



STULECIE KOŁA NAUKOWEGO
PRZYRODNIKÓW UAM



UNIwersytet
IM. ADAMA MICKIEWICZA
W POZNANIU

INTERNATIONAL CONFERENCE OF THE CENTENARY OF NATURAL SCIENCES CLUB AMU

ABSTRACT BOOK
19-21 NOVEMBER 2021



Patrynat Honorowy
REKTORA UNIwersytetu
IM. ADAMA MICKIEWICZA
W POZNANIU

Dziekan
Wydziału Biologii Uniwersytetu
im. Adama Mickiewicza
w Poznaniu

Scientific Committee:

Chair - prof. dr hab. Jan Holeksa

prof. UAM dr Agnieszka Knopik-Skrocka

prof. dr hab. Marlena Lembicz

prof. UAM dr hab. Agnieszka Ludwików

prof. UAM dr hab. Grażyna Liczbińska

dr hab. Bartłomiej Gołdyn

Organizing Committee:

The president of the organizing committee - Katarzyna Hubert

The vice president of the organizing committee - Kamil Kisiel

The vice president of the organizing committee - Michalina Krakowiak

The vice president of the organizing committee - Mariola Majewska

The secretary of the organizing committee - Michał Zacharysiewicz

IT Services

mgr Tomasz Bielecki

mgr Maciej Osowiecki

Introduction

The International Conference of Centenary of Natural Sciences Club of Adam Mickiewicz University in Poznań, Poland takes place on November 19-21, 2021. The Conference is the major event of the Centenary of NSC AMU and allows bachelor, master, and Ph.D. students to present the scientific results and exchange both ideas and experience.

The first day of the conference is held in Polish. The Official Opening and History Session are held on the Faculty of Biology of Adam Mickiewicz University in Poznań. The Scientific Sessions: both Oral and Poster, are performed on the Teams platform.

The Natural Sciences Club was founded in 1921. For 100 years, the organization has been grown. The specific structure of NSC allows constant development. NSC is divided into Sections directed by the students. NSC Members perform experiments, present their results at conferences and in scientific articles. The professional level of the research is provided by the scientists of the Faculty of Biology AMU. This cooperation results in the great success of the NSC.

PART I
SPEECH SESSION

Not entirely mysterious folding of an active retrotransposon RNA genome in the cell

Angelika Andrzejewska-Romanowska¹, Małgorzata Zawadzka¹, Julita Gumna¹,

David Garfinkel², Katarzyna Pachulska-Wieczorek^{1*}

¹Polish Academy of Sciences, Institute of Bioorganic Chemistry, Department of Structure and Function of Retrotransposons, Poznan, Poland

²University of Georgia, Department of Biochemistry and Molecular Biology, Athens, GA, USA

*e-mail: kasiapw@ibch.poznan.pl

Keywords: *in vivo* RNA secondary structure, Ty1, LTR-retrotransposons, translation

Long-terminal repeat (LTR)-retrotransposons are mobile genetic elements that comprise a significant fraction of many eukaryotic genomes. Similar to other RNA viruses, they possess a compact RNA genome that encodes information required for replication and interacts with host cell machinery. However, they lack a gene required for infectivity. The Ty1 retrotransposon is the most abundant mobile genetic element in the *Saccharomyces cerevisiae* reference strain and is a widely used research model. Like other LTR-retrotransposons, Ty1 replicates via an RNA intermediate and inserts their double-stranded DNA copy into the host genome. The Ty1 genomic RNA (gRNA) serves as a template for proteins synthesis as well as RNA genome, which is packed into virus-like particles (VLPs) and reverse transcribed.

To better understand the function and replication of LTR-retroelements, it is important to examine the structure of their RNA genomes in the cellular environment. Here, we present the first genome-wide RNA secondary structure model for an active LTR-retrotransposon in living cells. Using selective 2'-hydroxyl acylation analyzed by primer extension (SHAPE), we explored the secondary structure of the yeast Ty1 retrotransposon gRNA in its native *in vivo* state and under *in vitro* conditions (5.6 kb). We found that *in vivo* Ty1 gRNA structure is significantly remodeled and strongly destabilized in the cell than under *in vitro* conditions. Nevertheless, it still contains well-structured regions harboring functional *cis*-sequences. Our results suggest that RNA-RNA interactions critical for retrotransposition, such as gRNA dimerization, cyclization and tRNA annealing, occur in the cytoplasm before packaging into VLPs. Moreover, SHAPE experiments in cells inhibited for translation revealed that active ribosomes strongly contribute to the unfolding and remodeling of Ty1 gRNA structure in yeast. Our findings support the dual role of Ty1 gRNA as a template for translation and reverse transcription in the retrotransposition process. In addition, our study increases understanding of multifunctional RNA genomes folding in living cells and helps explain the interplay between translation and RNA structure.

This study was supported by the National Science Centre, Poland (project no 2016/22/E/NZ3/00426).

Viral Diseases of the Honey Bee (*Apis Mellifera*)

Mikołaj Mieszko Charchuta^{1}, Jakub Barylski²*

¹*Adam Mickiewicz University, Faculty of Biology, Natural Sciences Club, Section of Virology and Molecular Biotechnology*

²*Department of Molecular Virology, Institute of Experimental Biology, Faculty of Biology, Adama Mickiewicz University in Poznań, Poland*

**e-mail: mikcha1@st.amu.edu.pl*

Keywords: Bees, virsuses, chelidonium majus, animal epidemics

Bees supply us with many a products intended for the human consumption. Available data suggest, that these valuable insects suffer from the significant pressure connected with viral disease. The problem is aggravated by the prevalence of the honey bee's greatest foe – *Varroa destructor*. This mite's feeding strategy makes it a perfect viral vector. Combating it is crucial to reducing viral loads as a whole. Main strategy is using miticides, these however have significant drawbacks (accumulating in wax, reducing queen fertility).

A promising solution dwells in plant extracts. Many an essential oil have been shown to reduce the mite's population in a hive thus successfully alleviating the burden of viral diseases. Antiviral activity of *Chelidonium majus* has been previously described, but its influence on *V. destructor* remained largely unknown. For the past two years I studied this influence in my apiary. The preliminary results show a significant decrease in *V. destructor* loads. though further research ought to be conducted.

Is there any artificial light that is neutral to the behavior of freshwater invertebrates?

Anna Czerepska, Agata Owczarz*

Adam Mickiewicz University, Faculty of Biology, Sekcja Badań Podwodnych UAM

**e-mail: anncze7@st.amu.edu.pl*

Keywords: Daphnia magna, LED light, light pollution, behavior

Technological progress causes that, with time, new factors of anthropogenic origin emerge. The influence on aquatic ecosystems of these factors is still unknown, or not fully studied. Installations that emit LED light which are increasingly being installed in the immediate vicinity of water bodies can serve as a proper example. Artificial light sources situated near water bodies influence the interactions between organisms by, among other things, changing their behavior. It is known that zooplankton moving towards an artificial light source becomes an easy prey for predatory fish.

The aim of our study was to see if there is a light color that would be neutral for the behavior of freshwater invertebrates. We used *Daphnia magna*, which can be commonly found in Poland, in our studies. The experiment involved the insertion of *Daphnia magna* to a plexiglass tube that imitated a water column. This allowed us to simulate how the vertical movement of *Daphnia magna* would change in response to the light. RGB LED strips were attached to the tube. Behavior was studied for red, blue, green and a mixture of these three colors, i. e. white light. The control sample was a procedure conducted in the dark to see how the test species behave under conditions undisturbed by artificial lighting. Daphnids behavior, specifically their position in the water column, was recorded under conditions of incident light from above or below. The preliminary results of our study do not clearly indicate a completely neutral color for *Daphnia magna*, however, red and green light had the least effect on the behavior of the species.

Scuba diving: valuable tool for management of underwater invasive plants

Mateusz Draga, Maciej Gąbka*

Adam Mickiewicz University in Poznań, Faculty of Biology, Department of Hydrobiology

**e-mail: matdra@amu.edu.pl*

Keywords: invasive species, Elodea nuttallii, macrophytes, aquatic plant, freshwater

Invasive aquatic plants remain one of the major reasons for biodiversity losses in freshwater ecosystems around the globe. They also present a serious threat for industrial, navigational and recreational use of water bodies, which may generate costs in millions of euro annually. Thus, it is not surprising that finding effective ways to deal with such aquatic plants is regarded as of great importance.

During this summer both authors took part in a project whose goal is establishing safe and effective methods of management invasive aquatic plants, such as *Elodea nuttallii*. Four different techniques were tested, and three of them involved the use of scuba divers. Additionally, further evaluation of effect for each method as well as environmental monitoring were also performed with the use of diving.

Scuba diving not only allowed carrying out complicated underwater tasks successfully, but its use in monitoring also gave researches unique insight into the effectiveness of each method. Most importantly, methods which involved diving proved to be successful and some of them could possibly be even used in protected aquatic environments.

Effects of nicotine on neurodegenerative processes in a model of Alzheimer's disease in *Drosophila melanogaster* lineage Appl^d.

*Klaudia Kuzdrowska**, *Michalina Gadomska*, *Anetta Lewandowska-Wosik*, *Ewa Chudzińska*

Adam Mickiewicz University, Faculty of Biology, Department of Genetics

**e-mail: klakuz@st.amu.edu.pl*

Keywords: Drosophila melanogaster, Alzheimer's disease, nicotine, climbing assay, comet assay

Alzheimer's disease (AD) is a progressive, degenerative disease of the central nervous system characterized by worsening of synaptic transmission and the death of neurons. Among other things, amyloid plaques are formed in the brain because of the abnormal accumulation of toxic peptides, including β -amyloid (A β).

Drosophila is widely used in AD research because it presents the same markers of the disease like those in humans (Tau, A β), which are known for creating phenotypes as neuronal death, cognitive decline, and locomotor disorders.

Nicotine is a commonly used compound in the tobacco industry which is one of the largest in the world and it is linked to addiction. There is a reason why it has been widely studied in terms of its effects on the human body, including the nervous system. Animal models provide a useful tool for examining neurodegenerative processes and *Drosophila*, is a convenient model has been used in the study of Alzheimer's disease since years. It turned out that nicotine has neuroprotective properties in Parkinson's disease. However, there is little research focusing on the potential neuroprotection of nicotine in Alzheimer's disease.

The aim of our study was to check whether nicotine shows neuroprotective properties in a model of Alzheimer's disease in the *Drosophila* containing a genetic mutation in the form of a deletion of the Appl gene (Appl^d). The research used behavioral tests in response to nicotine administration (adult insect climbing assay). At the cellular level, a comet assay was performed to examine the extent of brain cell damage in Appl^d larvae treated with nicotine in relation to that seen in untreated flies. Our results showed that the effects of nicotine on Appl^d fly can impair locomotor activity. This effect was not observed in wild type fly. Contradistinctively, our results in comet assay showed that the nicotine treatment can decrease DNA strand breaks in larvae with AD. It is suggested that the nicotine effect on adult flies with AD can have a negative impact, but not in larvae, where this effect can be positive.

Expression of non-coding RNAs in brain tumors

Maria Gwit^{1,2}, Monika Piwecka¹*

¹*Department of Non-coding RNAs, Institute of Bioorganic Chemistry, Polish Academy of Sciences*

²*Faculty of Biology, Adam Mickiewicz University, Poznań*

**e-mail: margwi4@st.amu.edu.pl*

Keywords: brain tumors, glioblastoma, metastasis, non-coding RNAs, circRNAs, microRNAs

Glioblastoma multiforme is the most common and aggressive brain tumor occurring in the central nervous system. Similarly dangerous and aggressive are metastatic brain tumors which usually arise in the brain from lung, breast, and melanoma cancer cells. Despite progress in medicine, these tumors are often detected too late and its localization in the brain make the treatment very difficult which results in poor prognosis. In recent years non-coding RNAs have appeared to be involved in the regulation of key processes for cell functioning, and what is more, they might play an important role in the etiology of many diseases, including cancer. However, still a lot about their regulatory functions and cell specificity remain unknown. In this study, we have focused on determining the expression profile of different non-coding RNAs using RT-qPCR method and *in situ* RNA hybridization in human brain tissue sections. We have been investigating the regulation among circRNA CDR1as, microRNA mir-671, mir-7, and lncRNA Cyrano, which had been previously described as linked within the reciprocal network in the healthy brain. First, we confirmed that the analyzed brain tumor samples featured the upregulation of tumorigenic markers and factors, such as *TNC*, *GFAP*, miR-21, and downregulation of neuronal markers such as *TUJ1*, or *RIMS2*. The expression levels of ncRNAs in brain tumor samples were deregulated significantly when comparing to the healthy brain. Both CDR1as and lncRNA Cyrano are very low expressed in all analyzed tumor tissues and on the other hand miR-671 is detected at higher levels in pathological material than in the healthy brain. Analysis of RNA *in situ* hybridization (RNAscope method) allowed to detect CDR1as circRNA and control *GFAP* mRNA (glioma marker). CDR1as transcript was present at low level in the cytoplasm, which is consistent with RT-qPCR analyses. On the other hand, *GFAP* mRNA was localized in the nucleus and perinuclear areas. The outcomes have proved the possibility of using RNAscope technology to study pathological material collected from patients and frozen without prior fixation. Moreover, the project settled the groundwork for studying circRNA-miRNA-lncRNA networks in the context of cancer cell biology.

Colonization of Mars - challenges and possibilities

Natalia Hippmann¹, Piotr Nowicki¹, Natalia Konopińska^{1}, Łukasz Kaczmarek²*

¹*Section of Astrobiology, Natural Sciences Club of Adam Mickiewicz University, Faculty of Biology, Adam Mickiewicz University, Poland*

²*Department of Animal Taxonomy and Ecology, Adam Mickiewicz University, Poland*

**e-mail: natkon5@st.amu.edu.pl*

Keywords: astrobiology, space exploration, Mars, colonization

In the face of ever greater changes taking place on Earth related to overpopulation and to climate change and environment pollution, people began to look for a new planet to live, in space exploration can ensure the survival of mankind.

Thanks to the current progress in science, we can expect that the first man will stand on Mars in the next several dozen years. However, space missions like far-space exploration, bring with them many difficulties. One of the problems may turn out to be limited access to water and food production. Moreover, the conditions on Mars would restrict the cultivation of both plants and animals. An alternative solution could be the use of *in vitro* meat. The current development of technology may soon lead to the creation of a new type of machines, the so-called plantdroids, which can explore the soil of Mars on a larger scale than is the case with rovers. However, there are still problems related to, interaliation with radiation and temperature. Would life underground help to protect ourselves from them? Or maybe the terraforming of Mars or life under the dome will prove to be a sufficient solution?

During our speech, we will try to present what difficulties await humans when trying to colonize Mars and what examples of solutions we could use to possibly completely eliminate them.

Cytotoxicity of the selected *Chelidonium majus* latex defense-related compounds on cervical cancer cell lines

Michalina Krakowiak, Robert Nawrot*

Molecular Virology Research Unit, Institute of Experimental Biology, Faculty of Biology, Adam Mickiewicz University, Poznań, Uniwersytetu Poznańskiego 6, 61-614 Poznań

**e-mail: mickra4@st.amu.edu.pl*

Keywords: cervical cancer, cytotoxicity, chelidonine, GRP

Greater Celandine, *Chelidonium majus* L., is a perennial herbaceous plant belonging to Papaveraceae family. It is widely used in traditional medicine and pharmacy. *C. majus* grows wild in Poland, Europe, Asia, and North America. The plant produces yellow milky sap (latex) used in folk medicine to treat papillae and warts caused by human papillomavirus (HPV) infection. The latex is a rich source of biologically active compounds, such as alkaloids, e. g. chelidonine, and defense-related proteins, e. g. *C. majus* glycine-rich protein (CmGRP). *C. majus* products have been tested for their antibacterial, antiviral, antifungal, antitumor, anti-inflammatory, and immunomodulating activity. These studies relate to, inter alia, *C. majus* extracts, isolated alkaloids, and proteins. However, the information about the cytotoxic effect of isolated *C. majus* products is scarce. Thus, the effect of two plant compounds, chelidonine and CmGRP, on human cancer cell lines, such as HeLa, and C33A, has been tested with different concentrations. Moreover, the additive cytotoxic effect of both chelidonine and CmGRP was verified.

The study was supported by Study@Research 1st edition grant programme on Adam Mickiewicz University in Poznań, Poland.

The mystery of aging in naked mole-rat (*Heterocephalus glaber*)

*Klaudia Kuzdrowska, Bogna Malinowska**

Adam Mickiewicz University, Faculty of Biology

**e-mail: bogmal@st.amu.edu.pl*

Keywords: naked mole-rat, cancer resistance, aging, oxidative stress

The naked mole-rat (*Heterocephalus glaber*) is a small, eusocial, subterranean rodent native to East Africa. Clusters averaging 75 to 80 individuals live together in complex systems of burrows in deserts and other arid habitats. The tunnel systems built by naked mole-rats can stretch up to in cumulative length. They are most unusual mammals because of their several exceptional features. distinguished by the capability to live long and resist changes associated with the aging process. They exhibit very slight morphological and physiological changes with age and are resistant to age related diseases including cancer. These rodents should live a long time (senesce slowly). In nature they inhabit heavily protected burrows, and large, old breeding females make disproportionate reproductive contributions. Individuals can live a very long time: many of them live more than 20 years (and some even up to 30 years, which is 8 times longer than mice of a similar size. Naked mole-rats show far-reaching adaptations to hypoxia. This is due to their lifestyle -they inhabit closed underground burrows characterized by poor air circulation. Under these conditions, it is easy for oxygen levels to drop significantly and CO₂ levels to rise. Furthermore *H. glaber* has an exceptionally low metabolic rate, which may reduce oxidative stress and this feature affects theirs lacks pain sensitivity.

In this paper, we want to look at slow aging processes in naked mole-rats resulting from adaptations to their living environment. In recent years, several discoveries have been made in this species providing new insights in the natural mechanisms of cancer resistance. These adaptive mechanisms of naked mole-rats make them a great animal model to examine and understand mechanisms involved in aging, cancer resistance and adaptation to chronic hypoxia as well as to devise prevention and treatment to these challenges in humans.

***The influence of light in the nest habitat on eggshell pigmentation
in the great tit (*Parus major*)***

Katarzyna Malinowska^{1}, Paweł Podkowa², Klaudia Szala², Adrian Surmacki²*

¹*Adam Mickiewicz University, Faculty of Biology, Institute of Environmental Biology, Population Ecology Lab*

²*Adam Mickiewicz University, Faculty of Biology, Institute of Environmental Biology, Department of Avian Biology and Ecology*

**e-mail: katarzyna.malinowska@amu.edu.pl*

Keywords: eggshell pigmentation, protoporphyrin, digital image analysis, great tit

Daylight plays an important role in the embryonic development of birds, as it affects brain lateralization or accelerates chicks' growth. However, many groups, such as primary and secondary cavity-nesters, raise broods in relatively dim conditions. The study answered the question whether there is any relationship between the level of illumination in the nesting site and the content of protoporphyrine pigment in the eggshell of the great tit (*Parus major*). We hypothesize that under poorer light conditions eggs will contain less amount of protoporphyrine to compensate for the unfavorable conditions and to increase light penetration into the embryo. To test the hypothesis, we used 159 nest boxes of two types that differ in illumination level inside, located in Wielkopolski National Park. In the middle of the incubation period, we took photographs of great tits' eggs under standardized conditions. Next, we use images from overall 35 great tits' clutches to conduct the multispectral analysis in ImageJ with micaToolbox plugin. Additional custom scripts in micaToolbox were written to calculate several variables of interest. These were factors known from the literature to correlate strongly with protoporphyrin content, such as spots brightness, spots size and spotting coverage. Statistical analysis was performed in R using generalized linear mixed models. The results do not confirm the research hypothesis and other factors might explain the variability in eggshell coloration, such as the female's condition or the calcium content in a diet.

Biomedical properties of the latex from selected plants with the focus on antiviral and anticancer activities

Oliwia Mazur, Joanna Gracz-Bernaciak, Robert Nawrot*

Adam Mickiewicz University, Faculty of Biology, Institute of Experimental Biology, Molecular Virology Research Unit

**e-mail: oliwia.mazur@amu.edu.pl*

Keywords: plant latex, antiviral activity, biomedical properties, cytotoxicity, drug discovery

Nowadays there is a rising demand for complementary therapeutics. Approximately 40% of drugs available at the market contain herbal active ingredients and the number is still growing. Both wild medical plants, as well as domesticated species can serve as a source of raw materials (extracts) from which effective remedies can be obtained. One of such materials is plant latex. The components of latex can be distinguished into two major groups — secondary metabolites and proteins. The activity of both has been studied in different plant species.

Several *in vitro* and *in vivo* assays have shown the broad spectrum of biomedical properties of latex such as: cytotoxicity, immunomodulatory potential, antiproliferative, anti-neoplastic, anticancer, antimicrobial and antiviral activity. The ability of latex extracts were confirmed to act not only against plant viruses but animal and human as well. Although the mechanism of this activity is still undiscovered it is assumed that two groups of proteins are responsible for such antiviral potential — peroxidases which generate H₂O₂ during pathogen attack and nucleic binding proteins such as major latex protein (MLP) or glycine rich proteins (GRP). Medical plants are also often studied in the context of cancer treatment and cytotoxicity. The administration of secondary metabolites or whole latex extracts has affected the apoptosis and proliferation rates, activated signaling pathways and were involved in down or upregulation of genes involved in oncogenesis.

The aim of this review is to present the current literature data from studies on antiviral and cytotoxic properties of plant latex. Despite long history of use of medical plants, there is still room for improvements and for further exploration of such rich natural deposits of active molecules.

Why the tropical ice masses are important? Interdisciplinary approach

Julia Borkowska^{1,2}, Zofia Nowak^{1,2}*

¹Adam Mickiewicz University, Poznań, Poland. Faculty of Biology; Departments of Biology and Biology teaching

²Students Section of Studies on Mountain and Polar Ecosystems

*e-mail: zofnow4@st.amu.edu.pl

Keywords: Tropical glaciers, climate changes, biodiversity

Although the combination of the words „tropical” and “glacier” seems incongruous, it is a real, remarkable phenomenon. Tropical glaciers are located between the tropics of Cancer and Capricorn. Most of tropical ice masses are located in South America, then in Africa, and only few in Asia.

Due to their unique location, tropical glaciers disappear faster than those at the poles. Their small size, location in humid and warm areas trigger a fast response to the climate fluctuations. Other factors such as mineral dust or black carbon transported with wind can also have an impact on faster melting due to reduction of ice albedo. That is why they are the perfect indicators of current climate changes and anthropogenic impact, so-called symbols of global warming.

Although tropical ice masses are important components of tropical ecosystems e.g., they shapes downstream ecosystems, are habitat for various life forms, important natural heritage, they store knowledge about past and contributes to regional economy, regrettably, they are still tabula rasa for scientific community.

The main aim of the presentation is the introduction to (I) the current state of the knowledge on tropical glaciers, (II) the biology and ecology of glacial ecosystems in the tropics, and (III) the consequences of their disappearing.

We are probably among the last witnesses of tropical glaciers’ existence. Hence we would like to promote the current state of the art and the importance of tropical glaciers as unique habitats for tropical psychrophiles, and important component shaping downstream tropical ecosystems.

Small regulatory RNAs derived from tRNA and snoRNA – the role in cancer

*Kinga Plawgo**

*Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Molecular Biology and Biotechnology,
Department of Gene Expression*

e-mail: kinpla@st.amu.edu.pl

Keywords: tRNA, snoRNA, tRF, sdRNA, RNA processing, cancer

In recent years with the advancement of next-generation sequencing the number of newly discovered RNA molecules is rapidly increasing. Among others, small RNAs derived from tRNAs and snoRNAs have been observed. It became apparent that tRNAs and snoRNAs are processed into fragments which have functions distinct from their parent molecules. tRNA can be specifically cleaved into tRNA-derived small RNA (tsRNA), which can be further divided into tRNA-derived stress-induced RNA (tiRNA) and tRNA-derived fragments (tRFs). snoRNA undergo processing into stable shorter fragments called snoRNA-derived RNAs (sdRNAs). Importantly, these processed RNA molecules are not merely degradation products but were shown to have biological roles under different physiological and pathological conditions. They show many similarities to microRNA, and some were shown to regulate gene expression in a similar way to microRNA.

The aim of this work is to review the literature on sdRNA and tsRNA and their involvement in the pathogenesis of cancer. All tumors present specific signatures of altered small RNA expression, including sdRNA and tsRNA. Different molecules derived from tRNA and snoRNA act as tumor suppressors and/or oncogenes in various types of cancer. Due to their involvement in pathogenesis, often in a specific manner, they may potentially serve as novel therapeutic targets. Furthermore, circulating noncoding RNA molecules could serve as diagnostic and prognostic tools.

The bioink for meniscal tissue engineering

Julia Anna Semba

Center for Advanced Technology, Adam Mickiewicz University, Poznań

e-mail: julsem@amu.edu.pl

Keywords: bioink, 3D bioprinting, meniscus

Tissue engineering combines principles of engineering and life sciences to develop artificial tissues and organs for clinical use. One of the most promising technologies for commercial manufacturing tissue constructs is 3D bioprinting. Since cartilage injuries become increasingly prevalent in modern societies and have low or no capacity for self-repair and none of the available treatments provide satisfactory, long-term outcomes, 3-D bioprinting can become a novel therapy in orthopedics. The extensive and ongoing studies in this field are focused on such topics as cartilage biology, standardization of cell culture protocols, bioink formulation, and 3D bioprinting technology. Among them, the development of bioinks is a pivotal step as their composition and structure affect the phenotype of the developing tissue and strongly influence the cell condition and differentiation. The bioink composed of alginate, gelatin, and carboxymethylated crystal nanocellulose that was formulated and investigated for 3D bioprinting of meniscal scaffolds will be presented as an example.

***Development of the gene bank of carnivorous plants
at the AMU Faculty of Biology***

Joanna Sokołowska^{1}, Gabriela Belniak², Maciej Nowak², Oskar Kamiński²,*

Maria Katarzyna Wojciechowicz¹

¹*Institute of Experimental Biology, Faculty of Biology, Adam Mickiewicz University in Poznań, Poland*

²*Section of in vitro cultures, Natural Sciences Club, Institute of Experimental Biology, Faculty of Biology, Adam Mickiewicz University in Poznań, Poland*

**e-mail: js89840@st.amu.edu.pl*

Keywords: in vitro cultures, Drosera, carnivorous plants

Plant *in vitro* cultures is a biotechnological method, widely prevalent in botanical sciences and experimental research. The plant tissue cultures allow the dedifferentiation and regeneration of living tissue plant cell into a whole organism. One of the application of the method is the preservation of genetic biodiversity. Hence, it allows the preservation of endangered plant species, such as carnivorous plants, in gene banks.

Carnivorous plants are a large cluster including currently over 700 species. These plants often grow in places with nutrient deficiencies, which resulted in the development of strategies to obtain necessary nutrients, such as nitrogen and phosphorus compounds, from small invertebrates tissues. Carnivorous plants have developed multiple types of leaves modifications. One of the major purposes of the Natural Sciences Club's Section of in vitro cultures is the application of clonal reproduction in the protection of rare and endangered plant species. Therefore, the object of our interest is mainly carnivorous plants that came from the didactic collection of the Department of General Botany. As part of the Section's activities, species of the genera: *Pinguicula sp.*, *Drosera sp.*, *Dionaea sp.* have been introduced into *in vitro* cultures. Currently, our collection consists of *Pinguicula vulgaris*, *Drosera rotundifolia*, *D. burkeana*, *D. paradoxa*, and *Dionaea muscipula*. In the future, we plan to introduce multiple *Drosera* species collected in North America, South America, Africa and Asia. This would allow creating the robust collection of sundews species, preservation of endangered plants, and development of the Section's gene bank.

In the speech, we will present the current collection of in vitro plant cultures and the scientific background of the planned project.

Can eggshell pigmentation act as a signal of female or nestlings condition in postreproductive sexual selection in Red-backed shrike *Lanius collurio*?

Klaudia Szala, Adrian Surmacki*

Adam Mickiewicz University, Faculty of Biology, Department of Avian Biology and Ecology, ul. Uniwersytetu Poznańskiego 6, 61-614 Poznań, Poland

**e-mail: klaudia.szala@amu.edu.pl*

Keywords: digital photography, micaToolbox, protoporphyrin, repeatability, spottiness

According to the sexually selected eggshell colouration hypothesis (the SSEC hypothesis hereafter), eggshell pigmentation can act as a signal of female or nestlings condition that influence male paternal effort. Here we test this and other assumptions of the SSEC hypothesis on Red-backed shrike *Lanius collurio*, a species with protoporphyrin-based eggshell pigmentation.

During two years of fieldwork (2020-2021), 60 clutches were photographed in standardized conditions, saved in RAW format and processed in micaToolbox software. We measured eggshell colour in red, green and blue channel and eggshell brightness as a sum of values in three channels. Additionally, we used a number of descriptors of eggshell pattern, *i.a.* percent of spottiness and dominant spot size. Adult birds were trapped with mist nets and ringed. Following biometric measurements were taken: mass, length of wing, length of tarsus and length of head with beak. Further, scaled mass index was calculated as a measure of birds' condition. Nestlings were taken out of nest at 9th or 10th day of life (day of hatching of first chick in a brood = day 1), ringed and measured in the same manner as the adults. Then, we compared different measures of eggshell pigmentation from digital photography with females' and nestlings' condition, adding clutch size and date of laying of first egg in a clutch as covariates. Additionally, we tested whether eggshell traits were repeatable within clutches.

In the presentation we will present and discuss the results of this work.

Are birds in Poland endangered by the invasive species?

*Zuzanna Trzebuniak, Michał Wawrzynowicz**

Adam Mickiewicz University, Poznań, Poland, Population Ecology Lab, Ornithological Section of the Natural Sciences Club

**email: micwaw2@st.amu.edu.pl*

Keywords: invasive species, birds, raccoon, domestic cat

During the sixth mass extinction, the issue of invasive species is extremely important because their expansion and impact are one of the causes of severe biodiversity loss. In Poland, one in five bird species is threatened with extinction, and a dozen have already become extinct (The red list of birds in Poland 2020), therefore the question of threat from invasive species seems to be critical. In this presentation, we would like to mention two of them: the raccoon (*Procyon lotor*), considering its expanding range and increasing population numbers, and the domestic cat (*Felis catus*), which is the silent killer of millions of birds. On the basis of the literature data, we will try to look at the case and try to answer the title question.

Genetic prediction panel - tool for dog's breed predisposition prediction to work on duty in Law Enforcement

Jakub Winkler-Galicki^{1,2}, Paulina Walczak³, Mikołaj Woźniak⁴*

¹*Adam Mickiewicz University, Faculty of Biology, Laboratory of High Throughput Technologies,*

²*Medical University of Poznan, Cathedral and Department of Physiology,*

³*Adam Mickiewicz University, Faculty of Theology, Systematically Theology*

⁴*Adam Mickiewicz University, Faculty of Political Science and Journalist, Strategic Studies Department*

**e-mail: jwg@amu.edu.pl*

Keywords: dogs, genetic panel, Law Enforcement, prediction, odour

Dogs are commonly used in different areas of Law Enforcement such as Police, Rescue Teams, or Fire-brigades, and also Economical and Financial Control Units. The history of dogs in Police or military service is thought to started already in the 14th century and is constantly developed. The majority of us see dogs as K-9 Units working as searching, protecting, or attacking dogs. To the most common dog's unit duties belongs: drug, explosive materials, guns, human, cadavers, chemicals or money searching, protecting, crowd controlling, and attacking. What is more, on duty different kinds of the breeds can be found. To the most common once belongs German Shapers, Belgian Malinois, Bloodhound, Dutch Shepherd, but many different breeds is being thought to be useful in particular cases. Even though that dogs are going through restricted selective processes and further preliminary trainings it is really difficult to establish the level of aggression or fare at the beginning of recruiting processes and because of that determine if the individual should be trained more in aggression to be a defensive and offensive dog or to work with smells. That is why it seems to be needed to develop genetic panels allowing us to test the puppies.

The main purpose of the speech is to show the possibility of using analyses of several genes (*DRD4*, *HTR2B*, *IGF1*, and *MHGA2*) to results of establishing ways of determining a dog's abilities. What is more, the authors want to describe also usage of genetic panel to determine health problems basing the problem on the Iraqi police dogs' case solved with a proposed genetic panel and show how the dogs' application process can be changed in time and due to the genetic test done in early age of puppy.

PART II
POSTER SESSION

***In vitro* root cultures of *Salix viminalis* and *S. cinerea* – preliminary studies**

Gabriela Belniak¹, Maria Katarzyna Wojciechowicz^{2*}

¹Adam Mickiewicz University, Faculty of Biology

²Adam Mickiewicz University, Faculty of Biology, Institute of Experimental Biology, Department of General Botany

*e-mail: maria.wojciechowicz@amu.edu.pl

Keywords: *Salix viminalis*, *Salix cinerea*, *in vitro* cultures, phytoremediation, bioenergy, adventitious roots

Plant *in vitro* cultures is a biotechnological method widely used in experimental research, due to possibilities of obtaining *de novo* regeneration of plants in a faster time and in mass quantities compared to conventional methods of growing plants. Two species of the genus *Salix* selected for research: *S. viminalis* and *S. cinerea* are common plants in Poland, significantly important for environmental protection. These species are considered to be economically important due to their use and suitability for bioenergy and phytoremediation purposes. The development of an optimal *de novo* regeneration protocol for *S. viminalis* and *S. cinerea* would enable further experimental studies on increasing biomass growth or intensifying the process of heavy metal accumulation.

In this study, adventitious roots obtained in vase cultures of cut shoots of perennial willows were selected as the research material. Compositions of modified MS media (Murashige and Skoog, 1962) were developed enriched with the additions of phytohormones belonging to auxins, cytokinins and gibberellins. In investigated species, applied pilotage modifications can be considered as a *novum* in research on root cultures: two-phase media, micro-incision of roots and shaking explants in a liquid medium used as a preculture. Lateral root development was successfully induced in *S. viminalis* cultures. The tendency towards rhizogenesis was observed, at a later stage of culture the development of callus tissue was observed. Histological analysis of *S. viminalis* and *S. cinerea* primary explants showed the activity of meristematic centers in the pericycle from which lateral roots were formed. In *S. cinerea* cultures initiation of cell division activity in pericycle does not imply root formation.

Study of the lethal and sub-lethal effects of the herbicide Roundup on larvae of *Chaoborus flavicans* (Meigen, 1830)

Aleksandra Dzięgelewska^{1}, Zbigniew Adamski^{1,2}, Piotr Klimaszyk³, Magdalena Winkiel¹, Polyxeni Nikolaou¹*

¹*Department of Animal Physiology and Developmental Biology, Institute of Experimental Biology, Faculty of Biology, University of Adam Mickiewicz in Poznań, ul. Uniwersytetu Poznańskiego 6, 61-614 Poznań*

²*Laboratory of Electron and Confocal Microscopy, Faculty of Biology, University of Adam Mickiewicz in Poznań, ul. Uniwersytetu Poznańskiego 6, 61-614 Poznań*

³*Department of Water Protection, Institute of Environmental Biology, Faculty of Biology, University of Adam Mickiewicz in Poznań, ul. Uniwersytetu Poznańskiego 6, 61-614 Poznań*

*e-mail: aledzi7@amu.edu.pl

*Keywords: ecotoxicology, water ecosystems, *Chaoborus flavicans*, pesticides, Roundup 360 Plus, glyphosate*

The use of pesticides in the modern world constantly increases, due to the intensive development of the economy and increased demand for food. They are used as plant protection products against pathogens, weeds and pests. Their use reduces crop losses and improves the quality of products. However, they also lead to environmental pollution. Not only terrestrial organisms are harmed by the use of pesticides, but also those that occur in aquatic ecosystems. For this reason, scientists are increasingly paying attention to the toxicity of plant protection products and their impact on the natural environment, including water ecosystems. Therefore, we decided to test the effect of the commonly used herbicide Roundup 360 Plus on *Chaoborus flavicans* larvae. The species is commonly found in various water reservoirs. The larvae were exposed to a range of concentrations, from 20 mg/L to 2000 mg/L. We observed toxic effects, including lethality and behavioral sublethal effects and the altered vertical migration of midges within the water column. The microscopic observations revealed malformations of insects' morphology and anatomy. Among the most prominent changes were altered body shape and lower density of chromatophores in air sacs.

Do ticks from Ixodes genus and Lipoptena cervi affect the occurrence of small and medium hosts in suburban forests of western central Poland?

Oskar Kołacki, Milena Patan, Barbara Grochowska, Maciej Szulakiewicz,*

Aleksandra Anczyńska

Adam Mickiewicz University, Faculty of Biology, Institute of Environmental Biology, Department of Animal Morphology

**e-mail: oskkol@st.amu.edu.pl*

Keywords: parasitology, ticks, avoidance, suburban forests, Lipoptena

The interactions between animals have been studied by scientists and lay people alike, yet just recently we have realized, that majority of them may not be visible at the first glance. Just with the break of the 21st century, we've realised the impact of the presence of predators on their surroundings and the population dynamics of prey and producers. Second decade however has shown us, that even less visible links between macroscopic animals are in play. The ecology of disgust, as coined by Weinstein in 2018, analyses research papers on the impact of parasite presence in the environment showing that parasites and potential of parasites, while less impactful, change the behaviour of hosts in an observable way. Our research focused on searching for a correlation between animal and parasite presence, to see whether the potential hosts would be less inclined to forage in an area rich in tick and *Lipoptena* activity. The comparison of data seems to be inconclusive, with one site giving negative correlation between host activity and adult male and female ticks, and *Lipoptena* ($r=-.1693$; $r=-.3633$; $r=-.4978$) while the other shows a positive correlation between the same variables ($r=.37$; $r=.096$; $r=.242$). However, comparison of sites and their vicinity seems to explain the differences. The site with negative correlations is surrounded by houses and natural barriers – this means that hosts have more caloric sources of food and larger mammals have difficulty crossing to the site. On the other hand – the second site was placed in a green sector, which starts at the edge of the city and ends nigh in the city centre – which means there would be a higher likelihood of larger mammals in the area. The sources of food are scarce in this area and therefore animals are less inclined to avoid foraging in areas with parasite activity. This work shows, that while there is a correlation, there is no one variable affecting the foraging preferences and following research should include a broader analysis of the state of the sites as well as the surrounding areas.

The occurrence of integrons in bacteria isolated from Arctic environments

Marcelina Małecka^{1}, Dariusz Ignatiuk², Nicoletta Makowska-Zawierucha¹*

¹*Polish Academy of Sciences, Institute of Bioorganic Chemistry, Department of Molecular Genetics, Poland*

²*University of Silesia, Faculty of Earth Sciences, Poland*

**e-mail: marmal31@st.amu.edu.pl*

Keywords: Arctic, cryosphere, antibiotic-resistant bacteria, integrons

The spread of antibiotic resistance among bacteria in fragile and fast-changing polar regions is strongly understudied and only basically recognized. Contemporary studies have shown that responsible for the emergence and spread of multidrug antibiotic resistance among bacteria are integrons. Integrons are a DNA fragments that are capable of capturing gene cassettes coding for antibiotic resistance. They are located on transposons and plasmids, which facilitates spreading of resistance determinants through bacterial population *via* horizontal gene transfer.

The main aim of this study was to determine the type and frequency of integrons and their gene content in bacteria cultured from aquatic environments of Arctic region (Spitsbergen, Svalbard archipelago). The samples were collected from the Adventfjorden (water, sediment), glacier river (water, sediment) and Lars Glacier (ice core). The presence of integrons was determined by multiplex PCR assay for detecting *intI1*, *intI2* and *intI3* integrase genes. Primers complementary to the conserved regions of class 1 integrons were used for amplification of variable regions. The gene cassettes were cloned using pGem-Teasy Vector System (Promega) and sequenced.

Class 1 integron-integrase genes were found in 5,4%-51,2% of the cultured isolates depending on location: the most frequent were in sediment of Adventfjorden, the lowest in ice core from Lars Glacier, whereas class 2 and 3 integrase genes were not detected. Analysis of the variable regions revealed the presence of genes encoding proteins of different functions, both physiological and antibiotic resistance.

The presence of bacteria with integrons in Arctic ecosystems is biotic contamination and should be considered a potential threat for human and polar environments. Understanding the pathways of antibiotic resistance spreading in pristine Arctic ecosystems is crucial in global actions against the problem of constantly growing antibiotic resistance in natural environments.

The study was funded by National Science Center grant no. NCN 2020/36/C/NZ9/00221.

Effect of solanine on chosen parts of neuro-endocrine system of *Tenebrio molitor* and *Zophobas atratus*.

Polyxeni Nikolaou^{1*}, *Magdalena Winkiel*¹, *Pawel Marciniak*¹, *Zbigniew Adamski*^{1,2}

¹*Adam Mickiewicz University, Faculty of Biology, Department of Animal Physiology and Developmental Biology*

²*Adam Mickiewicz University, Faculty of Biology, Electron and Confocal Microscope Laboratory*

**e-mail: polnik@amu.edu.pl*

Keywords: Zophobas atratus, Tenebrio molitor, solanine, Corpus cardiacum, Corpus allatum

In the recent years the use of synthetic insecticides is getting more and more restricted, creating a gap in the market that could be covered with some biopesticides and other plant protection products. Plants from the Solanaceae family have various secondary metabolites such as glycoalkaloids that are important in their defense mechanism against different pathogens, such as viruses, bacteria, fungi and insects. One of them solanine was chosen to be tested against beetles *Zophobas atratus* and *Tenebrio molitor*, two polyphagous stored products' pests, that are mostly found in grain products. The substance was injected into one month old adults, in two concentrations (10^{-5} M and 10^{-7} M). Specific part of the neuro-endocrine system (retrocerebral complex *corpus cardiacum* - *corpus allatum*) was chosen due to the fact that it produces juvenile hormone and stores other hormones thus plays a crucial role in metamorphosis. These organs were removed after 24, 48 and 72 hours post injections, and the length and width were measured using light and electron microscopy methods. The results showed that there is a clear atrophy in the *corpus cardiacum* of *Zophobas atratus* after treatment, while in both species there was a size decrease in the whole organ after solanine injections in both concentrations.

snoRNA-derived small RNAs as possible regulators of translation

Piotr Pietras, Anna Mleczko, Piotr Machtel, Mateusz Walkowiak, Anna Wasilewska,*

Kamilla Bakowska-Zywicka

Institute of Bioorganic Chemistry of the Polish Academy of Sciences, Department of Functional Transcriptomics

**e-mail: ppietras@ibch.poznan.pl*

Keywords: *Yeast, snoRNA, sdrRNA, Regulation of translation, Ribosome*

In recent years, a number of small RNA molecules derived from snoRNAs have been observed. This relatively new topic is currently the object of intense research. It has been observed, that snoRNA-derived small RNAs (sdrRNAs) in cells are mainly involved in microRNA pathway. However, similar molecules have been observed in *Saccharomyces cerevisiae*, which is an organism lacking miRNA machinery. Both sdrRNAs and snoRNAs may directly interact with translating ribosomes in a stress-dependent manner. Likely consequential to their ribosome association and protein synthesis suppression features, yeast sdrRNAs may exert inhibitory activity on translation.

To clarify this, we set up an *in vitro* translation system for *S. cerevisiae* grown under optimal conditions. When the assay was performed in the presence of synthetic sdr67, sdr83 or sdr128 we observed a reproducible inhibitory effect on translation. To investigate whether *in vitro* effects have a physiological significance in yeast we used electroporation to introduce synthetic sdrRNAs into *S. cerevisiae* cells. With this assay, we proved that yeast sdrRNAs can decrease translational efficiency *in vivo*. Because both snoRNAs and ribosomes are universally conserved, we tested if sdrRNA-mediated repression of translation is functionally conserved in other eukaryotic species as well. To test this possibility, we examined three cell-free *in vitro* translation systems using wheat germ extracts, rabbit reticulocyte lysates, and HeLa cell lysates. The addition of *S. cerevisiae* sdrRNAs reproducibly inhibited *in vitro* protein biosynthesis in the wheat germ system. *In vitro* translation was very mildly inhibited by yeast sdr67 in the rabbit reticulocyte but not by sdr83 nor sdr128. No inhibition was observed in human systems. These data suggest that *S. cerevisiae* sdrRNAs might potentially inhibit translation systems in selected eukaryotes.

XRNAX as a method to study RNA interactome in the adult mouse brain

Marta Pietras, Eliza Kopera, Ayca Olcay, Monika Przybył, Monika Piwecka*

Department of Non-coding RNAs, Institute of Bioorganic Chemistry, Polish Academy of Sciences, Poznań, Poland

*email: mpietras@ibch.poznan.pl

Keywords: UV-crosslinking, RNA-binding proteins, RNA-protein interactions, proteomics, mouse brain

RNA binding proteins (RBPs) can interact with RNA to form ribonucleoprotein complexes that are inherently dynamic e.g. their composition, localization or quantities can change depending on changing physiological or disease conditions. RBPs are involved in regulation of the RNA life cycle from transcription through splicing, modification to translation, cellular transport and degradation. Malfunction of RBPs underlies many diseases, including neurodegeneration and cancer. Knowledge of RNA-protein interactions contributes to the better understanding of gene expression programs and regulatory functions of non-coding RNAs (ncRNAs). In recent years new methods have been developed enabling to study RNA-protein complexes globally. In our project we are interested to shed light on the brain-specific RBPome. Therefore, we apply the recently published RNA interactome method which is based on phase separation of RNA-protein complexes upon prior UV crosslinking, namely XRNAX protocol. We are comparing two different homogenization methods of brain tissue subjected to UV crosslinking with the aim to capture RNA-protein complexes in a robust way. Preliminary results from the mass spectrometry show the potential of the XRNAX method in combination with the appropriate preparation of the mouse tissue for the identification of RBPome in the brain. These studies may provide novel, exciting insights into the RNA interactome in the brain and can be used for the interrogation of mouse models of human neurological disorders.

CRISPR/Cas9 –system for genome editing

Natalia Pietrzak^{1,2}, Maria Gwit², Julia Misiorek¹*

¹*Department of Molecular Neurooncology, Institute of Bioorganic Chemistry, Polish Academy of Sciences, Poznań*

²*Section of Regenerative Medicine and Cancer Research, Adam Mickiewicz University, Poznań*

**e-mail: natpiet12@st.amu.edu.pl*

Keywords: CRISPR, gRNA, Cas9, PAM, genome editing

CRISPR(Clustered regularly interspaced short palindromic repeats)/Cas9 is a genetic engineering tool that is based on the bacterial immune system defending prokaryotes from phages. CRISPR was first described in 1987 in *Escherichia coli*. However, it became a tremendous success later in 2012 when Emmanuelle Charpentier and Jennifer Doudna adapted CRISPR type II from *Streptococcus pyogenes* as molecular tool for editing the human genome. They received The Nobel Prize in 2020 for this achievement.

CRISPR/Cas9 involves two essential components: an 18–20 nucleotide long, single guide (sg)RNA which recognizes and binds to target gene, and Cas9, an endonuclease that generates a double-stranded DNA break at target loci. In order to bind and cut a specific sequence of DNA must be followed by a protospacer adjacent (PAM) motif - NGG. Repair after the DNA cut may occur via two pathways: non-homologous end joining (NHEJ) or homology directed repair (HDR) where a homologous piece of DNA is used as a repair template.

Due to the fact that CRISPR/Cas9 enables quick and easy design of sgRNA, this method has risen to be the most used DNA editing tool and has given new opportunities. One of the most exciting applications of CRISPR/Cas9 is its potential use to treat genetic disorders caused by single gene mutations including cystic fibrosis (CF), Duchenne's muscular dystrophy (DMD), and haemoglobinopathies. This poster aim's to describe the overview of CRISPR/Cas9 method.

Effects of vegan diet on oral health.

Daria Puroł, Katarzyna Talarczyk*

Adam Mickiewicz University in Poznan, Faculty of Biology, Institute of Human Biology and Evolution

**e-mail: darpor@st.amu.edu.pl*

Keywords: diet and oral health, vegan diet, veganism, dentition, tooth, oral cavity

Vegan diet is increasingly popular. There are many beneficial effects of veganism, including low content of saturated fats, however, potential negative consequences have not been wholly examined yet.

For oral health essential are complete proteins found in animal products, while plant sources generally provide incomplete proteins. Vegan diet is also associated with deficiencies of some vitamins, and micro- and macronutrients, which can result in adverse oral effects, such as stomatitis, enamel and oral abscesses. It is not known yet how vegan diet influences the development of children, who exclusively consume plant products from infancy.

The aim of this study is to systematize the literature on the impact of vegan diet on the condition of oral cavity. We searched for the relationship between vegan diet and the composition of saliva, health of teeth, gums, jaw bones, and oral cavity, and also diet vs diversity of oral microbiota. The search was performed in Google Scholar, including the papers with recent year of publication, and being listed in JCR.

It can be concluded that the results of studies on the effects of veganism on oral health are inconclusive, because there is contradictory evidence on whether the diet is beneficial or detrimental. Salivary metabolomic profiling identified diet-related biomarkers which revealed significant variation between three dietary groups (omnivores, ovo-lacto-vegetarians, and vegans). Dietary effects on the oral microbial community were related to the diversity, composition, and functional potential of the salivary microbiota, which were present at all taxonomic levels, including species associated with periodontal disease. It seems that further research is needed to explain how vegan diet specifically affects oral health and whether beneficial or adverse effects predominate.

***Characteristics and morphology of spruce stumps
in a natural mountain forest***

Bartosz Sołtysiak, Jan Holeksa*

Adam Mickiewicz University in Poznań, Department of Plant Taxonomy

**e-mail: barsol@st.amu.edu.pl*

Keywords: stumps, deadwood, natural forest, spruce, spruce bark beetle

High stumps are a form of deadwood that is increasingly left by foresters in commercial forests of various European countries in order to maintain high biodiversity in these forests. Their morphological features affect the composition and abundance of saproxylic fauna and flora inhabiting them. The research has been focused on differences between stumps resulted from breaking snags, that is, trees previously killed by the spruce bark beetle, and those, which are the result of breakage of live trees by strong gusts of wind. It has been hypothesised that the activity of spruce bark beetle is the most important factor contributing to the formation of stumps in the natural mountain spruce forest. Fieldwork was carried out in the Babia Góra National Park, in an area under strict protection from 1954. The research area is in a natural mountain forest in which the dominant species is spruce (*Picea abies*). Bark beetle (*Ips typographus*) is mainly responsible for the death of standing trees. Thanks to many years of protection and the lack of forest management, this area is a valuable source of information about the processes taking place in natural forests. As many as 193 stumps were formed from trees that died between 2014 and 2020, and their morphological features such as height and diameter were measured. The height snags and live trees broke at, and the relationship between diameter of trees and height of stumps were determined. The rate of tree breakage of dead trees was also determined. Stumps from snags were significantly, however only slightly taller than stumps from live trees. There was no relationship between thickness of trees and height of stumps. More than 50% of snags older than 5 years were broken. It has been also shown that almost 80% of stumps in natural forests are created in connection with the activity of the spruce bark beetle.

The Project was founded by Study@research, ID-UB, no. 009, Project no. Z0002350.

PTT-quant - a new method for direct identification and absolute quantification of premature transcription termination events, following the example of bacterial riboswitches

Piotr Machtel, Anna Wasilewska-Burczyk, Julian Zacharjusz, Kamilla Bąkowska-Żywicka*

Institute of Bioorganic Chemistry of the Polish Academy of Sciences, Department of Functional Transcriptomics

**e-mail: awasilewska@ibch.poznan.pl*

Keywords: transcription termination, riboswitch, Bacillus subtilis, transcription regulation

Regulation of gene expression by premature termination of transcription is well known in all domains of life. While methods for identification of regulatory events are available by sequencing, the detection of biochemical studies is curbed by a deficiency of sensitive and precise experimental methods. Herein we would like to present a new method for an absolute quantification of premature transcription termination events, PTT-quant. It is based on highly sensitive two-step digital droplet PCR protocol, coupled with RNase H treatment. As a result it enables the reliable and sensitive quantification of prematurely terminated as well as full-length transcripts. The usage of our method allowed us to perform a comprehensive investigation of the transcriptional riboswitches in *Bacillus subtilis*.

This work was supported by National Science Centre, Poland [UMO-2016/23/N/NZ1/02446 to P. M.]. The work was also supported by the Polish Ministry of Science and Higher Education, under the KNOW programme.

Preliminary effect of chilling treatment on anatomy in high- and low-cold tolerant genotypes of C4 energy grass *Miscanthus sinensis*

Estera Wojtkowiak², Aneta Basińska-Barczak¹, Gabriela Belniak³, Karolina Sobańska^{1}*

¹*Institute of Plant Genetics, Polish Academy of Sciences, Poznań, Poland*

²*Poznań University of Life Sciences, Poland*

³*Adam Mickiewicz University, Faculty of Biology, Poznań, Poland*

**e-mail: ksob@igr.poznan.pl*

*Keywords: chilling stress, cold tolerance, *Miscanthus sinensis*, cell wall structure*

Miscanthus species are characterized by high yield of photosynthesis and biomass production, even under low-temperature conditions - in contrast to typical C4 plants from tropical and subtropical regions. This feature has made *Miscanthus* biomass one of the most promising feedstock for the biofuel and bioproduct industry. In addition, unique features of *Miscanthus* species make them a convenient model in studies related to plant tolerance to low-temperature stress, including alterations in anatomy in response to these adverse environmental conditions. Under conditions of temperate climate, which cover most of Europe, the most resistant to low temperatures is *Miscanthus sinensis*. The goal of the study was to determine effects of the response to the chilling stress in previously selected high- and low cold-tolerant genotypes (HCT and LCT, respectively) of *M. sinensis*, which were used as models for the comprehensive research, microscopic observations to recognize key components of cold acclimation in energy grasses.

The results showed significant changes in anatomical alterations during acclimation to low temperatures, which extent was determined by a genotype. Furthermore, cold stress caused altered structure and composition of cell wall, as observed using pectin and AGP protein immunostaining analysis. Both play a key role in cell building and stress response.

Detection of components cell wall with antibodies LM5, LM 6 and MAC207 allowed of the determination of their distribution in specific tissues, as well as changes in the location and accumulation during treatment cold.

Acknowledgements: This study was performed within project Preludium 15, No. 218/29/N/NZ9/00854, granted by National Science Centre, Poland.

Speech session	3
Andrzejewska-Romanowska, A.	4
Charchuta, M.	5
Czerepska, A.	6
Draga, M.	7
Kuzdrowska, K.	8
Gwit, M.	9
Hippmann, N.	10
Krakowiak, M.	11
Kuzdrowska, K.	12
Malinowska, K.	13
Mazur, O.	14
Borkowska, J.	15
Plawgo, K.	16
Semba, J.	17
Sokołowska, J.	18
Szala, K.	19
Trzebuniak, Z.	20
Winkler-Galicki, J.	21
Poster session	22
Belniak, G.	23
Dzięgelewska, A.	24
Kołacki, O.	25
Małecka, M.	26
Nikolaou, P.	27
Pietras, P.	28
Pietras, M.	29
Pietrzak, N.	30
Purol, D.	31
Sołtysiak, B.	32
Machtel, P.	33
Wojtkowiak, E.	34