1

(NRG group) treated and untreated C2C12 myoblasts. The impact of time, gelatine and NRG1 treatment on C2C12 differentiation was assed using morphological analysis of formed IFs. The time course investigation revealed that C2C12 cells needed 6 days of growth phase in order to minimise the cell detachment. The gelatine experiment revealed surprising negative impact of AF coating on IF development in C2C12 cell line. NRG results demonstrated a potential positive impact of treating C2C12 cells with NRG1 on IF population.

Response of cancer cells to action of ribonuclease binase

ОТВЕТ ЗЛОКАЧЕСТВЕННЫХ КЛЕТОК НА ДЕЙСТВИЕ РИБОНУКЛЕАЗЫ БИНАЗЫ

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Keywords: *cancer, apoptosis, ribonuclease, binase*

According to the World Health Organization, cancer is the second leading cause of deaths in the world. Despite significant scientific and technological advances in the last years, this disease still lacks effective and safe treatment options. Accordingly, the search for new forms of therapy to battle malignancies is actively ongoing.

Many ribonucleases from different biological sources are known to have anticancer activity. An interesting representative of this class is binase, a bacterial ribonuclease that demonstrates high anticancer effect both *in vitro* and *in vivo*. Therefore, binase is considered to be an attractive candidate for the development of an anticancer drug.

In our laboratory, together with a few collaborating groups, it was shown that ribonucleolytic activity of binase is required for effective killing of cancer cells, and that expression of several oncogenes makes previously unresponsive cells sensitive to binase. However, the exact way in which binase selectively triggers apoptosis in cancer cells remains obscure.

One of the most plausible hypotheses incorporating and explaining the observed effects is that binase may trigger innate immune response by generating fragments of endogenous RNA that are recognized as non-self. In fact, the ability to activate the immune response was demonstrated for a few ribonucleases from the same enzymatic class as binase. At the same time, specific RNA ligands to the receptors necessary for ribonuclease-induced immune response were shown to harbor potent and selective anti-cancer activity. Consequently, if the same ability is true for binase, it can provide the long-sought explanation for its action.

In the present work, using standard techniques of biochemistry and molecular biology, the ability of binase to activate innate immune response and its importance for the action of binase will be investigated. The major marker of this response is the activation of expression of several cytokines. The induction of their expression will be investigated with real-time PCR and/or Enzyme-linked Immunosorbent Assay (ELISA). Since the expression of these proteins is not required for the associated induction of apoptosis, RNA-interference will be used to silence critical components of this pathway and investigate the resulting change in the efficacy of binase.

Ribonuclease binase is a promising anti-cancer agent. Revealing the precise mechanism of its action will allow to design modifications that further enhance its properties and counter possible side effects. In the end, binase in combination with other medicaments might provide an effective option for treating previously resistant types of cancer.

Effect of ouabain and marinobufagenin on the proteome of human umbilical vein endothelial cells

Влияние уабаина и маринобуфагенина на протеом клеток эндотелия пупочной
вены человека

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Keywords: *HUVEC*, *CTS*, *Na-K-ATPase*, *ouabain*, *marinobufagenin*, *proteomics*

All animal cells contain Na-K-ATPase, which is a membrane enzyme maintaining transmembrane potential. Another crucial function of the protein is to initiate signal cascades via binding with cardiotonic steroids (CTS). CTS are specific inhibitors of Na-K-ATPase which are detected in mammalian blood. There are different Na-K-ATPase isoforms in various tissues, which have different constant of binding with CTS.

Recently, some research groups have shown existence of endogenous CTS in human body, specifically ouabain and marinobufagenin, therefore they have suggested that CTS are mammalian hormones. There are few data on the mechanism of CTS action, but some studies indicate that the targets of CTS are kidney, brain, blood vessels and heart. The role of the compounds in the development of essential hypertension is of particular interest.

The aim of the study is to investigate mechanisms of CTS action on human umbilical vein endothelial cells (HUVEC). The influence of ouabain and marinobufagenin on sodium and potassium concentration in HUVEC was measured by atomic-absorption spectroscopy. Then, the effect of these compounds to cell viability was estimated by Alamar-Blue test and toxicology kit LDH based. After all, the proteomic analysis of HUVEC treated with ouabain and marinobufagenin was conducted by liquid chromatography - mass spectrometry.

Treatment of HUVEC with physiological concentrations of ouabain (0,3 nM) and marinobufagenin (30 nM) enhances Na-K-ATPase activity. Moreover, these concentrations cause increasing abundance of proteins involved in proliferation process. In the same time, higher concentrations of the CTS lead to inhibition of Na-K-ATPase, cell viability decrease and rising abundance of proteins providing cell response to stress, particularly, it concerns the endothelin-converting enzyme, which is known to play a significant role in the regulation of blood pressure.

Our results show that physiological concentrations of ouabain and marinobufagenin may stimulate proliferation of endothelial cells, through increasing Na-K-ATPase activity, which is important for blood vessels regeneration and angiogenesis, but dysregulation of CTS concentration induces inhibition of the enzyme, which, in turn, leads to decline of endothelium viability. In response, the endothelial cells express defensive proteins, that may cause blood pressure changing. Thus, CTS can be considered as potential targets for the treatment of essential hypertension and other cardiovascular diseases.

Cross reactive, microbiota-derived monoclonal IgA antibodies bind to the brain antigens and ameliorate LPS-induced acute systemic inflammation

Кросс-реактивные моноклональные IgA против микробиоты связывают антигены в мозг и уменьшают тяжесть ЛПС-индуцированного острого системного воспаления

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Keywords: *immunoglobulin A (IgA), natural antibodies, inflammation, microbiota, guts, brain*

Interactions between immune system and intestinal microbiota contribute significantly to the maintenance of body homeostasis [1]. Immunoglobulin A (IgA) is the main secretive antibody that controls the composition and diversity of the commensal microbiota [2], [3]. It is produced by residual intestinal IgA⁺ plasma cells (IgA⁺ PC) in response to microbial antigens in the lumen [1]. Microbiota contains about 10¹⁴ microorganisms, so the diversity of specific antigens is broad [4]. Given this great diversity, host antigens may have similar structures to microbiota antigens and result in cross-reactivity [2], [5]. Interactions between intestinal IgA and cross-reactive host antigens reflect host-microbiota interconnections in physiological and pathological conditions. This statement is confirmed by numerous studies, which evaluated IgA antibodies contributions to metabolic disorders [6], [7], inflammatory diseases [8], oncology [9], neuropsychiatric pathologies [10], [11], [12]. In this case, investigation of specificity, cross-reactivity and physiological functions of naturally produced intestinal IgA is crucial for fundamental understanding of host/microbiota interactions and for clinical implications.

To investigate the biological role of various intestinal IgA we generated hybridoma cell lines from isolated mouse IgA⁺ PC producing monoclonal antibodies with various specificities. Cell line producing monoclonal IgA named h7B10 is one of the most studied by this stage of project. In initial investigations *in vitro* we discovered autoreactivity between h7B10 and mice brain antigens by western blot analysis, which

was further confirmed by immunohistochemical staining of brain tissue. Next, biological significance of h7B10 *in vivo* was evaluated. To do so, we first depleted J-chain, which is necessary for the secretion of IgA antibodies into the lumen [13]. Strikingly, h7B10E3 subclone, but not h7B10, prevented temperature drop in lipopolysaccharide (LPS)-induced acute systemic inflammatory response syndrome (SIRS). Also, h7B10E3 diminished levels of pro-inflammatory cytokines tumor necrosis factor (TNF) and interleukin-6 (IL-6) in sera after LPS administration.

In conclusion we can state that one the various IgA antibodies from intestines has significant biological activity confirmed *in vitro* and *in vivo*. Since TNF and IL-6 are one the key players in sepsis and other SIRS [14], [15], our findings may be useful for clinical applications. However, microbiota antigens specific to h7B10, its cross-reactivity to other organs and biological significance require further investigation.

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Transcriptomics, Nanopore sequencing, plant ontogenesis, *Physcomitrium (Physcomitrella) patens*

Изучение транскриптома модельного растения *Physcomitrium patens* с использованием прямого секвенирования РНК

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Keywords: *transcriptomics, nanopore sequencing, plant ontogenesis, Physcomitrium (Physcomitrella) patens*

Nowadays, the only way to sequence RNA directly is nanopore sequencing (Oxford Nanopore Technologies). It is a long-read fragmentation and PCR free sequencing technology, which makes alignment and quantification easier. Sequencing RNA directly also gives information on nucleotide modifications and poly(A) tail lengths. Two articles on *Arabidopsis thaliana* direct RNA sequencing published in 2020 revealed the role of RNA methylation in the circadian clock in plants and described thousands of new gene isoforms.

This study aimed to find plant transcriptome changes at different stages of ontogenesis. Moss *Physcomitrium patens* was used as a plant with simple morphology and a well-studied small genome. Moss transcriptome of the two main developmental stages, protonemata and gametophores, was sequenced.

Protonemata were sequenced in 3 biological replicates and gametophores in 4 biological replicates to reach similar library size. Total RNA was isolated using TRIzol™ Reagent and purified with a Poly(A)Purist™-MAG Purification Kit. The Direct RNA sequencing kit by Oxford Nanopore (SQK-RNA002), FLO-MIN106 (ONT R9.4) flow cells, MinION platform and standard MinKNOW software were used for sequencing. Reads were basecalled with Guppy 4.0.15 (Oxford Nanopore Technologies) software. MinIONQC.R script, Samtools, Bedtools, Minimap2, DESeq2, Nanopolish, NanoCompore, NanoTail, Stringtie were used for the bioinformatics analysis. The full pipeline is available on https://github.com/Liverworks/moss_nanopore.

About 4 million reads with mean quality score 10 were sequenced in each state. More than 92% of reads aligned to the moss genome. Expression was observed in 8000 loci, 800 of them were novel. Up to 70 000 isoforms were found, 36% of them confirm known isoforms. Most of the known genes are protein-coding, but an expression of 3.5 thousand long non-coding RNAs was proved. LncRNAs showed significantly lower expression levels than protein-coding genes.

Differential expression analysis showed that protonema and gametophore transcriptomes are dramatically different (91% of the variation in PCA). Genes associated with translation and ribosomal proteins are actively expressed in protonemata, while transcriptional factors are specific for gametophores.

Poly(A) tail length was estimated in 17 thousand transcripts with high expression, 2 thousand of them showed a significant difference between the two states. The poly(A) tails were longer in gametophores for 1900 of them. The length of the poly(A) tail and expression negatively correlated ($\rho=-0.205$, $p=0.0$).

In conclusion, nanopore sequencing is a powerful method for RNA research as it allows one to study various aspects of the transcriptome.

This work was supported by the Russian Science Foundation (project no. 17-14-01189).

Liquid biopsy in diagnosis of bladder cancer: a pilot study

Жидкая биопсия в диагностике рака мочевого пузыря: пилотное исследование

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Keywords: *bladder cancer, genetics, liquid biopsy, hot-spot mutations*

Bladder cancer is the 13th most common oncological cause of death world-wide [1]. Although cystoscopy is considered as the gold standard for the detection of this type of cancer, it is not able to achieve 100% accuracy [2]. Its invasive nature and costliness are the other reasons which highlight the need for the development of new techniques for the diagnosis of bladder cancer. It is known that tumor-specific DNA is secreted into surroundings and in case of bladder cancer into the cavity of this organ along with some malignant cell which are directly exfoliated from the tumor surface [3]. Thus, the aim of the present pilot study was to evaluate the diagnostic potential of urine liquid biopsy in patients with bladder cancer.

The pilot study included 26 patients with histologically proven bladder cancer (oncology group), 15 patients with no signs of urinary disease (control group), and 9 patients with recent transurethral malignancy resection (“second look” group). Genetic material was isolated from 4 mL of whole urine using QIAamp Circulating Nucleic Acid Kit (Qiagen, Germany). DNA was analyzed through digital droplet polymerase chain reaction using a QX200 System (Bio-Rad, USA). 2 most common hot-spot mutations of telomerase reverse transcriptase gene (TERT C228T and C250T) were selected as tumor-specific markers.

The analysis of oncology and control groups revealed that TERT C228T and C250T based urine liquid biopsy has a 58% sensitivity and 100% specificity leading to 72% overall accuracy. The positive and negative predictive values were 100% and 56%, respectively. The area under the receiver operating characteristic curve was 0,79 which highlights the substantial diagnostic power of urine liquid biopsy. The analysis of the “second look” group revealed that 4 out of 9 patients were positive for either TERT

C228T or C250T mutation, which is a sign of possible bladder cancer recurrence which is undetectable by routine cystoscopy.

Urine liquid biopsy provides great diagnostic potential. Due to the promising results of the pilot study we plan to extend the hot-spot mutations panel and to recruit more patients with bladder cancer to obtain confident data about clinical significance of urine liquid biopsy.

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IR family receptors used as chemogenetic instrument

Рецепторы семейства IR как инструменты хемогенетики

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Keywords: *chemogenetics, neuron, receptor, photo-activated*

Chemogenetics is a novel rapidly growing bundle of techniques providing modern biology with a set of tools targeted at the cell metabolism manipulation in cell cultures, tissues, organ slices or intact transgenic animals. Being represented mainly by the genetically encoded receptors of various origins, chemogenetic tools respond to their specific activators called ligands. Such activation typically results in either recruiting of cellular metabolic pathways via G-protein release or opening an ion-channel, both leading to changes in the cell membrane voltage in neurons, cardiomyocytes or other cell types. The IR-family does not belong to G-protein coupled receptors (GPCR) group,

therefore is incapable of causing barely-predictable metabolic responses; instead, expressed as homodimers of the constitutive IR8a and diverse variable subunits, IR family receptors form a non-selective cation channel permeable to K⁺, Na⁺ and to a lesser degree to Ca²⁺ ions; the caused cation current may lead to neuronal action potential firing.

An efficient co-expression of the constitutive IR8a subunit paired with IR64a, IR75a or IR84a, the variable subunits activated with different acidic ligands, was reached in mammalian cells via the self-cleaving peptides usage; the vector also contained the synthetic pCAG promoter suitable for mammalian neural expression and the red fluorescent marker tdTomato for positive cells selection. In order to assemble the vector, AQUA-cloning *in-vivo* recombination was used; the self-cleaving peptides T2A and P2A were included into the primer sequences and cloned in between the subunits and downstream the variable subunit to allow independent expression of both and tdTomato. All the three vectors carrying the different variable subunit coupled with IR8a originated from one carrying only IR8a, that was also assembled using the AQUA-cloning procedure in the TOP10 E.coli strain during the previous cloning step. HEK293 and murine neural cells were considered suitable for testing the constructs using patch-clamp; the murine neuron cell cultures were prepared from murine embryos frontal lobes, cleaned off integumentary tissue.

Eventually, after cell transfection and examining the obtained transgenic HEK293 and primary neural cultures for bacterial or fungal contamination, the ligand sensitivity of nucleofected cells was tested: the cells demonstrated sufficient response if transfected with IR8a IR64a homodimer - the examination approved the previously shown low-selective acid sensitivity increasing the neuronal cell membrane potential. The same response yet not strong enough to cause the action potential firing was recorded with photoactivatable proton-donors, making IR8aIR64a heterodimer a potential base for a novel photo-chemogenetic cell membrane potential manipulation technology.

New steroidal imidazopyridines: synthesis and evaluation of antiproliferative effects

Синтез и оценка антипролиферативных эффектов новых стероидных
имидазопиридинов

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Keywords: breast cancer, estrogen receptor alpha, steroidal imidazopyridine, antiproliferative effect

Breast cancer accounts for 25% of all types of malignant tumors in women and is hormone-dependent in 70% of cases. Heterocyclic derivatives of steroids, including those bearing imidazo[1,2-a]pyridines pendants, are synthetic modulators of steroid receptors and enzymes of steroid metabolism. Previously we described synthesis and antiproliferative activity evaluation against hormone-dependent cancer cell lines of novel steroidal imidazoheterocyclic derivatives [1]. Moreover, steroids C17-modified with heterocycles, abiraterone and galeterone, showed high efficacy in prostate cancer [2].

Hormone-dependent MCF-7 breast cancer cells were received from the American Type Culture Collection (ATCC). Immunoblotting and MTT test were used to evaluate the activity of the compounds.

Antitumor effects of new compounds have been evaluated on MCF-7 breast cancer cells, which are characterized by high expression of estrogen receptor alpha (ER α /ESR1). 17-(Imidazo[1,2-a]pyridine-6-carboxylate)-3 β -acetoxy-21-bromopregn-5,16-dien-20-one (compound 1) showed significant antiproliferative effects on MCF-7 cells and was chosen as a leader. The half-maximal inhibitory concentration (IC₅₀) of compound 1 was 0,1 μ M. Antitumor activity of compound 1 was 80 and 50 times higher than the activity of cisplatin and tamoxifen (the reference drugs), respectively. The SwissTargetPrediction database was used to search for potential protein targets of small molecules [3], [4]. Probable molecular targets of new steroidal imidazopyridines are enzymes of steroid metabolism and nuclear receptors. Influence of submicromolar concentrations of compound 1 on ER α expression was demonstrated using immunoblotting. Apoptosis was detected by PARP degradation and demonstrated in cell incubation with steroid 1 at a concentration of 0,125 μ M or more.

The inhibitory effect of steroidal imidazopyridines on hormone-dependent MCF-7 breast cancer cells growth was demonstrated. ER α -mediated signaling pathway is considered as one of the targets for this class of compounds. Compound 1 showed submicromolar activity and was chosen as a leader for further experiments. Funding: the study was financially supported by the Russian Foundation for Basic Research, project 18-29-09017 (ER α signaling).

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Methods of preservation of tropical micromycetes

Методы хранения тропических микроскопических грибов

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Keywords: *fungi preservation, cryopreservation, conservation, culture collections*

Fungi play significant roles in the biosphere and human life. They participate in soil formation and organic matter decomposition, cause diseases of plants, animals and humans and enter into mutualistic relationships. Furthermore, certificated fungal strains with concrete features and genome are important for many spheres of activity, for instance, food industry, biotechnological or scientific research. Thus culture collections are required for biodiversity maintaining, manufacturing, scientific and medical research. These areas demand an increase in the volume and quality of collections, which directly depend on improvement and optimization of the storage methods. Tropical species may have specific characteristics that require special storage approaches.

The present study is aimed at selection of the most optimal methods and conditions for storage of tropical micromycetes. Further methods of preservation were used:

- cryoconservation (-80°C) within 5%, 10%, 20%, 30% and 50% glycerol solution, additionally in 20% and 50% solutions with Tween;
- storage in distilled water at 4 and 20°C;
- drying on cellulose, silica gel and soil.

To assess the methods and their variations we checked the quantity of viable colony forming units before and after the storage.

As a result of the work, 118 cultures of tropical micromycetes from the collection of the Department of Mycology and Algology were selected and characterized. The database of the Department collection (4060 strains) was updated and taxonomic statistics were compiled. To assess and compare the methods, we introduced a universal 3-point scale.

In cryoconservation 20% and 30% glycerol solutions were optimal for the majority of cultures, furthermore, Tween addition had a positive effect. *Cochliobolus geniculatus* cultures originating from different climatic zones required diverse saturation of cryoprotector – strain from the temperate climate stored better in solutions with lower glycerol concentration. According to the statistical analysis, no reliable differences in preserving in distilled water at 4 and 20°C were evident in the present study. The best substratum for drying was soil and the worse was cellulose.

Summarizing, the survival rate and quality of the strains are the highest when stored in soil and at –80°C and are minimal when stored in a dried state on cellulose. The difference in the physiological characteristics of the cultures of *Cochliobolus geniculatus* from the tropical and temperate zones necessitates the selection of individual storage variations. The results of this work may be used to improve the quality of culture collections and thus all the industries using their strains.

Myosin II in focal adhesion regulation in cancer cells

Роль миозина II в регуляции фокальных контактов в раковых клетках

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Keywords: *myosin II, focal adhesions, cancer cell migration*

Adhesion and migration provide many crucial processes as cell division and differentiation. These processes are mediated by focal adhesions (FAs). Dysregulation of normal FAs dynamics results in invasion and metastasis. FAs are supramolecular complexes which link actin cytoskeleton to extracellular matrix and provide cell response to the external signals [1]. FAs formation and growth should be considered as the actomyosin contraction result. It has been previously shown that ROCK and MLCK kinases mediate activating phosphorylation of non-muscle myosin II [2]. Thus, the main attention in research is payed to identification the essential role of myosin II kinases in FAs turnover and cancer cell migration.

For the FAs visualization A549 cells (human lung carcinoma) were transfected with the vinculin-RFP construct. To study contribution of each kinase in FAs' dynamics and migratory potential of A549 cells inhibitory analysis was used. Control and treated cells (1-hour incubation with 10 μ M Y-27632 or 10 μ M ML-7) were captured in the time-lapse. FA's lifetime, area (one frame from time-lapse sequence), speed and efficiency of migration were calculated.

The majority (about 80%) of dynamic FAs was localized at the cell periphery. The FA lifetime median was 50 min (range 10-235 min, n=100). After ROCK inhibition, median of FA lifetime increased up to 75.2 min (15-180, n=50), $p < 0.0001$. MLCK inhibition led to the same effect: median was 70 min (15-270, n=50), $p < 0.0001$. The FAs area median for A549 control cells was 0.77 μm^2 (0.15-7.71 μm^2 , n=472). After 30 min of incubation with Y-27632 FAs were twice as small, median was 0.45 μm^2 (0.03-4.25, n=476), $p < 0.0001$, ML-7 also affected FAs area reduction at the cell edge: 0.28 μm^2 (0.06-4.59, n=372), $p < 0.0001$. Importantly, both inhibitors dramatically decreased the efficiency of A549 cells migration (medians were 0.41 (0.10-0.61), 0.32 (0.054-0.37) and 0.24 (0.19-0.46) for control, Y-27632 and ML-7 respectively). At the same time, Y-27632 and ML-7 had an opposite effect on the path length, when speed change was not significant.

In general, myosin II is found to be as crucial for the FAs' lifetime and area as for the cell migration efficiency. The obtained data reveal the differences between the effects of the two inhibitors and suggest the presence of independent FAs' regulatory mechanisms for cancer cells. Moreover, our findings refute the canonical assumption that myosin II phosphorylation depends on its localization: both MLCK and ROCK kinases are able to regulate FA dynamics at the cell edge.

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Comparative analysis of taxonomic diversity in *Microgecko* Nikolsky, 1907 (Squamata, Gekkonidae)

Сравнительный анализ таксономического разнообразия гекконов рода
Microgecko Nikolsky, 1907 (Squamata, Gekkonidae)

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Keywords: *Gekkonidae*, *Middle East*, *mitochondrial DNA*, *morphology*, *taxonomy*

The genus *Microgecko* belongs to a complex and poorly studied group of Palearctic geckos of the Gekkonidae family. According to various sources, this genus includes up to eight species that live on the territory of the mountain systems in Iraq, Iran, Pakistan, and India. However, a limited set of external diagnostic features used for the identification of taxa of this group does not allow to reliably resolve the phylogenetic relationships on the intraspecific and species level. Therefore, the aim of the present study was to unravel the taxonomy of this group by applying an integrative approach based on the information from three independent sources: morphology, acoustic traits, and mitochondrial DNA (the cytochrome c oxidase gene). For morphological characteristics, 70 specimens of three Iranian species were studied; the molecular genetic analysis included 17 samples of six *Microgecko* taxa.

Based on the results of the analysis of standard morphometric measurements and pholidosis features (14 morphometric and 11 meristic characters), the diagnoses of each studied taxa of *Microgecko* and their limits of morphological variability were clarified. In addition, the study of acoustic communication of the geckos revealed the interspecific traits and some level of conservatism in their signals, which allows us to use them as a diagnostic feature of the *Microgecko* species. The preliminary analysis of the COI gene did not confirm the monophyly of the species *M. persicus*, represented by three unrelated lineages corresponding to the subspecies *M. p. persicus*, *M. p. euphorbiacola*, and *M. p. bakhtiari*. Furthermore, the phylogenetic analysis revealed at least three distinct evolutionary lineages of *M. latifi*, two of which probably belong to new taxa and require formal taxonomic descriptions. Within the clade of *M. helenae*, there are two independently evolving lineages whose divergence level corresponds to the species level, although these new taxa are nearly indistinguishable morphologically.

Thus, this detailed analysis provides a better understanding of diversity patterns of the genus *Microgecko*, new insights into the phylogeny of its species, and new possibilities to describe new taxa of these geckos. Moreover, the results of the present study stress the importance of unique mountain ranges as a hot spot of herpetological biodiversity in Asia.

CYP450 9e2 and odorant receptor expression in black garden ant *Lasius niger* under conditions with different anthropogenic load

Изучение экспрессии цитохромов p450 и обонятельных рецепторов у черного садового муравья *Lasius niger* в условиях с различной антропогенной нагрузкой

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Keywords: *Lasius niger*, urban environment, cytochrome P450, detoxification

Black garden ant *Lasius niger* is a well-studied and wide spread species, it dominates ant communities in many European cities and often is better represented in urban areas than in undisturbed natural habitats. Moreover, its genome has been recently published, allowing to make assumptions about the biological success of *L. niger* in urbanized habitats. According to previous studies, cytochrome P450 genes of the family 9e2 (CYP9E2) are amplified in the genome. This cytochrome family is involved in the detoxification of various xenobiotics, including myco- and phytotoxins. In addition, *L. niger* has a smaller number of olfactory receptor genes (OR) compared to other insects. The aim of the research was to discover how the expression levels of CYP9E2 and OR correlate with the ability to live in urbanized habitats.

For the experiment standard methods of RNA extraction, cDNA synthesis and real-time PCR were used. The ants were collected within the Moscow limits and in the suburbs during this and previous summer. In Moscow the ants were collected under the curb neighbouring the industrial area, whereas the suburban ants were collected in the fields. Expression levels of CYP9E2, OR and two housekeeping genes were studied, the RNA of the frozen ants was extracted via standard phenol-chloroform extraction. Further, the

samples were diluted and treated with DNase to get rid of the genomic DNA. Then the cDNA was synthesized using the sample's RNA. Finally, the expression rates were shown by the real-time PCR.

The experiment suggested that expression levels of CYP9E2 in black garden ant differ from the ones of OR genes, and thus may correlate with the number of gene copies found in the genome. To test this, the expression levels were studied in ants collected in various polluted sites in Moscow and in clean areas out of the city. Further, in the last part of the research, published transcriptomes of different ant species and the CYP9E2 protein modelling will be analysed.

In conclusion, the results provide that CYP9E2 are overexpressed in *L. niger*, indicating their importance in metabolism of xenobiotics, whereas OR are expressed inconstantly, but when occurred, the expression is very low, which may reflect an insignificant role of smell for this species or the adaptation to the intense odor habitats. Moreover, city populations show higher expression levels than the suburban ones. The results contribute to the understanding why *L. niger* is so widely spread in urbanized habitats.

**Maternal behavior and mother-infant relationships in northern fur seal,
*Callorhinus ursinus***

Материнское поведение и отношения мать-детёныш у северного морского котика, *Callorhinus ursinus*

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Keywords: *maternal behavior, eared seals, Callorhinus ursinus*

The research of the mammalian maternal behavior is one of the most interesting and important areas of knowledge in zoology. Not only are the common features of all Mammalian species (including humans) interesting, but also the specific of different species, groups and orders.

The study focuses on the maternal behavior of the Northern fur seal. The Northern seal is one of the two species of eared seals that live on the territory of Russia. It is pelagic and migrates widely from its breeding grounds. This species is included in the international red book and lives in the north of the Pacific ocean, in the Bering sea, the Sea of Okhotsk and the Sea of Japan. The Northern fur seal spends most of its annual cycle in the water. The ground period is short – from three to five months.

In the 20th century, the biology of this species was intensively studied in the USSR. Currently, there are almost no scientific and environmental programs dealing with this species in Russia. The maternal behavior of the Northern fur seal has hardly been studied.

However, this species has very interesting features that distinguish it from other representatives of eared seals. It is important to conduct a detailed quantitative study that will allow us to compare two species living in Russia in the future.

The purpose of the research is to identify environmental and social factors that determine the way of maternal behavior and mother-infant relationships in the Northern fur seal. We shall describe and compare the birth behavior of different females, describe and analyze the first interaction of mother and cub, analyze the styles of maternal behavior, describe the process of development of cubs, collect data on the duration of the postpartum period, study the mode of stay in the sea and on the shore in nursing females, the process of meeting mother and cub after feeding trips, identify the role of "kindergartens", the significance of the age of the mother and conduct a comparative analysis of the features of the eared seals.

Field studies are planned on the Northern Rookery of Bering Island in 2021 and 2022. An important point in our research is the individual identification of animals. We shall determine the age of females by the method of Nikulin and Lisitsina, and individual identification of females will be carried out by photo and video registration.
