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OF ABSTRACTS**

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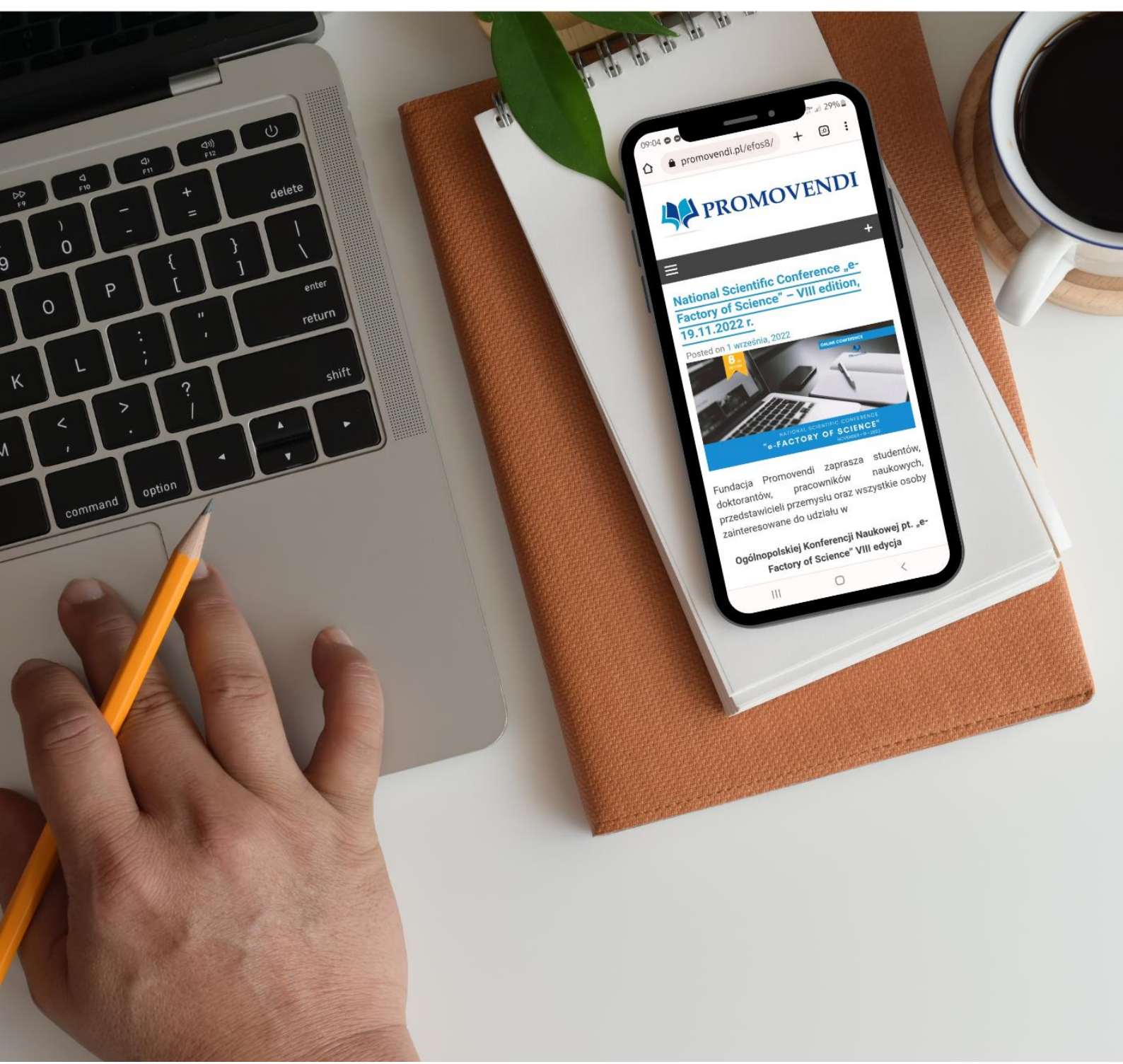
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# ABSTRACTS OF ON-LINE SPEECHES





# **THE ROLE OF EDUCATION IN THE PRESERVATION OF THE SLOVAK LANGUAGE AS A NATIONAL MINORITY LANGUAGE IN POLAND: ANALYZING THE FUNCTIONS OF EDUCATIONAL INSTITUTIONS AND THE CHALLENGES FACED BY THE EDUCATION SYSTEM**

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## **A few words about the author(s):**

Based in Poland, holds a master's degree in Ethnology from the University of Ss. Cyril and Methodius in Trnava. He is dedicated to preserving Slovak culture and pursuing a PhD on the Slovak minority in Poland, while also working as an educator.

## **Abstract:**

This article explores the role of education in preserving the Slovak language as a national minority language in Poland. It begins by outlining the linguistic situation of Slovaks in Poland and emphasizes education as a vital tool for promoting the Slovak language. A historical review details the development of Slovak schools, particularly in regions like Spiš.

The article focuses on how Slovak schools contribute to shaping national identity and analyzes the curriculum's cultural content. It also examines the benefits and challenges of bilingualism among students learning both Slovak and Polish.

Additionally, it evaluates the availability of Slovak-language educational materials and the initiatives designed to cater to the Slovak minority's needs. The crucial role of teachers in transmitting language and culture is highlighted, along with the challenges they face in diverse educational settings.

The social and cultural functions of schools as local cultural hubs are discussed, including their role in organizing Slovak cultural events. Finally, the article outlines initiatives supporting Slovak-language education and offers recommendations for enhancing its effectiveness, emphasizing its importance in fostering a lasting ethnic identity among future generations of Slovaks in Poland.

## **Keywords:**

Slovak language; education; bilingualism; cultural identity; minority rights





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## **THE ROLE OF ANTISEPTICS IN OPHTHALMOLOGY**

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### **A few words about the author(s):**

Graduate of the Medical University of Warsaw. Co-author of ophthalmology papers published in Impact Factor journals. Longstanding member of the Student Scientific Association at the Independent Public Clinical Ophthalmology Hospital in Warsaw.

### **Abstract:**

Antiseptics and preservatives belong to the category of biocides, which also includes disinfectants (agents used on non-living surfaces). Bactericidal agents in this group are utilized to treat infections, while bacteriostatic agents are applied to prevent bacterial proliferation. With the increasing resistance of microorganisms to currently available antibiotics and the lack of new chemotherapeutics with broader activity against pathogens, these agents play a critical role and demonstrate a high degree of effectiveness. It is known, however, that their efficacy may be influenced by biological factors, such as the presence of organic matter and cations, which can reduce bactericidal action over time. A wide variety of antiseptic agents is available, each with varying efficacy against different microorganisms. In clinical ophthalmology, the most commonly used agents include povidone-iodine, chlorhexidine, hexamidine diisethionate, and polyhexamethylene biguanide (PHMB).

The presentation will discuss indications for the use of antiseptics in ophthalmology, evidence-based effectiveness, safety profiles, and potential limitations.

### **Keywords:**

ophthalmology; antiseptics; eye infections



## **SYSTEMIC TIMBER CONSTRUCTION TECHNOLOGY FOR THE CONSTRUCTION OF ZEOZ**

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### **A few words about the author(s):**

Polish academic teacher at the Poznań University of Technology at the Institute of Building Structures. A certified designer with royal international and European qualifications.

### **Abstract:**

A model technology was developed based on a prototype model. A single-family detached residential building with a habitable attic and an integrated garage was chosen as the prototype model for the systemic timber construction technology intended for ZEOZ-type buildings. The prototype building was designed based on prior analyses and guidelines, which also formed the foundation for the prepared construction and implementation project. Low-heat-transfer glazing with a special low-emission coating was applied. According to previously conducted analyses, room layout was carefully planned. Rooms fulfilling sanitary and hygienic functions are situated away from the external partitions, as they require the most heating. This approach avoids situations where there are significant temperature differences on either side of the external partitions, which could result in considerable heat loss.

### **Keywords:**

zero-energy building; prototype model; timber construction; energy performance certificate; airtightness tests



## **WOODEN ARCHITECTURE – PAST OR FUTURE?**

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### **A few words about the author(s):**

Paulina Magdalena Ferenc – student of Architecture at the Cracow University of Technology. As an exchange student, she also studied at the Università IUAV di Venezia. She is active at the University through membership in Scientific Clubs.

### **Abstract:**

The paper describes the correlations between the history of wooden architecture and the contemporary return to this type of construction in connection with the trend of designing sustainable, ecological, and environmentally friendly buildings. A brief historical outline of wooden structures in Poland is presented, taking into account differences depending on the region of the country. Then, the advantages and disadvantages of this type of construction are described and the public opinion on the reception of wooden architecture is presented based on a survey.

The work contains a comparative analysis of parts of the building constructed using three different technologies (CLT, brickwork, and reinforced concrete construction), along with the impact of the construction of the considered parts on carbon dioxide emissions and the correlation between the results. The next part presents contemporary construction works in which wood was used and a summary.

### **Keywords:**

architecture; wooden architecture; ecological building



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## **FUNCTIONALIZED CARBON NANOTUBES WITH OPTIMIZED METAL OXIDES FOR ENHANCED ELECTROCHEMICAL GLUCOSE SENSING**

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### **A few words about the author(s):**

Anna Gawron, MSc Eng., is a Biomedical Engineering graduate, now a researcher at the Centre of Polymer and Carbon Materials PAS. She focuses on carbon nanomaterials, biosensors, and polymer-carbon composites for biomedical applications.

### **Abstract:**

Diabetes is a chronic disease affecting millions of people, characterized by persistently high blood glucose levels that can lead to serious complications. Continuous monitoring of blood glucose is crucial for effective treatment and prevention of diabetes. This increases the need for reliable and accurate glucose measurement technologies. Enzymatic glucose sensors, although widely used, are not stable, and have poor response time and sensitivity under various environmental conditions.

In this study, these challenges were addressed by developing a novel platform using functionalized carbon nanotubes (CNT) integrated with optimized metal oxide nanoparticles for electrochemical glucose sensing.

The properties of CNT including high electrical conductivity, large surface area, and chemical resistance, make them an ideal scaffold for sensor applications. Research focuses on functionalized CNTs combined with optimized metal oxide nanoparticles - zinc oxide, to produce a highly sensitive and selective platform for electrochemical glucose sensing. Metal oxides, including those known for their redox activity, were synthesized with precisely controlled particle size and dispersion on the CNT surface. These studies highlight the potential of engineered nanomaterials in the development of non-enzymatic glucose sensors, offering a promising approach for future glucose monitoring solutions in diabetes care.

### **Keywords:**

non-enzymatic sensors; electrochemical sensors; glucose; carbon nanotube



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## **ANALYSIS OF BETALAINS AND THEIR ANTIOXIDANT ACTIVITY IN AMARANTHUS CRUENTUS L.**

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### **A few words about the author(s):**

Our research team is exploring plant sources rich in bioactive compounds to develop pharmaceuticals and cosmeceuticals, focusing on the biological activity, isolation, and separation of saponins and betalains using chromatographic techniques.

### **Abstract:**

*Amaranthus cruentus* L. is a nutritionally rich plant with health-promoting properties, owing to its high content of protein, minerals, and bioactive compounds like flavonoids, saponins, and betalains. Betalains are divided into red-purple betacyanins and yellow-orange betaxanthins. Due to strong antioxidant, anticancer, and anti-inflammatory properties, betalains are extensively studied for their ability to neutralize free radicals, protecting cells from oxidative stress and chronic and cancerous diseases. Therefore, studying these compounds in *A. cruentus* is vital for uncovering new applications in medicine and nutrition. The objective of this study was to determine the betalain profile of *A. cruentus* using spectrophotometry UV-Vis and HPLC-DAD-ESI-MS techniques and to assess the antioxidant activity of *A. cruentus* extracts via the ABTS radical cation assay. Ten betacyanins were identified in *A. cruentus*: (iso)amaranthin, (iso)celoscristatin, (iso)betanin, (iso)gomphrenin I, (iso)betanidin, and three betaxanthins: valine-betaxanthin, proline-betaxanthin and a newly identified compound, miraxanthin II. The flower extract contained nearly four times more betacyanins and over double the betaxanthins compared to the leaf extract. Additionally, the flower extract demonstrated significant antioxidant capacity, as evidenced by a reduction of 50% of ABTS cation radicals at a concentration of  $89.8 \pm 0.04 \mu\text{g/mL}$ , in contrast to  $135.6 \pm 0.02 \mu\text{g/mL}$  required for the leaf extract.

### **Keywords:**

*Amaranthus cruentus* L.; antioxidant activity; betalains



## **CURRENT STATUS AND FUTURE PROSPECTS OF PHOTOCATALYSTS USED IN METAL-FREE ATRP**

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### **A few words about the author(s):**

Eng. Weronika Zuba is a master's student working in the Chmielarz Research Group in photoinduced atom transfer radical polymerization and developing novel photocatalysts to synthesize functional materials.

### **Abstract:**

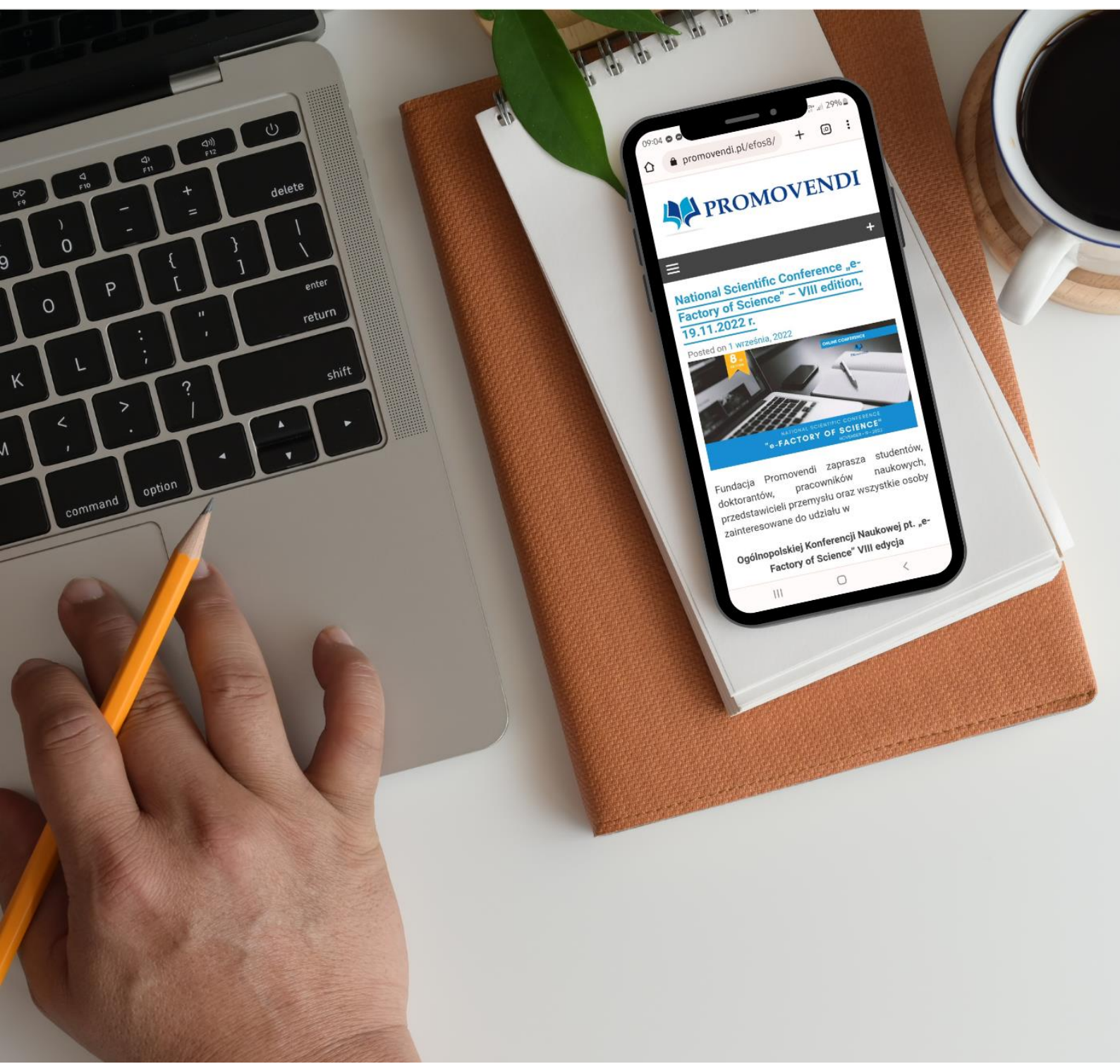
Current research in polymer synthesis focuses on developing environmentally friendly and cost-effective techniques to produce advanced polymeric materials for various applications, including electronics, pharmaceuticals, and medicine. Controlled polymerization techniques enable the synthesis of polymers with predetermined and reproducible properties, well-defined topology, and narrow molecular weight distributions. Photoinduced atom transfer radical polymerization without a metal catalytic complex (metal-free ATRP) is emerging as a technique that combines these features. This method uses light as an external reducing agent, eliminating the need for high temperatures or additional chemicals to achieve controlled polymerization. It employs photosensitive compounds as catalysts that can convert light into chemical energy, thereby removing toxic catalytic complex from the process. Currently, the development of efficient photocatalysts is a major area of investigation, with researchers focusing on shifting the absorption properties of these compounds to the visible region to enable syntheses in more feasible setups. Here, we provide an overview of current knowledge and future perspectives on metal-free ATRP and the applied photocatalysts.

Financial support from the National Science Centre in Poland (SONATA BIS 10, 2020/38/E/ST4/00046).

### **Keywords:**

photoinduced atom transfer radical polymerization; photocatalysts; visible light

# ABSTRACTS OF PRESENTATIONS





## **TAXES IN POLAND – DEFINITION AND SCOPE**

**Joanna Chrzęszcz**

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### **A few words about the author(s):**

I am 32 years old and I study Economics.

### **Abstract:**

The presentation shows what taxes we are currently struggling with in Poland. I explained what indirect and direct taxes are.

### **Keywords:**

tax; declaration; tax rate; legal person





## **EDUSCRUM AND ITS IMPACT ON MOTIVATION IN FOREIGN LANGUAGE LEARNING**

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### **A few words about the author(s):**

Katarzyna Roszkowska is a PhD student at the University of Silesia, studying linguistics, interested in glottodidactics. She conducts research related to teaching foreign languages in the context of language anxiety and motivation.

### **Abstract:**

EduScrum is a teaching method which was used among vocational school students in order to measure the level of motivation in the context of foreign language learning. There were 132 students who took part in the research. The level of their motivation was measured twice- at the beginning (before the introduction of teaching with the EduScrum method) and at the end of the research (once teaching with this method was ended). The tool which was used was a motivation questionnaire based on the questionnaire created by Dornyei and Ushioda. Both intrinsic and extrinsic motivation factors were examined. All the obtained results were analysed and compared which led to the conclusion that the use of EduScrum was partially motivating for vocational school students in the context of foreign language learning on the example of English language.

### **Keywords:**

motivation; language learning; vocational school



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## EXPLORATION OF A NEW URACIL ANALOG AS AN ABC TRANSPORTER INHIBITOR IN TAXOL-RESISTANT MCF-7/TX CELLS

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### **A few words about the author(s):**

Dr. Angelika Długosz-Pokorska, Assistant Professor at the Medical University of Łódź, specializes in biomolecular chemistry and experimental oncology, focusing on anticancer compounds and cancer drug resistance.

### **Abstract:**

Resistance to chemotherapy remains a significant challenge in cancer treatment, often mediated by the overexpression of ATP-binding cassette (ABC) transporters and the activation of NF- $\kappa$ B signaling pathways. In this study, MCF-7/Tx cells, a Taxol-resistant breast cancer cell line, were derived from MCF-7 cells exposed to increasing concentrations of Taxol (Tx). MCF-7/Tx cells exhibited morphological changes, including enlarged size, irregular shape, and increased nucleoli, along with enhanced proliferation and a 24-fold higher resistance to Taxol compared to the parental MCF-7 cells. Gene expression analysis revealed an upregulation of ABCB1, ABCG2, and NF- $\kappa$ B in MCF-7/Tx cells, which correlated with elevated protein levels of ABC transporters. Treatment with Tx further increased these expressions, whereas a novel compound, U-359, demonstrated down regulatory effects on ABC transporters and NF- $\kappa$ B. Co-treatment of MCF-7/Tx cells with Tx and U-359 resulted in a synergistic reduction in ABCB1 and ABCG2 protein levels, indicating potential as multidrug resistance (MDR) inhibitors. Additionally, U-359 enhanced intracellular accumulation of an MDR dye, suggesting its role as an MDR modulator. The dual modulatory effect of U-359 on reducing NF- $\kappa$ B/p65 protein levels, particularly in combination with Tx, underscores its potential in overcoming chemotherapy resistance mechanisms involving ABC transporters and NF- $\kappa$ B signaling in breast cancer cells.

### **Keywords:**

ABC transporters; MDR; Taxol; Tx-resistant modulator



## **SUDDEN CARDIAC DEATH**

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### **A few words about the author(s):**

Guerguer Mohamed Aymen, 3<sup>rd</sup> year medical student in Jan Kochanowski University.

### **Abstract:**

Sudden cardiac death (SCD) is a leading cause of mortality worldwide, primarily resulting from underlying cardiovascular diseases (CVD). Often occurring without warning, SCD is typically due to lethal arrhythmias such as ventricular fibrillation. This paper explores the anatomical, physiological, and pathophysiological aspects of SCD and CVD, emphasizing recent advancements in diagnosis and treatment. Enhanced diagnostic techniques – including electrocardiography (ECG), advanced cardiac imaging, and genetic testing – have improved early detection of high-risk individuals. Innovations in pharmacological treatments, such as anti-arrhythmic drugs and statins, combined with device-based interventions like implantable cardioverter-defibrillators (ICDs) and catheter ablation, have advanced the management and prevention of SCD. Preventive strategies – ranging from lifestyle modifications and public access to automated external defibrillators (AEDs) to precision medicine approaches – are contributing to better outcomes. Integrating these strategies into clinical practice is essential for reducing the global burden of sudden cardiac death.

### **Keywords:**

sudden cardiac death; cardiovascular diseases; ventricular fibrillation; lethal arrhythmias



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## **PHISIO THERAPY AND TRAINING, INJUARY PROBLEMS IN YOUNG FOOTBALL PLAYERS**

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### **A few words about the author(s):**

Mgr. Janina Rzeszot physitherapist.

### **Abstract:**

In the study, experimental football training programs promoted the physical development of boys aged 10-11. Football systematically excludes late maturing boys and favors middle and early maturing boys as chronological age and sporting specialization increase. They differ in body size and degree of maturity. In young football players, this is typical for boys in adolescence, while footballers with different degrees of maturity do not differ in terms of functional capacity, football skills and goal orientation. The incidence of injuries did not differ significantly between late, normal and early maturing players. Physiotherapy for young football players. Despite the re-emergence of cupping among athletes, evidence supporting its effectiveness and safety remains sparse. Nordic hamstring exercises (NHE) to investigate the preventive effect of NHE on the incidence and severity of hamstring injuries in amateur soccer players, incorporating NHE into regular amateur training significantly reduces the incidence of hamstring injuries but does not reduce the severity of hamstring injuries.

### **Keywords:**

physical development; injuries; physiotherapy; exercises



## **INNOVATIVE FAT SUBSTITUTES IN MEAT PRODUCTS**

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### **A few words about the author(s):**

Małgorzata Latoszewska is a student of Food Technology and Human Nutrition at the Faculty of Food Technology. She is a member of the Scientific Circle of Food Technologists. Her main research interest is the development of innovative meat products.

### **Abstract:**

Meat products are a significant source of high-quality protein, vitamins, and minerals. However, they frequently contain substantial amounts of saturated fatty acids, which excessive consumption increases the risk of cardiovascular diseases. There is a rising interest in alternative ingredients that improve the lipid profile of meat products. This study aimed to review advancements in the development and application of fat substitutes in meat products. It utilises a literature review approach, searching for scientific articles on Google Scholar using terms such as "fat replacements in meat products" or "functional meat products". Conventional methods of replacing animal fat with non-lipid ingredients or liquid lipids frequently result in a decline in the overall quality of the final product. Consequently, recent research has focused on combined approaches and new technologies that facilitate structuring multi-component matrices. The most promising formulations encompass hydrogels, oleogels, or bigels, typically based on emulsion systems. Current research has investigated the synergistic effects of various substances, primarily proteins and polysaccharides. These effects are facilitated through both thermal and non-thermal methods (e.g., ionic or ultrasound treatments). Nevertheless, further research should focus on completely replacing animal fat due to still occurring sensory and textural problems in meat products, especially with semi-coarse or coarse ground ingredients.

### **Keywords:**

fat substitutes; meat products; innovative technologies



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## **INFLUENCE OF HOMOGENIZATION TIME AND TEMPERATURE ON THE PHYSICOCHEMICAL PROPERTIES OF COLLAGEN-AGAR EMULSION GELS**

**Małgorzata Latoszevska (1)\*, Iwona Szymańska (2)**

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### **A few words about the author(s):**

Małgorzata Latoszevska is a student of Food Technology and Human Nutrition at the Faculty of Food Technology. She is a member of the Scientific Circle of Food Technologists. Her main research interest is the development of innovative meat products.

### **Abstract:**

A promising approach to developing substitutes for animal fats involves the gelation of oil-in-water (o/w) emulsions. While protein-polysaccharide complexes are commonly used for this purpose, the potential of combining collagen proteins with agar still needs to be explored. The characteristics of o/w emulsions are significantly affected by the time and temperature of their preparation. Thus, this study aimed to investigate the effects of varying homogenization times and temperatures on the physicochemical properties of collagen-agar emulsion gels. The o/w emulsions (50/50 v/v) were prepared by homogenizing the aqueous and oil phases for 1, 2, 3, and 4 minutes at temperatures of 60, 70, and 80°C, followed by refrigerated storage (6±2°C). The gelled emulsions were characterized by evaluating pH value, hardness, resistance to centrifugal/static force, and syneresis. Additionally, the thermoreversibility of these properties was examined. All emulsion gels exhibited more than 92% centrifugal stability, with no statistically significant differences in pH (5.3–5.4) and hardness (15.0–22.0 N). In turn, the forced leakage increased as the homogenization temperature rose to 70 and 80°C. All emulsion gels had thermoreversible properties. However, with the extension of time and temperature of their preparation, the degree of syneresis increased. Notably, the emulsion gel homogenized for 2 minutes at 60°C exhibited the greatest stability in its primary and secondary states.

### **Keywords:**

animal fat substitutes; emulsion gels; collagen proteins; agar; physical stability



# **APPLICATION OF BIOINFORMATICS TOOL IN METABOLIC PROFILING FOR IN VITRO MODEL STUDY OF METABOLIC SYNDROME IN HORSES**

**Natalia Rogosch**

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## **A few words about the author(s):**

Natalia Rogosch holds a Master of Science in Engineering in Bioinformatics. Her interests include experimental biology, omics sciences, and their medical applications. She is currently advancing her skills in Data Science, focusing on AI.

## **Abstract:**

Equine Metabolic Syndrome (EMS) is a metabolic disorder marked by insulin resistance, obesity, and an increased risk of laminitis, posing significant challenges to both equine health and the breeding industry. This study provides a comprehensive metabolic analysis of undifferentiated adipose-derived stem cells (EqASCs) from healthy horses and those affected by EMS. Liquid chromatography-mass spectrometry (LC-MS) and bioinformatic analysis were utilized to compare metabolic profiles between the two groups. The study enabled the identification of 28 metabolites that showed significant differences in EqASCs from EMS-affected horses compared to healthy controls. Further analysis revealed 10 key metabolic pathways influenced by these metabolites. Glutamate and glutamine emerged as the most critical metabolites, linked to seven metabolic pathways. Their involvement spans pathways related to amino acid synthesis, oxidative phosphorylation, and de novo lipogenesis, underscoring their central role in cellular growth and homeostasis in undifferentiated EqASCs.

## **Keywords:**

bioinformatics; metabolomics; mass spectrometry; Equine Metabolic Syndrome; Equine Stem Cells



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## **STUDY ON DEVELOPMENT OF INNOVATIVE CONTROL OF LIFTING EQUIPMENT RPZP.01.01.00-32-0024/20**

**Dorota Kocoń, Jarosław Dominkiewicz\***

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### **A few words about the author(s):**

Employees of the company 'Elwiko Stanisław Dropik' from the marketing and development departments.

### **Abstract:**

The presentation focused on research into innovative control systems for passenger elevators, specifically addressing rope wear measurement and cabin position tracking. The study aimed to improve elevator safety and maintenance. Advanced measurement systems were developed to monitor rope wear, helping prevent malfunctions by predicting when ropes need replacing. Computer simulations were created to optimize control systems and predict elevator behavior. A mobile app was also designed for remote monitoring and maintenance. To validate the solutions, a full-scale elevator test setup with three floors was built, enabling real-world testing of the systems. The project seeks to enhance elevator reliability and streamline maintenance processes.

### **Keywords:**

passenger lifts; control system; laser





## **ANTIOXIDANT PROPERTIES OF EXTRACTS FROM GREEN PARTS OF CARROT AND PARSLEY**

**Zuzanna Jurkiewicz (1)\*, Karolina Koprowska (2, 3), Andrzej Leniart (1)**

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### **A few words about the author(s):**

I am a 3<sup>rd</sup>-year student of the first-cycle studies in the field Chemistry of Cosmetics and Pharmaceuticals with Business Elements at the Faculty of Chemistry, University of Lodz and an active member of the Cosmetic Chemistry Scientific Club.

### **Abstract:**

Plant extracts find their application in the cosmetic, pharmaceutical and food industries. They exhibit moisturizing, flavoring, medicinal, and, above all, antioxidant properties. Due to the latter, they are used not only as active substances but also as antioxidants that preserve the product. Nowadays, consumers increasingly prefer products with the highest possible content of natural materials. Although there are no conclusive reports on the toxicity of synthetic antioxidants, products containing plant extracts are more likely to be chosen by customers for emotional reasons.

Separating individual compounds with antioxidant properties from a complex plant matrix is difficult and time-consuming. In addition, antioxidants often demonstrate synergistic effects, meaning that measuring the concentration of a single antioxidant compound does not fully capture the extract's overall antioxidant potential. Thus, the concept of total antioxidant capacity (TAC) was introduced, which evaluates a sample's ability to scavenge free radicals and reduce metal ions.

In the present study, extracts of carrot and parsley leaves were obtained using the Soxhlet extraction method. Then, their total antioxidant capacity was assessed by UV-VIS spectrophotometry using the FRAP (Ferric Reducing Antioxidant Power) and Folin-Ciocalteu.

### **Keywords:**

antioxidation; antioxidant properties; total antioxidant capacity; parsley; carrot



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## **RAMAN IMAGING – A VALUABLE TOOL FOR TRACKING FATTY ACID METABOLISM – NORMAL AND CANCER HUMAN COLON SINGLE-CELL STUDY**

**Monika Kopec\*, Karolina Beton-Mysur, Beata Brożek-Pluska**

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### **A few words about the author(s):**

Monika Kopec is an Assistant Professor in the Institute of Applied Radiation Chemistry, Faculty of Chemistry at the Lodz University of Technology. Her research interests focus on Raman spectroscopy and Raman imaging applications in cancer diagnostics.

### **Abstract:**

The altered metabolism of lipids is a key factor in many diseases including cancer. Therefore, investigations into the impact of unsaturated and saturated fatty acids (FAs) on human body homeostasis are crucial for understanding the development of lifestyle diseases. We present an approach to study the impact of palmitic (PA), linoleic (LA), and eicosapentaenoic (EPA) acids on human colon normal (CCD-18 Co) and cancer (Caco-2) single cells using Raman imaging and spectroscopy.

Analysis of Raman band intensity ratios typical for lipids, proteins, and nucleic acids (I1656/I1444, I1444/I1256, I1444/I750, I1304/I1256) proved that using Raman mapping, we can observe the metabolic pathways of FAs in ER, which is responsible for the uptake of exogenous FAs, de novo synthesis, elongation, and desaturation of FAs, in mitochondria responsible for energy production via FA oxidation, in LDs specialized in cellular fat storage, and in the nucleus, where FAs are transported via fatty-acid-binding proteins, biomarkers of human colon cancerogenesis.

We hope that demonstrated contribution will open new possibilities in molecular biology to better understand colon cancer development.

This research was funded by grant No. W3/6D/2022 from the FU2N—Young Scientists' Skills Improvement Fund at the Lodz University of Technology.

### **Keywords:**

fatty acids; Raman spectroscopy; Raman imaging; colon cancer; biomarkers



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## **ELECTRIC CARS: CHALLENGES AND IMPACT ON THE ENVIRONMENT**

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### **A few words about the author(s):**

I am management and production engineering student and I have been a member of the Qualitas student research club.

### **Abstract:**

Electric vehicles were once highly favored in the 19th and early 20th centuries, making up approximately one-third of car sales in the United States by 1900, thanks to their silent operation and emission-free performance. However, the introduction of cost-effective gasoline-powered cars contributed to a decline in electric vehicle manufacturing. In recent years, the EV sector has experienced remarkable growth, accounting for 14 percent of global passenger car sales in 2022, driven largely by increased environmental consciousness during the COVID-19 pandemic. Nevertheless, several obstacles remain, particularly in securing dependable and affordable electricity sources and advancing battery technology. Essential battery characteristics - such as energy and power density, efficiency, recharge duration, lifespan, and safety - are vital for optimal EV functionality. While electric vehicles offer significant environmental benefits, including reduced greenhouse gas emissions and diminished reliance on fossil fuels, they also present challenges associated with battery production, energy sourcing for charging, and disposal. The trajectory of electric vehicles hinges on breakthroughs in battery innovation, with developments like solid-state batteries promising improved capacity, faster charging times, and enhanced safety, thus paving the way for a more sustainable transportation future.

### **Keywords:**

electric car; environment; impact



## **DATA QUALITY IN THE INFORMATION SOCIETY. RESEARCH ON SOLVING THE DEW POINT PROBLEM FOR STATIONS MONITORING AIR QUALITY IN TERMS OF SUSPENDED PARTICULATE MATTER PM 2.5 AND PM 10.**

**Piotr Matysik, Grzegorz Gniadek\***

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### **A few words about the author(s):**

Dr. Eng. Piotr Matysik is responsible for research in the field of air quality and implementation of control algorithms in the SW embedded area. He gained his scientific experience at AGH in the Department of Automation and Robotics. Grzegorz Gniadek, MA.

### **Abstract:**

Low-cost external stations using optical sensors are often used for measuring air quality in terms of suspended particulate matter PM<sub>2.5</sub> and PM<sub>10</sub>. However, the physics of these sensors introduces a significant error (above 50%) under conditions where the dew point is present. The construction of the measurement station impacts the quality of the readings. When the examined air is introduced into the measurement station in a controlled manner (temperature and humidity parameters), it allows for measurements with low error rates (between 5% and 15%).

The main research problem that this project aims to solve is mitigating the effect of the so-called dew point in external stations when measuring suspended particulate matter in the air.

A station was designed to solve the dew point problem. A prototype model was created for laboratory testing, along with 13 prototypes for preliminary environmental studies.

The research was conducted:

In laboratory conditions within a climate chamber for the prototype.

In natural environmental conditions over a 3-month period for 3 prototypes.

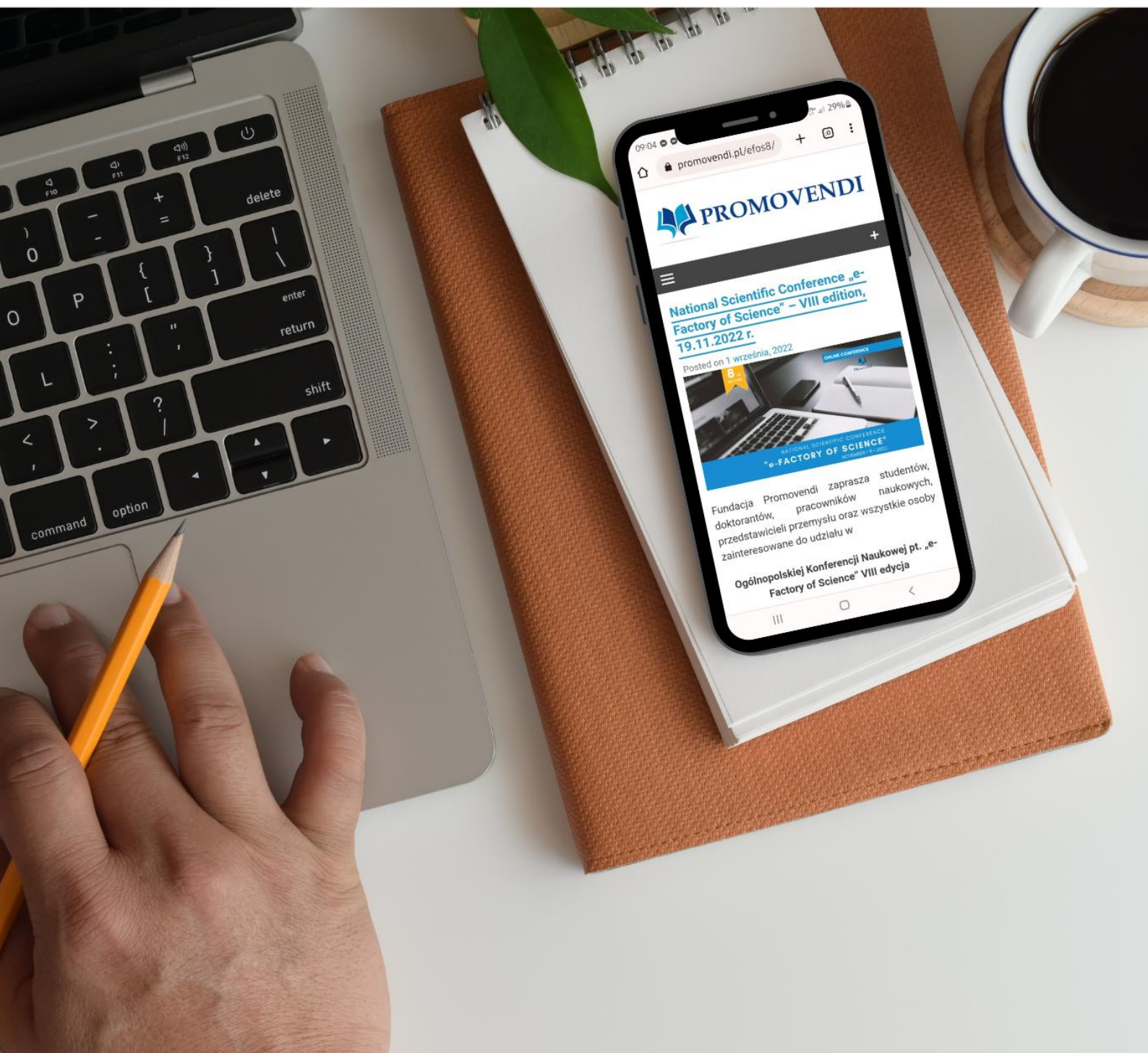
In natural environmental conditions over a 12-month period for 10 prototypes.

The highest hourly deviation was 16%. During the autumn-winter months, the deviations were higher, which is associated with the frequent occurrence of the dew point problem. During this period, deviations ranged from 10% to 16%. In the warmer months, when the dew point issue is less frequent, deviations ranged from 3% to 10%.

### **Keywords:**

air quality; dew point issue; particulate matter PM<sub>2.5</sub>; PM<sub>10</sub>; measurement station

# ABSTRACTS OF POSTER





## **THE IMPACT OF THE CSRD DIRECTIVE ON CORPORATE SUSTAINABILITY STRATEGIES**

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### **A few words about the author(s):**

I am student of Management and Production Engineering at the University of Economics in Poznań. I'm member SQN Qualitas scientific circle, where I am expanding my knowledge in environmental and quality standards. My passions are aviation and gliding.

### **Abstract:**

The Corporate Sustainability Reporting Directive (CSRD) significantly impacts corporate sustainability strategies by introducing new ESG reporting requirements for a wider range of companies and enforcing the principle of "double materiality". Mandatory verification of reports enhances their credibility, strengthening the trust of investors and stakeholders. In response to CSRD, companies are transforming their strategies, focusing on emissions reduction, efficient resource management, and diversity policies. Key changes, along with the challenges and benefits arising from the directive's implementation, are examined.

### **Keywords:**

CSRD; ESG



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## **ORAL COLONIZATION OF DENTURE USERS BY GRAM-NEGATIVE BACILLI**

**Adam Beben (1)\*, Katarzyna Juszcuk (2), Ewa Kwapisz (2),  
Iwona Ordyniec-Kwaśnica (1), Katarzyna Garbacz (2)**

*(1) Department of Dental Prosthetics, Medical University of Gdańsk*

*(2) Division of Oral Microbiology, Medical University of Gdańsk*

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### **A few words about the author(s):**

Adam Beben D.D.S. – assistant in the Department of Prosthodontics at the Medical University of Gdansk. His interests include microbiology of prosthetic restorations of oncology patients.

### **Abstract:**

Patients using removable dentures (settling acrylic dentures) often struggle with prosthetic stomatopathies and other oral conditions caused by bacteria colonizing the oral cavity. This study aimed to determine the frequency of Gram-negative bacilli species colonizing patients using dentures.

Oral and denture swabs were collected from 30 patients of the Dental Prosthetics Clinic at the Medical University of Gdańsk. Samples were cultured on Columbia and MacConkey agar. The cultures were incubated at 37°C under aerobic conditions for 24 hours. The cultured strains were identified by biochemical tests (API ID strips) and, in case of doubtful identification, using matrix-assisted laser desorption/ionization-time of flight mass spectrometry (MALDI-TOF MS).

The study's findings revealed a significant risk, with Gram-negative bacilli being isolated in materials from 30% of patients using settling removable dentures. Of these, 21.4% were identified as *Citrobacter freundii*. The next most frequently isolated bacilli included species of *Escherichia coli*, *Klebsiella oxytoca*, and *Pseudomonas* spp. This underscores the potential risk of bacterial colonization in denture users.

Although isolated Gram-negative bacilli are considered relatively pathogenic, they may be a reservoir of infection for elderly patients using removable prosthetic appliances. Implementing preventive measures and education on denture hygiene may help prevent infections caused by opportunistic bacteria.

### **Keywords:**

Gram-negative bacilli; Enterobacterales; removable dentures



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## **ORAL OCCURRENCE OF CANDIDA SPECIES IN PATIENTS USING REMOVABLE DENTURES**

**Katarzyna Juszczyk (1)\*, Adam Bęben (2), Ewa Kwapisz (1),  
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### **A few words about the author(s):**

MSc Eng. Katarzyna Juszczyk – specialist at the Department of Oral Microbiology at the Medical University of Gdańsk. Her scientific interests include oral microbiology and antimicrobial resistance of oral microorganisms.

### **Abstract:**

Recently, the frequency of infections caused by *Candida* species has increased. This problem affects the aging population, particularly individuals who use dentures exposed to oral candidiasis. The aim of the study was to analyze the occurrence of *Candida* spp. in patients using removable dentures. The swabs were taken from 30 individuals using dentures, most of whom were women (60%). Swabs were collected directly from the oral cavity and dentures and cultured on Columbia and Sabouraud agar media. They were then incubated for 24 to 48 hours at 37°C under aerobic conditions. *Candida* spp. were identified based on morphological characteristics, filamentation tests, assessment of growth on chromogenic media (CHROMagar™ *Candida*, Graso, Poland), and biochemical tests (*Candida*–Screen, Erba Lachema, Czech Republic). In most cultures (70%) *Candida* spp. were isolated. The dominant oral species in the tested materials was *Candida albicans* (33.3%), followed by *C. tropicalis* (23.3%) and *C. glabrata* (10%). Less frequently isolated were *C. guilliermondii* (6.7%), *C. kefyr* (6.7%), *C. krusei* (6.7%), and *C. lipolytica* (6.7%). The least frequently isolated species was *C. lusitaniae* (3.3%). The use of dentures increases the risk of colonization by *Candida* species, indicating the need to monitor this phenomenon and search for effective eradication methods, especially in patients predisposed to infections.

### **Keywords:**

*Candida* spp.; oral candidiasis; removable dentures





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## THE OCCURRENCE OF GRAM-NEGATIVE BACILLI IN THE ORAL CAVITY IN ADOLESCENTS: THE SOPKARD-JUNIOR STUDY

**Marta Katkowska (1)\*, Katarzyna Garbacz (1), Ewa Kwapisz (1),  
Klaudia Suligowska (2, 3), Aida Kusiak (4), Dominika Cichońska (4)**

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### **A few words about the author(s):**

dr. n med. Marta Katkowska, assistant professor at the Department of Oral Microbiology, Medical University of Gdańsk, studies the occurrence of bacteria in the oral cavity and their drug resistance profile and the occurrence of virulence factors.

### **Abstract:**

The oral cavity is one of the most biologically complex niches in the body and is a major site of entry for bacteria. However, not all microorganisms that appear in the oral cavity can survive and become oral microbiota. The composition of the oral microbiota is dynamic and changes over human life. Colonization of the upper respiratory tract by GNB predisposes patients, especially immunocompromised or hospitalized, to bacterial infections such as pneumonia, bacteremia, or urogenital infections. For these reasons, the study conducted within the SOPKARD Junior program addresses the occurrence of oral colonization by GNB among healthy adolescents. Oral samples were collected from 182 adolescents, aged 13-14 years, without long breaks due to hospitalization or chronic diseases. Bacterial strains identified using classical methods, and was verified by the matrix-assisted laser desorption ionization time-of-flight mass spectrometry (MALDI-TOF MS) method. From 182 oral swabs collected from healthy adolescents, 68 GNB were isolated (37.4%), including Enterobacterales (46/68-67.6%) and non-fermenting bacilli (22/68-32.4%). The most common GNB in our study were *Enterobacter cloacae*, followed by *Pseudomonas* spp. and *Serratia* spp., 22.1%, 19.1%, and 19.1% respectively. The origin of GNB in the oral cavity is not yet clear. Their presence may be due to ingestion of contaminated drinking water and food, poor personal hygiene or environmental pollution.

### **Keywords:**

Gram-negative bacilli (GNB); oral carriage; oral colonization



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## **ASSESSMENT OF THE STABILIZATION OF CORNEAL TOPOGRAPHIC PARAMETERS AFTER DESCEMET'S MEMBRANE TRANSPLANTATION IN LONG-TERM FOLLOW-UP**

**Monika Kuśmierz-Wojtasik\*, Anna Machalińska**

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### **A few words about the author(s):**

The co-author of scientific publications in foreign journals (IF 6,938), congress reports, the winner of the Student Grant for the Scientific Project and the author of the work awarded at the Conference of Medical University Students (3<sup>rd</sup> place).

### **Abstract:**

**Introduction:** The aim of the study was to assess the dynamics of changes in corneal topography in healthy patients and with comorbidities who underwent the Descemet's membrane endothelial keratoplasty (DMEK) procedure in long-term follow-up.

**Materials and methods:** The study group consisted of 29 patients, 4 of whom had both eyes operated on. Best corrected visual acuity (BCVA), endothelial cell count (ECC), and central corneal thickness (CCT), mean keratometry (MK), mean astigmatism (MA), asymmetry of astigmatism (AA), and higher order aberrations (HOA) were analyzed before and after at 12, 24 and 36 months. Data were measured and calculated using anterior segment optical coherence tomography (AS-OCT) acquired with a CASIA2 (Tomey, Nagoya, Japan).

**Results:** Although BCVA significantly improved one year after the procedure in both healthy and comorbid patients, BCVA fluctuations were observed in the latter group. Long-term observation revealed a reduction in ECC and CCT in the 12th month, stabilizing in the 24th and 36th months. Anterior MK values remained stable throughout, while the posterior levels stabilized after 12 months. Total MK values showed no change over 36 months. No significant differences were observed between preoperative and 36-month values. Significant reductions in MA, AA, and HOA were observed until the 12th month, followed by stabilization.

**Conclusions:** DMEK brings long-term benefits to patients, including improved visual acuity and topographic parameters.

### **Keywords:**

DMEK; HOA; UT-DSAEK; astigmatism; keratometry



## **GLP-1 ANALOGS VS PERIODONTITIS PROGRESSION IN DIABETES TYPE 2**

**Eryk Prajwos (1)\*, Malgorzata Król (2)**

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*(2) Department of Biochemistry at the Pomeranian Medical University in Szczecin*

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### **A few words about the author(s):**

Graduates of Pomeranian Medical University and members of the Student Scientific Society in the Department of Biochemistry at Pomeranian Medical University in Szczecin.

### **Abstract:**

Type 2 diabetes and periodontitis are interlinked chronic conditions, with diabetes often worsening periodontitis severity. Periodontitis, an inflammatory disease affecting the supporting structures of teeth, is intensified by diabetes-induced hyperglycemia, which increases pro-inflammatory molecules like IL-1 $\beta$ , IL-6, TNF- $\alpha$ , and matrix metalloproteinases (MMPs). Glucagon-like peptide-1 (GLP-1) receptor agonists, used for diabetes management, show potential in reducing periodontal inflammation. These agents lower pro-inflammatory cytokines and may impact oral tissues directly, as GLP-1 receptors are present in oral and salivary glands. By improving glycemic control and exhibiting tissue-protective effects, GLP-1 receptor agonists offer promise as adjunctive treatments for managing periodontitis in diabetic patients. Further research is needed to understand the mechanisms by which GLP-1 receptor agonists can improve oral health outcomes.

### **Keywords:**

diabetes; periodontitis; GLP-1 analogs; glycemic control; oral health



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## THE EFFECT OF THE ADDITION OF ORGANIC AND INORGANIC MG SALTS ON THE EFFICIENCY OF BIOMATERIAL-BIOMASS GROWTH FROM IN VITRO CULTURES

**Małgorzata Poliszak (1), Maja Tomczyk (1), Joanna Zontek-Wilkowska (1),  
Żaneta Binert-Kusztal (1), Bożena Muszyńska (2), Agata Krakowska (1)\***

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### **A few words about the author(s):**

A group of scientists conducting research in the field of pharmaceutical biomaterials.

### **Abstract:**

Mushrooms have not only aromatic and taste values, but also constitute a valuable source of health-promoting organic substances (including phenolic, indole compounds) and inorganic substances (micro and macroelements). Hence, they can be used to supplement deficiencies of the above-mentioned substances and provide an alternative to dietary supplements. In addition, biomass can be used as a natural biomaterial with unique properties, e.g. in the form of a matrix for nanoparticles. Therefore, an important aspect is the appropriate conduct of the mycelium culture stage in vitro, which allows for the control of the mycelium growth course in order to obtain a specific/assumed quantitative and qualitative composition of the biomass. In the presented research work, the substrate, liquid medium according to Ododux was modified by adding organic salt  $C_{12}H_{10}Mg_3O_{14} \cdot 9H_2O$  and inorganic salts ( $MgCl_2 \cdot 6H_2O$ ,  $MgSO_4 \cdot 7H_2O$ ,  $Mg(NO_3)_2 \cdot 6H_2O$ ,  $Mg_3(PO_4)_2 \cdot 5H_2O$ ) for in vitro culture of mushrooms of the genus *Pleurotus* spp. The obtained biomass was separated by filtration and then subjected to lyophilization. It was shown that the addition of salt increases the biomass growth (growth at a level above 30% compared to the control). The best results were obtained with the addition of salt:  $Mg_3(PO_4)_2 \cdot 5H_2O$  (*P. citrinopileatus*, *P. djamor* over 55% increase in biomass compared to the control), whereas in the case of the addition of salt  $Mg(NO_3)_2 \cdot 6H_2O$  no mycelium growth was observed for any of the *Pleurotus* spp.

### **Keywords:**

biomass; biomaterial; in vitro cultures; enrichment



## **APPLICATION OF BIOMATERIAL-BIOMASS FROM IN VITRO CULTURES AS AN EFFECTIVE SORPTION MATERIAL**

**Anna Jeziorek (1), Kamila Ryś (1), Małgorzata Suchanek (2), Żaneta Binert-Kusztal (1), Joanna Zontek-Wilkowska (1), Bożena Muszyńska (3), Agata Krakowska (1)\***

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### **A few words about the author(s):**

An interdisciplinary team of scientists working on pharmaceutical biomaterials.

### **Abstract:**

Studies on the accumulation of metals in mushrooms have been conducted for many years. Initially, mushrooms were used as natural environmental bioindicators. Later, their mycoremediation potential was noticed. The natural ability of mushrooms to accumulate metals results, among others, from the presence of a low-molecular protein - metallothionein. This protein has a strong affinity for metal cations. In the presented work, it was proposed to combine their natural ability to bind metals with the use of unique, proprietary synthesized nanopowders with sorption properties, thus obtaining targeted mycosorption. Two commercially available powders were used for the experiment -  $\text{TiO}_2$  and  $\text{Fe}_2\text{O}_3$ , as well as proprietary YSZ nanopowders with the addition of neodymium (obtained by calcination and hydrothermal method). As the obtained results show, both fungi and powders accumulate elements (Mg, Zn, Cd and Pb) in over 90%. However, nanopowders do not desorb them back, hence the possibility of their use in mushroom cultures. As a result, toxic metals are eliminated by their permanent binding to the used nanopowder, which results in the lack of their desorption. As a consequence, safety for humans is ensured, which was confirmed by tests conducted in a model digestive system.

### **Keywords:**

biomass; biomaterial; sorption; mycoremediation



## **EFFECTIVENESS OF CEFIDEROKOL® COMBINATION WITH SILVER NANOPARTICLES (AGNPS) ON GRAM(+) AND GRAM(-) BACTERIA**

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### **A few words about the author(s):**

An interdisciplinary team of scientists working on new applications of pharmaceuticals.

### **Abstract:**

Creating new strategies in the treatment of difficult-to-heal wounds is still a big challenge. According to WHO (FACT SHEET-SDG-FINAL25-10-17), pressure ulcers or difficult-to-heal wounds are one of the most common non-communicable diseases of civilization, hence the search for effective ways of treating them and/or alleviating the course of the disease is one of the priorities of modern medicine. A common problem in the case of existing wounds is bacterial infections, the treatment of which is difficult due to the increasingly frequent drug resistance of bacteria resulting from the rapid increase in the use of antibiotic therapy, which is often unjustified. Hence, the search for new solutions is fully justified. In the presented experiment, the use of Cefiderocol (FETROJA®) - a siderophore cephalosporin, with confirmed effect on gram-negative bacterial infections, was proposed. This preparation, applied in the form of an infusion, was used in combination with Ag nanoparticles externally. The effect of their combination on two strains of bacteria gram (+) and gram (-) was tested. Positive effect on gram (-) strains was confirmed. It was shown that the combination of Ag nanoparticles may be an alternative with a maximum spectrum of antibacterial action in combination with an innovative antibiotic.

### **Keywords:**

Cefiderocol; nanoparticles; bacteria; application



## **SURFACE PREPARATION AND ANTIBACTERIAL PROPERTIES**

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### **A few words about the author(s):**

A scientific team conducting research on the properties of pharmaceutical biomaterials.

### **Abstract:**

Inspired by biomimetic structures of plants with antibacterial surfaces, we attempted to analyze the effect of the etching medium selection on the physicochemical parameters of the surface, such as roughness, hierarchical structure, wettability, optical properties and the ability to form oxide layers in the etching process. The model research surface, due to its confirmed inert character, was sodium-lime-silicate glass (SLS), which was etched in two different media. Hydrofluoric acid at a concentration of 0.5M, 1M and 5M - the first etching medium, acetic acid at a concentration of 0.5M, 1M and 5M - the second etching medium. The optimal etching time was selected for each process. The optimized samples were subjected to XPS analysis to determine the oxygen layer on the surface.

### **Keywords:**

biomaterials; properties; surface; modification



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## **MEDICAL TRAINING OF THE MANED NYALA (TRAGELAPHUS ANGASII) HERD CONDUCTED IN THE BYDGOSZCZ ZOO, BASED ON POSITIVE REINFORCEMENT OF THE EXPECTED BEHAVIOR PATTERN**

**Dominika Gulda\*, Malwina Jankowska, Agnieszka Lewińska**

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### **A few words about the author(s):**

PhD. D. Gulda - researcher of the behavior, welfare, and environmental needs of species in ZOOs.  
MSc. M. Jankowska – Zoophysiotherapist and zookeeper, focused on animal welfare.  
MSc. A. Lewińska – Zootechnician and zookeepers, enthusiast of wildlife and landscapes.

### **Abstract:**

Medical training of animals in zoos is a key element in ensuring the welfare of animals and the effective management of the health of captive populations. The article presents the use of positive behavioural reinforcement (PRB) techniques in the training of a heterogeneous group of maned antelopes, aimed at regular control of animal body weight. Traditional medical methods can be stressful for animals and zookeepers, which is why positive behavioural reinforcement methods are increasingly used.

The PRB program for nyalas consisted of nine steps, starting from the selection of a motivator, through the development of a behavior pattern, its obtaining, to the consolidation of the results obtained.

After three months of training, all individuals of the maned antelopes regularly participated in weighting sessions, showing no signs of anxiety.

Systematic monitoring of the animal's condition and nutrition, including the possibility of visual inspection of the animal, weight control and the possibility of administering supplements, deworming agents or antiseptics, are key elements ensuring proper animal welfare.

The results of the study indicate that PRB can effectively increase animal cooperation, reduce stress associated with medical procedures, and improve their overall health and welfare. The procedure is not intended to tame or anthropomorphize animals.

### **Keywords:**

zoological garden; welfare; medical training of animals; behaviour; antelopes





## **MONITORING ADAPTIVE STRESS IN A PAIR OF LYNXES (LYNX LYNX) DURING ENCLOSURE CHANGE AT THE ZOO**

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### **A few words about the author(s):**

DVM A. Wojtowicz – Zoo veterinarian, wildlife protector, and felidae enthusiast. Ph.D. D. Gulda – researcher in animal behavior, welfare, and zoo environmental needs. MSc. B. Pionke – carnivorous mammals zookeeper, designing training programs for wild species.

### **Abstract:**

Due to renovation work on the existing lynx enclosure, a pair of lynxes (*Lynx lynx*) was temporarily relocated to a new enclosure. This study aimed to monitor the adaptive stress induced by this environmental change using behavioral and physiological assessment methods.

Stress levels were evaluated through multiple complementary approaches. Thermography enabled continuous monitoring of body surface temperature, indicating autonomic nervous system responses to stress. Rapid temperature fluctuations served as markers of acute physiological stress. Weight monitoring provided insights into potential metabolic changes linked to stress, with weight loss signaling possible chronic stress impacting health. Ethogram analysis, observing interactions between individuals, helped assess social comfort; increased conflicts suggested elevated stress and adaptation challenges. Monitoring food intake patterns served as an indicator of appetite and welfare, with reduced food interest often reflecting psychological stress.

Additionally, analyzing behavior related to the use and acceptance of new enclosure elements shed light on environmental acclimatization. High activity and exploration indicated gradual adaptation, while avoidance suggested anxiety or discomfort.

These results offer detailed insights into stress and adaptation processes in lynxes during enclosure changes and can inform welfare management practices for predatory species, especially when temporary relocations are necessary.

### **Keywords:**

lynx; welfare; zoo; thermography; indicator of stress



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## **PREPARATION OF EDUCATIONAL EXHIBITS IN THE ZOO: THE CASE OF THE TARANTULA EXHIBIT (THERAPHOSIDAE)**

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### **A few words about the author(s):**

Ph.D. Eng. Monika Lik – Zoologist, researcher focused on the welfare and health of wild animal species, member of the Scientific-Didactic Council at Bydgoszcz Zoological Garden, and passionate wildlife enthusiast.

### **Abstract:**

Using live animals for educational purposes can be challenging, especially with venomous, fast-moving, or phobia-inducing species like spiders—particularly tarantulas (Theraphosidae). To allow visitors to observe such species closely, many zoos display preserved specimens in showcases accessible during tours and educational activities. These specimens are sourced from animals that died naturally and are preserved to prevent decomposition while maintaining their natural appearance.

This study aimed to prepare taxidermy specimens from spider samples for educational displays. Spider preservation methods vary. The simplest involves submerging the specimen in a preservative liquid, usually 80% ethanol, but this method can obscure visibility and cause body bristles to clump, detracting from the specimen's natural look.

Taxidermy offers a better preservation method. Although more complex, it allows for a lifelike appearance. Key steps involve removing internal organs from the opisthosoma (the spider's main body part, excluding legs) to prevent decay, then filling it to approximate its natural shape. The choice of filling material depends on the preparer's experience, and extreme care is needed to protect the chitinous cuticle and retain the spider's natural appearance.

### **Keywords:**

tarantula; education at the zoo; exhibit, spider



## **LOCATION AND PROTECTION OF THE SITES OF SCARLET WAXCAP (*HYGROCYBE COCCINEA*) AND ONION-STALK PUFFBALL (*SCLERODERMA CEPA*) IN THE ZOO AS AN ELEMENT OF ENVIRONMENTAL EDUCATION**

**Agnieszka Lewińska, Monika Lik\***

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### **A few words about the author(s):**

M.Sc. A. Lewińska – Zookeeper in the ungulate mammals section, wildlife, plant, and landscape enthusiast. Ph.D. M. Lik – Zoologist and researcher focused on the welfare and health of wild species, member of the Scientific-Didactic Council at Bydgoszcz ZOO.

### **Abstract:**

This study presents findings on the location of two rare fungi, the Scarlet Waxcap (*Hygrocybe coccinea*) and Onion-Stalk Puffball (*Scleroderma cepa*), within a zoo setting. Both are endangered and listed in Poland’s Red Book of Fungi: *H. coccinea* as "Vulnerable" (VU) due to diminishing meadow habitats, and *S. cepa* as "Near Threatened" (NT) from forest and soil degradation.

The zoo provides a unique opportunity to display these fungal species, enhancing visitor engagement with lesser-known ecosystem components. By incorporating fungi in educational displays, the zoo raises awareness of biodiversity, emphasizing the importance of flora alongside fauna. This approach supports conservation by highlighting the essential roles fungi play, such as fostering plant growth through mycorrhizal relationships and improving soil structure.

The marked locations and educational information on these species underscore fungi’s integral role in ecosystems, promoting a balanced view of conservation that includes native species preservation within their habitats. The zoo's efforts thus reinforce biodiversity conservation and offer valuable insights into ecosystem interdependence.

### **Keywords:**

fungi; environmental education; zoo; natural habitats; biodiversity



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## **DEEP LEARNING IN METABOLOMICS: APPLICATIONS, CHALLENGES, AND OPPORTUNITIES**

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### **A few words about the author(s):**

Natalia Rogosch holds a Master of Science in Engineering in Bioinformatics. Her interests include experimental biology, omics sciences, and their medical applications. She is currently advancing her skills in Data Science, focusing on AI.

### **Abstract:**

Metabolomics refers to the comprehensive study of small molecules, known as metabolites, which are generated through biochemical processes within living organisms. Metabolites serve as key regulators of cellular functions, and their concentrations can provide insights into an organism's physiological state, disease progression, and responses to external factors such as diet or pharmaceuticals. Consequently, metabolomics has become an essential tool in precision medicine, facilitating the molecular-level monitoring of physiological changes. In recent years, deep learning (DL) has gained significant traction as a powerful tool for metabolomic data analysis, introducing novel approaches for the processing and interpretation of large-scale datasets. This review explores the latest advancements in the application of DL to metabolomics, with a focus on its role in raw data processing, metabolite identification, biomarker discovery, and the prediction of metabolic pathways. Additionally, the review highlights challenges associated with implementing DL in metabolomics, future development perspectives, and key conclusions drawn from current research.

### **Keywords:**

metabolomics; Deep Learning (DL)



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## **SYNTHESIS AND INVESTIGATION OF ADVANCED MG-Fe NANOCOMPOSITE FORMED BY THE DECOMPOSITION OF TERNARY MAGNESIUM-IRON HYDRIDE**

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### **A few words about the author(s):**

A. Baran, PhD, a graduate of the Materials Engineering program at the Military University of Technology and assistant professor since 2024. Her scientific work is primary focused on the solid-state hydrogen storage materials.

### **Abstract:**

A crucial problem with forming Mg-Fe composites regards the element's non-solubility and absence of the intermetallic compound (e.g., Mg<sub>2</sub>Fe). Thus, this research aims to synthesize Mg<sub>2</sub>FeH<sub>6</sub> hydride and use it as a precursor to form an Mg-Fe nanocomposite via controlled thermal desorption. The primary purpose of the study is to examine the synthesis and properties of advanced bulk magnesium-iron (Mg-Fe) nanocomposites. The idea of forming the nanocomposites is connected with the Mg<sub>2</sub>FeH<sub>6</sub> hydride decomposition, followed by mechanical compacting. We think that the composite structure consists of a magnesium matrix with nanometric-sized iron particles incorporated into it will be composed. The newly developed material may possess unique properties due to nanostructurization.

Four samples with different stoichiometry (MgH<sub>2</sub>-Xwt.%Fe, X=5,10,25,50) were ball milled, hydrogenated in order to obtain ternary magnesium-iron hydride and decomposed (via home-made Sievert's type apparatus) for the compacting purposes. As a result, XRD (X-ray diffraction), DSC (differential scanning calorimetry), and SEM (scanning electron microscope) measurements were employed to see the chemical and phase composition, thermal history, and morphology of the powders.

### **Keywords:**

metal hydrides; Mg-Fe nanocomposite; compacting



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## **RISK ASSESSMENT IN THE PROCESS OF IMPLEMENTING A NEW PRODUCT FOR SERIES PRODUCTION**

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### **A few words about the author(s):**

PhD student at the Faculty of Mechanical Engineering of the Wrocław University of Science and Technology, associated with the automotive industry and production equipment for 20 years.

### **Abstract:**

The poster presents problem of risk analysis of complex processes. It is based on process of tooling development in automotive organization. The poster outlines role of the production equipment in light vehicles production processes and risk associated. It presents original risk analysis method considering risk categories as well as risk limitations. The method is described and presented on the example of tooling development. The use of the presented matrix enables support in quick decision-making regarding resource management, which aims to reduce risk.

### **Keywords:**

risk analysis; production; development; tooling



## **THE HEAT TALE AS AN EXAMPLE OF INTRODUCING PRESCHOOLERS TO TECHNICAL KNOWLEDGE OF BUILDING THERMAL MODERNIZATION**

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### **A few words about the author(s):**

Experts in creating indoor environments for buildings, thermal comfort, indoor installations, energy efficiency and renewable energy sources.

### **Abstract:**

Thermal modernization of buildings aims to improve the energy efficiency of buildings and installations, reduce CO<sub>2</sub> emissions, and improve indoor conditions and occupant comfort. Although the topic may seem difficult and too complicated for preschool children, it has been proven that it can be presented in an understandable way. A work-shop was organized at the Wrocław University of Science Technology, during which, by presenting “The Heat Tale”, written especially for these meetings, children learned about the phenomenon of heat loss in a building and ways to reduce it, the principles of using solar energy for heating and hot water preparation, and simple measures to protect the environment. Thanks to the accessible format, the classes were enjoyed by both children and their teachers. The benefits of such demonstrations are not only the formation of pro-environmental attitudes but also the fulfillment of the Ministry's assumptions on the core curriculum indicating the objectives of discovering possibilities, the meaning of action, and the accumulation of experiences on the path leading to truth, goodness, and beauty; it is the building of knowledge about the social, natural and technical world in the period when personality and interest in the surrounding world are most intensively formed. The satisfaction of the participants clearly confirms that it is right and possible to build a model of environmental education from an early age.

### **Keywords:**

Lower Silesian Science Festival; thermal modernization; pre-school education



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## **OPTIMALIZATION OF THE BIOLOGICAL PROCESS OF WASTEWATER PURIFICATION, BY USAGE OF THE INNOVATIVE METHOD OF NEUTRALIZING PERACETIC ACID AND IMPROVING THE CONDITION OF THE BIOREACTOR ACTIVATED SLUDGE**

**Sebastian Duciak, Danuta Ciechańska, Andrzej Norek, Jakub Stuglik\***

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### **A few words about the author(s):**

Sebastian Duciak, Research worker, specialist in chemistry; Danuta Ciechańska, Research worker, specialist in the use of raw materials; Andrzej Norek, Head of the research team; Jakub Stuglik, Project manager.

### **Abstract:**

Unstable work of IC reactor led the research team to analyse the biocidal compounds, among which were used in aseptic production: peracetic acid and used to neutralize it the sodium bisulfide. The rise of the hydrogen sulphide, generated by the bacteria, led to the replacement of the hydrosulphite with another substance. Based on performed laboratory surveys, ascorbic acid (vit. C) was selected.

Because of R&D work, which had been made with use of the vit. C, among other results was stated:

- a decrease in use of process chemicals in IC reactor,
- an increase in biogas production and decrease of sulphate concentration in wastewaters,
- an improvement in anaerobic sludge structure and it's growth.

In further part of the project, demonstration of the system used for water purification and recirculation, which was based on advanced filtration and disinfection of the recovered water, has been presented. As a part of the project, work based on the research and development on the adding quicklime into reactor was carried out. The dosed lime improved the condition of the anaerobic sludge and reduced the amount of microscopic suspended solids flowing out of the reactor. Finished work confirmed the modified wastewater treatment system based on:

- replacing sodium bisulphate with vitamin C,
- usage of quicklime, which enriches the structure of the activated sludge inside the bioreactor,
- the work of an advanced filtration and water returning system for industrial purposes.

### **Keywords:**

reactor IC; vitamin C; anaerobic sludge; recovered water; lime





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