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New Trends on Sensing - Monitoring - Telediagnosis for Life Sciences

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BOOK OF ABSTRACTS

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Topics

(Tele)diagnosis, (Tele)monitoring and (Tele)management in Medicine

- Analytical and bioanalytical methods for screening and diagnosis in medicine
- Telemedicine and e-Health
- Endocrine disruptors: advances in assessing environmental health risk and human health
- Environmental pollution and health- sensing, (tele)monitoring and modelling of environmental risk factors
- Personalized medicine
- Social innovations to improve the quality of life and well-being of older people
- Assessment of disease susceptibility and diagnosis
- Improving health information, data exploitation and providing an evidence base for health policies and regulation
- (Tele)diagnosis and (tele)management of environmental factors related to disorders
- Impacts of poor health on economic output and productivity
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- Make business a key partner in promoting health and preventing disease
- Physiotherapy – a way to increase the quality and sustainability of patient's lives

New Trends in Nutritional Sciences and Food Control

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- Nutrition status and health
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- New perspectives on the neuroscience of taste and olfaction
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- Nutrition: an anthropological perspective

New Trends in (Bio)engineering Sciences Applied in Life Sciences

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- Hospital hygiene through engineering and ICT solutions.
- Building materials impact on human health
- Occupant safety and health in constructions
- Monitoring the indoor air quality in buildings
- Electronic medical devices
- Image, data and signal processing in life sciences
- Computing and simulation in life sciences

New materials for electrochemical recognition of inorganic and biological species NOMARES Workshop / L'Atelier Nouveaux Matériaux pour la Reconnaissance Electrochimique des Mineraux et des Espèces Biologiques – 2020

The 6th edition of this francophone workshop organized by tradition by the Romanian Society of Chemistry and Politehnica University of Bucharest will be realized in 2020 in collaboration with the Transilvania University of Brasov, Romania.

The conference will bring together for the first time in online format francophone and other foreign university people and specialists of international and Romanian scientific research, as well as scientific and professional organizations. The workshop is an opportunity to present new results and allows:

- bringing together electrochemists (mainly French speakers) around one of the most modern topics,
- exchange of experience in the field of organic electrochemistry in general and molecular recognition of mineral and biological species in particular,
- scientific dissemination of projects in the field,
- the practice of the French scientific language at international level, as well as the presentation in French of research results in this field by Romanian and foreign researchers,
- publication of scientific results in French, in particular those obtained by young researchers,
- establish new cooperation with education and research centers in the field.

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NOMARES Workshop - New materials for electrochemical recognition of inorganic and biological species / L'Atelier Nouveaux - Matériaux pour la Reconnaissance Electrochimique des Mineraux et des Espèces Biologiques – 2020

PL.1. IS THERE A THRESHOLD SAFE ENOUGH FOR FOOD ALLERGIC PATIENTS?

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For many years, efforts have been made to address the problem of allergen thresholds that can protect the population with food allergies. With Directive 2003/89/EC and subsequent updates, the European Community has established the list of ingredients to be indicated on the label, even if they are present in small quantities. However, the law does not regulate the presence of allergens in traces, which can derive from the sharing of means of transport, production plants and packaging.
To evaluate if data at disposal allow the definition of a threshold that is safe for most allergic subjects.
Different peer-reviewed papers and documents form international expert groups will be consulted, as well as new recent data collected in Italy.
Considering that milk and egg are the foods most frequently responsible for allergic forms in childhood and the fact that they are practically ubiquitous in the food industry, the attention of this presentation will be focused on these two food ingredients. The data published by different scientific sources will be collected and discussed, in the attempt to propose quantities of milk and egg proteins that could be tolerated, in order to decrease the usual alert on the label "may contain traces of" "produced in an industrial plan, in which allergens are used".
A threshold will be discussed although this topic is not simple and requires numerous skills and the collaboration of experts such as researchers, allergologists (especially pediatricians) and expert of the food industry.

Keywords: food allergy, milk, threshold, anaphylactic shock

PL.2. PRECISION NUTRITION IN ROMANIA – A FRAMEWORK UNDER DEVELOPMENT

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Nutrition is the major controllable tool available to maintain health and reduce the onset of many diseases. During the last two decades, the wealth of knowledge in nutrition has improved remarkably due to genetics, epigenetics, microbiomics, metabolomics, and transcriptomics. These new technologies have revealed that adequate nutrition, far from having to rely on a one-size-fits-all approach, should rather address the specificity of each individual in regard to his or her nutritional requirements. Today, precision nutrition is a framework under development, aiming to address specific and personalized nutritional requirements.

The aim of this presentation is to inform upon the development and implementation of precision nutrition in Romania, along with research progress in this field. Stemming from guidelines generated by the International Society for Nutrigenetics and Nutrigenomics, and using concepts supported by experts in precision nutrition, we initiated the implementation of precision nutrition in Romania, along with the initiation of nutrition research benefitting precision nutrition.

According to present experience, a framework for implementing precision nutrition is presented, along with the tools that have to be in place in order to successfully bring precision nutrition to its user. The roles of various players, the necessary professional know-how, and other aspects are discussed.

Keywords: nutrition, nutrigenetics, precision nutrition, individualized nutrition

PL.3. A PROSPECTIVE ON APPLICATIONS OF BIOSENSORS IN MEDICAL FIELD

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Many researchers worked on the development of biosensors for wide spread applications. The research output was very promising, and as a result, governmental and private companies invested and promoted research in the biosensor field. The number of publications increased exponentially and “start up” companies were created to transfer the technology from laboratory to commercial applications.

Recent years have witnessed an increasing demand of biosensors for medical applications. Commercial biosensors have been developed for the detection of glucose for diabetes people, lactate sensor for sportsmen and urea sensor to monitor dialysis. It is anticipated that in the coming years, scientists will focus to monitor the human body in all aspects: livers will be monitored to make sure that enzymes are functioning correctly in filtering out the toxins, hearts will be monitored to avoid the heart attacks, cancer will be detected in its earliest stages. Indeed the body will be monitored continuously to determine possible health concerns that may arise.

Protein biomarkers are one of the important classes of biomarkers, which can be indicative of disease state according to their high or low expression in serum. Several tumor markers found in biological fluids are important for early stage screening of diseases because they are usually asymptomatic until advanced stages when the prognosis of survival is poor. In our group, we are working on MUC1 and NS1 proteins which are associated with early diagnosis of breast cancer and dengue virus respectively. Diagnostic accuracy for detection of these biomarkers is very limited; therefore, current research needs to focus on developing disposable bio-affinity sensing devices for the reliable and sensitive detection of these biomarkers. The outstanding sensitivity and selectivity of fabricated bio-affinity biosensors can potentially pave their way to be translated into point of care devices for early and precise detection of breast cancer and dengue virus.

Keywords: biosensors, medicine

PL.4. DATA MANAGEMENT, USE OF UAS, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING FOR SUSTAINABLE BIOLOGICAL SYSTEMS

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Big-Data has played a key role in digital agriculture. Sensors, telematics, and unmanned aerial system (UAS) are major source of spatial and temporal data in agriculture. Artificial Intelligence (AI) and Machine Learning (ML) has been applied to precision agriculture (PA). Sensing techniques to measure naturalized differential vegetative index (NDVI) have been developed as a tool to assess nitrogen status at different growth stages. The imagery from UASs offers new avenues in the area of data mining, AI and ML, which gathers information about crop status, number of leaves per plant, disease status, storm damage, weed infestation and problems with fertilization or irrigation, even on individual plant level. Use of AI and Deep Learning in addressing spatial variability of nitrogen fertilizer needs by applying variable rate inputs will maximize Corn production. Preliminary data were collected through a project under Special Research Initiative and these data are processed in a web-based tool to develop an algorithm for controls by the applicator.

Through this process, an incremental learning model, that continuously find and learn from novel classes of data identified automatically; resulting in efficient production system increasing the yield and quality of Corn.

S1. (Tele)diagnosis, (Tele)monitoring and (Tele)management in Medicine

KN.1.1. ETHICAL DILEMMAS IN TELEMEDICINE IN THE CORONAVIRUS ERA

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The use of telemedicine has a long history since passed the field of SF in reality; a reality whose importance we could not realize until a few months ago, due to the spread of the SarsCov2 virus.

The development of telemedicine especially related to family medicine and medical specialities must be achieved not only based by technical skills and resources but also on scientific knowledge, skills and resources, increasing the safety of the medical act.

The main directions of the use of telemedicine were analyzed, in terms of: 1) ethical impact 2) public health measures which must be taken.

From the point of view of public health, the main dilemmas that must be analyzed by a specialist in the field are:

a) when and how much telemedicine can be used in medical practice in that field
b) what would be the measures that a state should take from development and recognition of telemedicine services
c) how we prepare the population for such a situation.

The governments of most countries in this world have proved to be totally incoherent and powerless during this period, lacking the vision to take effective measures to reduce the risk of disease, but also to treat non- SarsCov2 diseases at the same time, even though they have „in their hand" the system of telemedicine

Keywords: SarsCov2, telemedicine, ethics, public health

O.1.1. TELEDIAGNOSIS- IS THERE A PLACE IN FAMILY MEDICINE IN ROMANIA?

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Traditional doctor-patient encounters are challenged by the development of new communication technologies. Some important arguments are in favor of telemedicine, like the extended use in the population of communication technologies, cost efficiency of distance doctor-patient encounters and the eventual compensation of the lack of medical personnel.

Furthermore, studies are showing that telemedicine can improve management of pain in cancer patient, access to medical advice, medication dosage adjustment, can facilitate obtaining a second opinion, laboratory tests results and permit vital functions monitoring. Family medicine is the place of the first contact in the Healthcare system. Here we put a big emphasis on personalized medicine and doctor patient relationship. The question is: are family doctors prepared to meet the challenge of telemedicine, replacing face to face contact? What are the limits and opportunities in Romania?

Our study is a qualitative analysis of perceptions of family doctors that are using telemedicine in the process of care. In-depth phone interviews have been organized for a target group of 30 doctors that have declared using various telemedicine channels for communicating with patients during COVID 19 crisis.

O.1.2 TELEHEALTH - A NEW WAY TO EASE CAREGIVERS' BURDEN

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Families living with chronic adult patients need more access to support and effective telehealth-based programmes may come in hand. As the health of recipient worsens, the caregivers may encounter challenges such as social isolation, emotional and physical strain, financial problems and family disturbances.
To provide, through a systematic review, a complete picture of how telemedicine tools may help informal caregivers with their burden and depression.
We searched Pubmed, Google Scholar and Cochrane database for English written studies that assessed the role of telemedicine implemented interventions focused on caregivers of adult patients.
Telehealth-based interventions are appealing because caregivers can receive help and support in their own homes, even though doctors have less control over patients. The most frequently used types of telehealth intervention formats were web-based and telephone calls. Clinicians would be encouraged to monitor caregiver-related stress and make appropriate recommendations for stress-reduction strategies, including cognitive-behavioral, psychoeducational, and multicomponent burden-reducing interventions. The evidence points to the feasibility of a telemedicine program in enhancing caregivers' well-being.
In this rapidly evolving world, tactics to maintain fidelity are essential to long-term success. The use of technology can improve the caregiving experience and facilitate decision making. Technology allows for creative solutions that can both change intervention or improve upon it. Many of these telemedicine-based interventions are group-based, yet the evidence suggests that individualized interventions are more effective in reducing caregiver distress. More personalized choices are needed to fit the heterogenic needs of family caregivers.

Keywords: telemedicine, caregivers, social support, chronic disease

O.1.3. MEDICAL TELE-EDUCATION AROUND THE WORLD BEFORE THE PANDEMIC CONTEXT – A REVIEW OF ADVANTAGES, LIMITATIONS AND PERSPECTIVES

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Over the past decade, the development of technology plaid an important role in medical education among medical students and resident doctors, the need for tele-education raising as time passes and becomes mandatory in the context of the actual pandemic in order to keep medical education going.

Tele-education refers to the use of technologies based on health care delivered on distance. This review is meant to outline the tele-education methods and their efficacy, demonstrated in different studies around the world, both in countries in Sub-Saharan Africa, where poverty, limited funding of health services and the shortage of doctors made it necessary and in more developed countries – Korea, Bosnia and Herzegovina, Australia – as a reaction to the limitations brought by distance and to the rapid advances in medical sciences.

Whereas e-learning appears to be at least as effective as traditional teaching methods, all studies seem to agree that it cannot replace traditional methods but are rather complementary to them. The integration of e-learning into medical education can catalyze the shift toward applying adult learning theory, where educators will no longer serve mainly as the distributors of content but will become more involved as facilitators of learning and assessors of competency.

O.1.4. TELEHEALTH DURING PANDEMIC TIMES - A FUTURISTIC APPROACH

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The author presents a non-invasive diagnostic and therapy modality, carried out at a distance, based on information transmitted in subspace by using a hair sample from the investigated patient.
It is a revolutionary method, using as a principle the EERRT (Evoked Electrophysiological Resonant Reactivity Test) backed up also by experiments transmitting biologic digitalized, holographic information done by other researchers.
We used in our clinic since 1996 an electronic device driven by a registered stress detecting software which can also perform in different quantum spaces. The novelty and uniqueness of the device is the fact that the information travels in both ways, device - patient and back, recording the reactivity of the examined person to different items (anatomical and physiological structures, systems, hormones, enzymes pathogenic organisms) and much more.
Concluding, during pandemic times and not only, but especially now because of the social distancing and other epidemiological circumstances, patients with different health issues do not need to be hooked to the special inductive harnesses, being diagnosed and helped at a distance.

O.1.5. UNUSUAL CLINICAL CASES OF FOOD ALLERGY: DIAGNOSIS AND IDENTIFICATION OF MAIN ALLERGENS

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Food allergy is an immune-mediated hypersensitivity to dietetic ingredients, where antibodies of IgE class mediate the most severe and acute events. Only few foods are responsible for the majority of allergic reactions; among them cow's milk, hen's eggs, peanut, tree nuts, shellfish, fish, wheat, and soy. Although with less frequency, also other foods and other classes of antibodies could be involved.
The aim of this work was the study of two unusual clinical cases of allergy: 1) an allergic reaction associated with the consumption of cooked goose's egg in a 14-year-old girl, who tolerated hen's egg 2) an adverse reaction occurred in a 21-year-old woman after the consumption of honey.
In both cases skin prick test or prick to prick test was performed with the foods involved in the adverse reactions. Total and specific serum IgEs were measured. Finally, the sensitization pattern of patients was studied by SDS-PAGE and immunoblotting techniques.
The clinical and biochemical tests confirmed the specific sensitization of the first patient to the goose's egg and the reactivity of the woman to honey. The *in vitro* techniques allowed, in both cases, the identification of the allergens involved.
This study underlines that both *in vivo* and *in vitro* assays are important tools for the diagnosis of food allergy and are useful for more specific identification of the offending allergens.

Keywords: food allergy, allergy diagnosis, immunoblotting, allergens' identification

O.1.6. ABUSE SUBSTANCES IN CHILDREN AND ADOLESCENTS IN A PEDIATRIC POISON CENTRE

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Abuse substances use among adolescents ranges from experimentation to severe disorders. All these substances increase in adolescents the risk of short-term problems, such as accidents, physical challenges, unwise or unwanted sexual activity, and overdose and long-term consequences, such as mental health disorders, underachievement in school, and substance use addiction.

Medical files of children and adolescents admitted between January and December 2019 in "Grigore Alexandrescu" Pediatric Poison Centre Bucharest with abuse substances use were analysed according to the substance used, frequency of usage, age, gender, social status and medical outcome.

169 cases of abuse substances use were admitted and treated. The most frequently abuse substance used was ethanol in 118 cases, followed by marijuana 35 cases, new psychoactive substances 11 cases, heroin 4 cases, amphetamines and methamphetamines 3 cases, cocaine 2 cases and LSD, MDMA, Tantum Rosa and hallucinogen mushrooms 1 case. At admission 38 cases were comatose. There were 94 males and 75 females, and 9 of them were under 14 and 160 between 15-18 years old. Occasionally users we 140 cases and 29 of them were chronical abuse substances users. In chronical user group 11 cases developed withdrawal signs and symptoms during admittance, and 5 of them lived in social care centres, and 2 of them had legal issues.

Occasionally and chronical adolescent substance use and misuse are serious issues that contribute to significant medical, psychological, social, and legal consequences. It can be difficult to prevent and treat substance use among adolescents, so several strategies are proposed to be implemented among this high-risk population.

Keywords: abuse substances, adolescents, children

O.1.7. CONTROVERSIES IN VITAMIN D ROLES AND TESTING

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The science surrounding vitamin D is a controversial topic of scientific discussion, and it is difficult to navigate the expanding vitamin D literature with heterogeneous and partially opposite recommendations. The impressive number of publications on vitamin D (PubMed search: 18,091 results in 2010-2020), differing in level of evidence and consequences for clinical practice, prevents the clinicians in assessing the importance of vitamin D status for a specific patient.

In the general population, vitamin D status varies widely, and understanding the causes of these variations is clinically and scientifically important. Vitamin D deficiency is common at all ages and has become a global public health problem. This condition can be a problem, especially in growing children because vitamin D plays an important role in bone metabolism and calcium homeostasis. Recent studies have shown that vitamin D deficiency is also linked to other conditions such as: musculoskeletal disease, cardiovascular disease, type 2 diabetes, metabolic syndrome, certain cancers (colorectal, breast, prostate) and autoimmune diseases.

The field of vitamin D is rapidly evolving. Despite many uncertainties associated with the understandings of the physiological function, the effects of excessive intake, and its role in health, it is at the same time a major focus in the research and health communities. Future studies are required to clarify the novel roles of vitamin D, such as: cell proliferation and differentiation, regulation of the innate and adaptative immune systems, preventive effects on cardiovascular and neurodegenerative diseases, and even antiaging effects.

Keywords: vitamin D, role, deficiency, immune system, cancer.

O.1.8. DEVELOPMENT OF A NEW IN VIVO METHOD TO EVALUATE THE PHOTOPROTECTIVE ABILITY OF SUNSCREENS AGAINST HIGH ULTRAVIOLET RADIATION-B

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Many commercial sunscreens fail to provide adequate protection against ultraviolet radiation (UVR) and contain potentially harmful chemicals that may generate reactive oxygen species and boost skin cancer risk.
The aim of our study was to improve the sustainability of the UV filter by adding photoprotective properties of different molecules with antioxidant and repairing mechanisms.
Our study included 38 people who were exposed to UVB irradiation of skin. The ointments containing avobenzone was supplemented with beta-carotene and trans-resveratrol. Skin colour was checked after 0, 4, 6, and 8 minutes. A chromameter was used for the measurements of colour changes (chroma) of the observed skin areas. One day after the first irradiation, we examined, measured and photographed all irradiation fields. All computations were performed with IBM SPSS statistics software.
The skin coloration was significantly affected by the length of exposure, Pillai's Trace (V) = 0.59, F (3.35) = 16.92, $p < 0.001$. The first four minutes of UVB radiation showed no significant change in skin colour ($f = 0.14$, $p > 0.05$). The coloration of skin after 4-6 minutes of radiation was significantly more reddish compared to coloration in the previous measurement ($f = 4.50$, $p < 0.05$). After the irradiation time to 6-8 minutes, changes in colour skin were even more pronounced and statistically highly significant in comparison to the previous period of time ($f = 27.91$, $p < 0.001$). It was observed that beta-carotene or trans-resveratrol significantly reduced the skin coloration after the irradiation time to 6-8 minutes.

Keywords: sunscreen; antioxidant; beta-carotene; trans-resveratrol

O.1.9. MUSIC THERAPY AS A HOME - BASED THERAPY METHOD IN THE CONTEXT OF DIGITAL LITERACY

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The intervention of music in neuroplasticity, in the therapy of chronic pain, in cardiovascular diseases, frequently accompanied by affective disorders, is proven and accepted, the limitations being due only to the small number of studies
The highlighting of the benefits of the e-literacy process by using the youtube digital platform in order to apply melotherapy as a method of home-based therapy in patients with chronic conditions and associated emotional disorders.
Sample composed of 20 participants over 60 years of age, with comorbidities and associated affective disorders. The design of the study, carried out in the period 2019-2020, places it in the category of prospective and mixed studies. I used my own questionnaire, with three sections: A. structure data of the sample, B. use of digital technology C. data related to melotherapy Statistical processing focused on predictive, exploratory and causal directions using Microsoft Office software.
This study proved of the benefit of using home - based therapy in the treatment of chronic diseases through digital literacy, in a patient-centered approach. The concrete approach is found in what is increasingly known as music medicine.
Melotherapy is an appropriate method of therapy using e-literacy in the elderly patient with chronic disease.

Keywords: e-literacy, melotherapy, home-based therapy

O.1.10. THE ROLE OF BIOCHEMICAL PARAMETERS IN ACUTE PANCREATITIS

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Acute pancreatitis (AP), one of the most frequent gastroenterological emergency, could determine both local and systemic complications. This inflammatory condition could affect the quality life of the patients, that's why it is very important to have a good diagnosis, prognosis and management.
The aim of our study was to evaluate the role of some biochemical parameters in AP.
We included in our study 100 patients admitted at the Department of Gastroenterology with diagnosis of acute pancreatitis.
We evaluated some biochemical parameters, such as amylase, lipase, bilirubin, alkaline phosphatase, blood glucose, C reactive protein, blood cells and their role in AP.
Diagnosis of AP was set according to the recent international guidelines, including clinical, biochemical and imagistic criteria. We also collected demographic, clinical and imagistic data.
Most of the patients were male, about 65%, with a predominance of urban provenience. The mean age of the group was about 58 years. We obtained some relationships between biochemical parameters and AP. We noticed the importance of amylase, lipase, blood glucose, C reactive protein, transaminases, alkaline phosphatase, bilirubin, blood cells in acute pancreatitis.
Every simple biochemical parameter could have an important role in diagnosis and prognosis of AP.

K**eywords**: acute pancreatitis, biochemical parameters

O.1.11. PREVALENCE OF PERI-IMPLANT INFLAMMATORY DISEASES AND THEIR ASSOCIATION WITH POTENTIAL RISK FACTORS

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The purpose of this study is to evaluate the occurrence of peri-implant inflammatory diseases and the correlation with potential risk factors implicated in the development of peri-implant inflammatory diseases.
Study was performed on data collected from 390 subjects enrolled in the maintenance program that attended a visit between Jan 2019 to Jan 2020. Clinical evaluation such as pocket depth measurements, bleeding on probing, plaque score and radiographs at implant level were performed. Patients were evaluated considering oral hygiene, smoking, history of periodontitis, keratinized tissue around implants and the quality of restauration. The prevalence of peri-implant inflammatory disease (at subject/implant level) was determined, and its association with the potential risk factors was evaluated by multi-level logistic regression models.
The prevalence of peri-implant inflammatory disease at subject level was 37.7%, while at implant level was 23.3%. 14.3% of them were diagnoses with early peri-implant inflammatory disease (mucositis) and 8.9% were diagnosed with advanced peri-implant inflammatory disease. History of periodontitis is correlated with 15 OR, lack of keratinized tissue around implants has an impact of 15.5 increased OR. Aged implants correlated to exposure to oral microbiota and load stress for more than 5 years assess a risk of 3.8 of developing inflammatory diseases. Smokers are showed an1.2 increased risk.
History of periodontitis is recorded as major factors associated with peri-implant inflammatory diseases. Also, the lack of keratinized tissue and the age of implants are involved.

Keywords: inflammation, infection, peri-implant disease, prevalence

O.1.12. BLOOD CYANIDE DETERMINATION IN FIRE-RELATED FATALITIES- A NEW ANALYTICAL CHEMISTRY METHOD

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Lately, cyanide gas (HCN) liberated from the combustion of nitrogen-containing materials is frequently reported in people exposed to smoke from enclosed space fires. However, the blood cyanide analysis is not a routine investigation because of the absence of a rapidly returnable diagnostic test, and in most hospitals and toxicological departments it is not performed.

The aim of the present work is to report a new kinetic ninhydrin-based assay of cyanide in post-mortem blood or liver samples.

Venous blood samples or liver fragments were obtained from fire-related fatalities, with ethical committee`s approval. 1 mL of blood was treated with 1 mL of 20% H_3PO_4 in a Conway cell, and HCN released was captured in a 2% K_2CO_3 solution. In addition, a 7.5 mg/mL KMnO4 was used to liberate HCN from the metabolite thiocyanate. The kinetics of colour reaction between cyanide ions and 2,2-dihydroxy-1,3-indanedione (ninhydrin) in a 2% potassium carbonate solution was followed at 493 nm using a Libra S35 UV\Visible spectrophotometer.

We measured 8 blood samples in which free cyanide ranged from none to 1.52 μg/mL and total cyanide from ≤0.5 to 4.44 μg/mL The reaction of HCN with ninhydrin was very selective, fast, cheap, and its sensitivity seems to be greater than most of the other available methods.

Cyanide poisoning can be evidenced in post-mortem blood samples using the quantitative method described above.

Keywords: cyanide, ninhydrin reagent, kinetic assay, UV\VIS spectrophotometer

O.1.13. DIFFERENT STRATEGIES FOR THE ELECTROCHEMICAL DETECTION OF ANTIBIOTICS

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Antimicrobial resistance, defined as the ability of a microorganism to stop an antibiotic from working against it, represents an important problem. One of the solutions is the development of new detection methods for more accessible monitoring and thereby, we present three different strategies for the electrochemical detection of antibiotics [1,2].
The first is a direct approach and involves the construction of a complex electrochemical fingerprint, involving a battery of tests for the detection of vancomycin [1] and the second is biomimetic-based, using molecularly imprinted polymers for the detection of cefalexin [2].
The third strategy involves a photoelectrochemical approach for the detection of rifampicin, based on the use of a perfluorinated zinc phthalocyanine (F_{64}PcZn), which generates singlet oxygen under visible light resulting in the oxidation of phenolic analytes [3].

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Keywords: Antibiotics, Electrochemical detection

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O.1.14. VOLTAMMETRIC STUDIES OF RIVAROXABAN

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Coagulation disorders are ailments that lead to many serious illnesses such as venous thromboembolism, which includes both deep vein thrombosis and pulmonary embolism. Rivaroxaban (RIV) is widely prescribed and belongs to the direct oral anticoagulants (DOACs). At present, RIV is often recommended for patients after major orthopedic surgery, for patients with thromboembolism, deep vein thrombosis, pulmonary embolism and peripheral occlusive disease.

The aim of this work was to check the analytical capabilities of the boron-doped diamond electrode (BDDE) and glassy carbon electrode (GCE) for the quantitative determination of rivaroxaban. The newly developed voltammetric method was used to determine RIV in pharmaceuticals and in spiked urine samples.

The experiments were carried out using square wave voltammetry with a three-electrode system with platinum wire as an auxiliary electrode, Ag/AgCl electrode as a reference electrode, and both boron-doped diamond and glassy carbon electrodes as working electrodes.

During the voltammetric experiments, a linear range of RIV determination was examined, and the detection limit was calculated. Moreover, rivaroxaban was determined in the pharmaceutical formulation (Xarelto) and in spiked urine samples. Very good recovery values were obtained.

A voltammetric method for the rivaroxaban determination in pharmaceuticals and spiked urine samples was developed on BDDE and GCE.

Keywords: rivaroxaban, voltammetry, glassy carbon electrode, boron-doped diamond electrode

O.1.15. BORON-DOPED DIAMOND ELECTRODE IN ANTICOAGULANTS DETERMINATION

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Boron-doped diamond electrode (BDDE) is widely used electrode in electroanalytical experiments due to its very good properties such as repeatable response, low and stable background current, very wide range of potentials (about 3.5V) in an aqueous environment, chemical inertness and mechanical resistance. Boron-doped diamond was first used in electrochemistry in the 1980s. Since then it has been increasingly used in the quantification of biologically active compounds.

The aim of this work was to develop the method of quantitative determination of two anticoagulants (rivaroxaban – RIV and dabigatran etexilate – DAB) using BDDE.

The experiments were carried out using square wave voltammetry with a three-electrode system with Ag/AgCl electrode as a reference electrode, platinum wire as an auxiliary electrode and BDDE as a working electrode.

During the voltammetric experiments, a linear range of anticoagulants determination was examined and the detection limit was calculated. Moreover, RIV and DAB were determined in the pharmaceutical formulations and in spiked urine samples. Very good recovery values were obtained.

A voltammetric method for the rivaroxaban and dabigatran etexilate determination in pharmaceuticals and spiked urine samples was developed.

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Keywords: rivaroxaban, dabigatran etexilate, voltammetry, boron-doped diamond electrode

O.1.16. ELECTROANALYSIS OF DOXORUBICIN OR GEMCITABINE LOADED DRUG DELIVERY SYSTEMS

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There is intense research on going for the optimization of the cancer treatment, a particular attention being paid nowadays for the development of drug delivery systems. The preclinical stage from the development of new drug delivery systems involves a complex process of characterization and analysis. Over time, electrochemistry has proved its efficacy in the medical field, including the analysis of anti-tumor drugs.
In order to be used for the evaluation of some new drug delivery systems, electrochemical methods for the detection of some antineoplastic drugs were developed.
Doxorubicin and gemcitabine were electrochemically characterized, simple and direct electroanalytical detection methods being developed for them. Further, the drug molecules were incorporated in different types of particles and the encapsulation efficiency and release profile were evaluated in different pH conditions using the electrochemical method developed.
The encapsulation efficiency and cumulative release were calculated based on the results obtained by electrochemical analysis and the values were compared with the ones obtained with UV-Vis spectrophotometry, a frequently used technique on this purpose.
The electrochemical methods developed proved to be efficient in the analysis of anti-tumor drug delivery systems, bringing some advantages like simplicity, sensitivity and low cost.

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Keywords: drug delivery systems, encapsulation, release, electrochemical analysis

P.1.1. FEMALE FERTILITY PRESERVATION IN PATIENTS WITH MUSCULOSKELETAL CANCER

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Besides the improvement of the survival rate in young patients with musculoskeletal cancer, we should always have in mind that infertility and premature menopause due to treatment may dramatically affect their quality of life.
This article is a review of the literature.
After puberty, the first option should be ovarian controlled hyperstimulation (COS) resulting in oocytes that are consequently fertilized using FIV or ICSI and the cryopreservation of the embryos. If the patient does not have a partner at that moment, the next method is the vitrification of the oocytes resulting from the COS. The disadvantages of using COS is the need to postpone the radio and chemotherapy for at least 2-3 weeks and high oestradiol levels, but there are very few hormone-dependent musculoskeletal tumors that may be affected. Ovarian tissue cryopreservation (OTC), with ovarian tissue transplantation (OTT) is the only method used if the patient is before puberty, plus this technique allows patients to spontaneously conceive if they do not have any other fertility pathology, but this freezing/thawing procedure may have success or net. There is currently no evidence to suggest that OTT causes reseeding of the original cancer, and the restoring of the ovarian endocrine function was reported in about 95% of the cases.
The success of fertility preservation techniques is related to the cryopreservation methods used and the age of the patient. The reproductive cells with the best survival are the embryos, the next are oocytes, or ovarian tissue may be cryopreserved. For best outcomes, the fertility preservation must be pluridisciplinary discussed, involving the ART specialist gynecologist, the oncologist and the surgeon of the musculoscheletal tumor.

P.1.2. NIGELLA SATIVA- PROMISING APPROACH IN FIGHTING COVID-19 PANDEMIC

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Nigella sativa is a plant with a rich history regarding its use in the treatment of respiratory diseases. The scientific literature shows a highly promising role of Nigella sativa in preventing the COVID-19 viral disease.
The purpose of our research was to give complex information about the role *Nigella sativa* may have in fighting COVID-19 pandemic.
We performed a review of the scientific literature by using the following terms “Nigella sativa” + “coronavirus” or “Nigella sativa” + “SARS” or “Nigella sativa” + “MERS” or “Nigella sativa” + “SARS-CoV-2” or “Nigella sativa” + “COVID-19”. Our search was performed in PubMed and Google Scholar, and it included original researches, protocols and reviews. None of the articles was excluded due to language reasons or affiliation.
Our research identified multiple original articles, reviews and interesting protocols for *Nigella sativa* usage in COVID-19 pandemic. Although the beginning of this year brought harsh, restrictive measures for scientific and research communities, *in silico* studies show that Thymoquinone and Hederagenin, naturally-derived bioactive compounds of Nigella sativa, exhibit affinity for COVID-19 6LU7 protease. Moreover, Nigellidine and α-hederin, also bioactive compounds, may inhibit COVID-19, giving the same or better results in tests performed *in silico* compared to drugs under clinical trials, thus becoming important in COVID-19 prevention.
Nigella sativa and its compounds show significant value in the fight against the COVID-19 disease until newer therapies are discovered, and more detailed studies are performed.

Keywords: *Nigella sativa*, COVID-19 pandemic, 6LU7 active site, molecular docking analysis

P.1.3. LEVEL OF KNOWLEDGE THAT YOUNG ADULTS HAVE REGARDING THE USE OF NICOTINE-CONTAINING PRODUCTS

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Smoking and the consumption of nicotine-based products is a global public health problem because it is a significant risk factor or a determinant in a multitude of diseases. It is also a cause of many premature deaths worldwide. Although the risks of smoking are known and efforts have been made to stop this addiction, the number of smokers is still increasing. The most worrying fact is that smokers choose to smoke from an increasingly young age.
Our objective was to evaluate the habit of consuming nicotine-based products, as well as the influence of their environment among adolescents and young adults.
This is a comparative descriptive study, which used a questionnaire as its research tool. The data collection was carried out between May and June of 2019. Six hundred questionnaires were distributed to students from different colleges in Brasov and one college in Iasi. Following the application of inclusion/ exclusion criteria in the study, 545 valid questionnaires remained, which were divided into two lots of smokers and non-smokers. Centralization and statistical analysis were performed using Microsoft Excel and IBM SPSS Statistics 2.0.
The availability of extra spending money does influence the consumption of nicotine products. For participants with an income of over 100 lei per week, 26.24% are smokers. The study showed that self-esteem and family do not represent a factor influencing the use of these products; over 55.33% of family members of smokers, were non-smokers. A troubling fact is that 74.31% of respondents have tried smoking, and 22.94% smoked their first cigarette between the ages of 13 and 15. The reasons why participants chose to smoke were, in order of frequency of answers: curiosity, stress, friends, group membership, advertisements and media. 11.07% of respondents smoke in the first 10 minutes after waking up. Buying cigarettes does not represent an obstacle, as 81.15% responded that it was effortless to buy nicotine-based products. 95.90% of respondents said they knew the risks of tobacco use, and 27% indicated that smoking cessation is not a priority.
The level of knowledge that young adults have related to the variety of nicotine-containing products and the dangers they present is medium. The peer group plays an important role in the lives of young people and changing the educational and family environment are elements that impact smoking among young people.

Keywords: smoking, young people, nicotine

P.1.4. CORRELATION OF THE LIFESTYLE OF SMOKERS WITH RESPIRATORY PATHOLOGIES WITH VARIATIONS OF BIOCHEMICAL, HEMATOLOGICAL AND HEAVY METAL CONTENT IN THE BLOOD

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Smoking is an old habit that has gradually spread around the globe and is currently the cause of millions of deaths a year, mainly associated with respiratory and cardiological pathologies. It is estimated that the vast majority of smokers worldwide originate in developing countries.

The work aims to highlight the lifestyle characteristics of groups of non-smokers, smokers with and without respiratory pathologies.

A survey was performed using three types of volunteers: non-smokers, smokers with and without respiratory pathologies. A questionnaire containing general information on the groups, data concerning smoking characteristics and lifestyle was distributed. Biochemical and hematological analyses, as well as heavy metal content in the blood, were performed. Comparative statistical analyses between groups were done.

The smokers who took part in this study started to be dependant on this addiction at a rather early age. Although some of them tried to stop smoking, they only succeeded temporarily because, according to the results of the questionnaire, they failed to resist the temptation.

According to the literature, long-term smoking can affect the state of health. Changes of cholesterol (total, LDL-c, VLDL-c, HDL-c), triglycerides and hematological parameters for the smoker's groups included in this study were observed.

It is essential to perform studies to underline the correlation between smoking and associated pathological status and to inform people, and especially teenagers, concerning these effects to quit smoking and to determine them not to smoke.

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Keywords: smoking, biochemical and hematological analysis, heavy metals

P.1.5. CHANGES OF HEMATOLOGICAL PARAMETERS IN CORRELATION WITH SMOKING STATUS IN ADULTS

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According to WHO, tobacco cigarette smoking is one of the major leading causes of death throughout the world. The number of deaths in ten years may be more than 8 millions. Smoking has both acute and chronic effect on haematological parameters.
The present study aimed to draw attention to the effects induced by tobacco use, in particular on the haematological changes induced by it in adults.
There are enrolled in this study one hundred and nine subjects, divided as follows: 31 active smokers, 67 non-smokers and 9 former smokers. In analyse of complete blood count was used the fully automatic haematological analyzer Sysmex XN-1000.
The statistical analysis was performed by GraphPad Prism 8.4.2, which generated the following results. The age and gender of the subjects did not represent an influence on the statistical analysis. The active smokers had significantly higher levels of white blood cell (p=0,027), monocytes (p=0,002), and mean corpuscular volume (p=0,020) when we analyse all three groups. Comparing the active smokers with non-smokers p value for monocytes variation is 0,001 and for MCV is 0,005.
Our study showed that continuous cigarette smoking determines severe adverse effects on haematological parameters (e.g. white blood cells count, mean corpuscular volume). These alterations might be associated with a higher risk for developing atherosclerosis, cancer, respiratory and neurological diseases, and/or cardiovascular diseases.

Keywords: tobacco cigarette smoking, haematological parameters

P.1.6. FLOW CYTOMETRY MONITORING OF A RELAPSED T-CELL ACUTE LYMPHOBLASTIC LEUKEMIA WITH A NEW CLONE - CASE REPORT

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Acute lymphoblastic leukemia (ALL) is the most frequent childhood cancer, 80%-85% of it is the B-cell type, and only 15% is T-cell ALL. T-Cell Acute Lymphoblastic Leukemia (T ALL) is a form of leukemia with a more reserved prognosis compared to B-Cell Acute Lymphoblastic Leukemia, regarding the response to treatment, the risk of relapse, and the survival rate. Current monitoring progress, by flow cytometry immunophenotyping and PCR-based amplification of antigen-receptor genes, recorded both worldwide and in Romania, led to increased rates of survival and healing rates in children diagnosed with ALL.
Here we present one pediatric patient with T-ALL, from our institution and discuss how our flow cytometry monitoring reflects what we have learned about this subtype of the disease. We also reflect on how we anticipate by flow cytometry monitoring the management might change between different checkpoints.

Keywords: leukemia, T cell, children, relapse, flow cytometry

P.1.7. ACUTE LYMPHOBLASTIC LEUKEMIA IN CHILDREN - DIAGNOSTIC ALGORITHM BY APPLYING THE LATEST WHO CRITERIA (2016)

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Acute lymphoblastic leukemia (ALL) is a severe hematological condition caused by the uncontrolled proliferation in the hematogenous bone marrow of immature cells called lymphoblasts. Acute lymphoblastic leukemia is the most common pediatric neoplasia accounting for 25% of all cancers in children.
However, this severe neoplasm benefits from new findings in diagnosis and treatment so that the cure rate has reached 90% in recent years.
These important improvements in the survival rate are mainly due to advances in diagnostic techniques.
If in the past, the diagnosis of ALL was based only on morphological features and immunophenotypic patterns, in the latest WHO classification (2016) a major role belongs to molecular markers.
Based on immunophenotypic and molecular data, patients are stratified into risk groups, with an impact on the choice of treatment and prognosis. This led to a significant improvement in clinical outcomes.
We present a laboratory diagnostic algorithm for ALL, applicable in current pediatric hematology practice.

Acknowledgements: *Partial financing of this study was covered by Transilvania University of Brasov under the competition "My graduation thesis"- 2020.*

P.1.8. THE MANAGEMENT OF THE CLINICAL LABORATORY IN THE EMERGENCY ROOM FOR PATIENTS WITH DIABETES

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The diabetes is a group of metabolic disorders that are characterized by hyperglycemia that is associated with disorders on the metabolism of lipids and proteins, due to a deficiency in the action of insulin in the target tissues. In Romania, in 2012 there were approximately 800.000 people with diabetes. According to recent studies, 1.7 million Romanians have diabetes, and another 3 million people suffer from prediabetes.

The diabetic patients may be present in the emergency room with diabetic ketoacidosis, hyperglycemic status, hyperosmolar status, severe hypoglycemia, acute or exacerbated conditions due to chronic complications of diabetes (coronary heart disease, peripheral vascular disease, nephropathy, somatic or vegetative neuropathy) and chronic diseases (liver cirrhosis, respiratory failure, heart failure). In these situations, the clinical laboratory plays an important role in the processing of biological samples collected from patients. They must be processed quickly, correctly and efficiently.

In this paper is presented a study performed in an emergency medical analysis laboratory. This study shows the laboratory tests required in the emergency room for diabetic patients, the analytical method used to dose the biological samples and the time of execution of the tests.

The study presents a number of 105 patients who came to the emergency room. Blood samples were taken from the patients to measure the following tests: astrup, ionogram, blood glucose, but also other tests: hemoleucogram, TGO, TGP, uric acid, urea, GGT, HDL, LDL, total cholesterol, creatinine, triglycerides, amylase, lipase, CK, CK-MP, troponin I. Statistic analysis were performed.

The study presents the importance of clinical laboratory and its management in medical emergencies for diabetic patients.

P.1.9. INNOVATIVE STRATEGY FOR SIMULTANEOUS DETECTION OF TWO IMPORTANT SALIVARY MARKERS

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The pathology of oral cavity is closely correlated with dietary intake. Most of the advanced glycation end-products (AGEs), such as methylglyoxal (MGL) and N-(carboxymethyl)lysine (CML), are associated with processed food. They are considered markers involved in oxidative stress by producing long-term damage to proteins in ageing, atherosclerotic plaques and diabetes.

An innovative approach for the sensitive and simultaneous electrochemical detection of MGL and CML was elaborated based on a lab-made printed platform using a flexible plastic foil as support, an Ag conductive ink for the design of the pseudoreference electrode and contacts, and a carbon ink for the counter and working electrodes.

The surface of the working electrode was electrochemically decorated with a nanostructured platinum film by means of cyclic voltammetry (CV) from a hexachloroplatinic acid solution in HCl. All steps involved in the elaboration of the sensor were optimized based on the differential pulse voltammetry (DPV) signal of the analytes.

The disposable sensor was successfully tested for direct electrochemical detection of MGL and CML using DPV. The employment of composite electrodes exhibits electron-mediating effect, which leads to well-defined and separated peaks associated to MGL reduction and CML oxidation, respectively.

The developed assay was shown to be selective and sensitive for the simultaneous *in vivo* analysis of salivary MGL and CML in healthy volunteers, being promising for the elaboration of point-of-care devices.

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Keywords: AGEs; electrochemical sensors; salivary markers

P.1.10. GRAPHENE–GOLD NANOSTRUCTURES HYBRID COMPOSITES SCREEN-PRINTED ELECTRODE FOR THE SENSITIVE ELECTROCHEMICAL DETECTION OF VANCOMYCIN

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The most important glycopeptide antibiotic, vancomycin (VAN), is used for the treatment of severe bacterial infections like methicillin-resistant staphylococcal infections and endocarditis. Considering the problem of antibiotic resistance as well as its toxicity, both correlated with the VAN concentration in biological samples, there is a need for better and more accessible quantification methods for this antibiotic [1].
In this context, we present a simple electrochemical method for VAN sensing based on a hybrid graphene-gold nanostructure nanocomposite electrode, which allows double detection directly in the oxidation domain and also indirectly, in reduction, using the electro-active gold nanostructures as a probe to monitor the current changing due to the interaction between gold and VAN.
The developed method was able to successfully detect VAN in the linear range of 1–100 µM and it was successfully applied for the analysis of human serum samples [1].

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Keywords: Graphene, Gold nanostructures, Vancomycin

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P.1.11. STUDY ON THE LEVEL OF MOBILE PHONE CONTAMINATION IN THE MEDICAL STAFF OF THE LABORATORY

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The use of mobile phones has become common in everyone's life. They are also used very often in hospitals and private clinics. However, they have a potential role in the transmission of various microorganisms. While the medical staff makes contact with the patients after using the mobile phone, there is the possibility of transmitting the microorganisms on its surface. The real problem arises when the transmitted microorganisms are not only non-pathogenic but even multidrug-resistant strains involved in nosocomial infections. Therefore, in the following study, this aspect is followed, as well as the role of lifestyle in the contamination of mobile phones.

The aim of this study is to correlate the lifestyle characteristics of laboratory medical staff who use mobile phones with the level of microbiological contamination of their phones.

The first part will involve the administration of questionnaires to the laboratory medical staff and the second part will consist of collecting samples from the surface of their mobile phones. The microorganisms were identified by specific identification tests and identification kits. Following the administration of the questionnaire in various surveys, it results that there is a high percentage of medical staff who use mobile phones at work. In all studies, coagulase-negative staphylococci (CONS), which are non-pathogenic bacteria belonging to the normal skin flora, were most frequently isolated. It is worrying that there are multidrug-resistant strains of MRSA type in most studies. Other bacterial species such as *Escherichia spp, Klebsiella spp, Pseudomonas spp, Acinetobacter spp, Micrococcus, Enterococcus and Bacillus spp* were also identified in different numbers from one study to another. Many of these species may be involved in the production of nosocomial infections.

Mobile phones have proven to be an effective method of communication in the health system, and as a result, it has improved the quality of patient care. However, there is also evidence that there are many bacteria on their surface, some even pathogenic, and this is a risk of nosocomial infections. Hand washing has been concluded to be the most effective method of preventing and controlling infections. Other recommendations would be disinfection with 70% alcohol and wipe soaked in ethyl alcohol. There is currently a great need for clear disinfection control protocols. It is also recommended to limit the use of phones, and as an alternative, it is recommended to use touch screen phones at the expense of keypads. The education of medical staff, patients and their families in this regard is also essential.

Acknowledgements: *Partial financing of this study was covered by Transilvania University of Brasov under the competition "My graduation thesis"- 2020.*

Keywords: mobile phones, contamination, medical staff, laboratory

P.1.12. CORRELATION OF HYDRATION BEHAVIOR AND PHYSICAL ACTIVITIES FOR A HEALTHY LIFESTYLE

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Water has many roles in the human body, as essential transporter of nutrients in the cells, but also the medium for toxins/metabolic products elimination. It also helps maintain constant body temperature. The balance between water outlets and water inlets defines the state of hydration. Hydration is under homeostatic control through mechanisms that modify the excretory pathways and stimulate the intake (thirst).
There were used two research methods: questionnaires survey on the issue of proper hydration and a clinical study for the analysis of parameters in direct dependence on water status for sedentary group (N=100) and athletes (N=75) before and after 20 minutes of physical activity.
Two situations in which the participants of both groups feel the need to consume more water are during the study and physical effort.
Dehydration influences hematological parameters (increases hematocrit). Sodium level varies in all three batches ($p = 0.022$).
Athletes hydrate the most during exercise. Rehydration during sports improves performance. This aspect was observed by 85.3% of the sportive participants of the presented study.

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Keywords: hydration, lifestyle, physical activity

P.1.13. OXIDATIVE STRESS AND BIOCHEMICAL CHANGES ASSOCIATED TO PHYSICAL ACTIVITY

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Oxidative stress is the sum of all metabolites accumulated in tissues and biological fluids through radical oxygen species/ imbalance between them and the antioxidant system.
The aim of this study was to determine levels of some blood and urinary parameters between groups and also for the athletes group before and after 20 min of physical effort.
A cross-sectional study was designed including 175 young subjects from Brasov (Romania), divided into two groups: sedentary group (N=100) and athletes (N=75).
Creatine level varied in all three batches ($p = 0.0001$). Physical activities influenced the blood glucose level. The glucose level is higher in the sedentary group compared to the athlete group before physical effort (20 min running), but it did not have statistical significance ($p = 0.530$). The level of glucose after physical exertion is higher than the beginning of physical activity ($p = 0.0001$).
It was observed that the level of uric acid was lower in the sedentary group compared to that of the athletes before the effort ($p = 0.036$), and it was higher after the physical effort than before the physical effort ($p = 0.269$).
Muscle injury is associated with an inflammatory response; there is a rapid and sequential invasion of muscle fibres with populations of inflammatory cells (lymphocytes, neutrophils).
These results indicated that physical effort is beneficial for human's health because the human body, in its adaptation, increases the antioxidant physiological defence.

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Keywords: physical activity, biochemical data, inflammatory response, oxidative stress

P.1.15. GLUTAMINE - NEVER ENDING RESOURCE IN LIVER DISEASE

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Glutamine is a non-essential α-amino acid that can be synthesized by almost all tissues by the glutamine synthetase from glutamate. Hepatic glutamine metabolism is majorly involved in systemic ammonia detoxification. The new advances in biochemical methods like metabonomics and metabolomics have helped discover new and important roles that glutamine plays in liver disease.

In hepatocellular dysfunction, ammonia detoxification via glutamine is taken over by skeletal muscles, brain and lungs. Furthermore, the major part of the glutamine produced is catabolized to ammonia in the intestine and the kidneys that then escapes detoxification via urea and is released into the blood stream and has a stimulatory effect on the production of glutamine in skeletal muscles and brain.

In acute and chronic liver failure, a high plasma glutamine concentration may be found. Increased levels of plasma glutamine have negative effects on the brain that can lead to hepatic encephalopathy. Targeting a combination of ammonia lowering mechanisms that affect glutamine metabolism can be used to prevent or treat hepatic encephalopathy.

One of the benefits of increased glutamine synthesis is its stimulation of the immune system, so glutamine supplementation can be used, especially during catabolic stress such as post-operative period, injury, or sepsis. Although care must be taken when using glutamine, due to its adverse effects on the brain.

Due to glutamine's role in cancer cell survival and proliferation, treatments targeting glutamine metabolism may be used in hepatocellular carcinoma. Increased metastatic potential of hepatocellular carcinoma has been tied to upregulation of glutamine synthetase expression in tumoral cells.

In conclusion, advances in metabolomics and genomics have highlighted new uses of glutamine as a diagnostic and therapeutic tool.

P.1.14. HISTORICAL REVIEW OF TRADITIONAL ROMANIAN FOOD

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In the last hundred years and in Romania, even in the last 25 years, the lifestyle has changed dramatically. Mechanization of the production of goods in general, means of transport, dissemination of information in all fields electronically (television or internet), regular use of computers, introduction of sewerage and water supply even in rural areas, electricity, all these have reduced the need for movement physical effort.
On the other hand, the increase in food imports that took place after the 1989 Revolution, the introduction of fast-food restaurants in urban areas changed an important part of the traditional way of eating.
These phenomena continue to lead to a greater need for correct information about healthy eating to prevent the occurrence of diseases and illnesses due to an erroneous intake of nutrients chosen qualitatively or quantitatively.

Keywords: food, Romanian traditions, anthropology

P.1.16. VITAMIN AND MINERAL STATUS ASSESSMENT STUDY IN CYSTIC FIBROSIS IN CHILDREN

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Cystic fibrosis sometimes called “65 rose disease” is one of the most common recessive monogenic diseases and is caused by mutations in the CFTR gene (Cystic Fibrosis Transmembrane Conductance Regulator). The protein encoded by this gene controls the secretion of exocrine glands from many organs, the mutations causing the secretions to thicken and affect the function of the bronchopulmonary system, digestive system, reproductive system and other organs.
Fifty-four children with cystic fibrosis, age between 1-16 years old, from pediatric department of National Institute for the Mother and Child Health Alessandrescu Rusescu, were observed. In the serum samples we determined heavy metals, vitamins A, D, and E and iron status.
Although there is an improvement in the management of patients with cystic fibrosis, this is still insufficient, because the management of this condition needs not only "corrections" in protein structures, but also symptomatic treatment and intensive physiotherapy that require concomitant therapies.

Keywords: cystic fibrosis, vitamin A, vitamin E, vitamin D, heavy metals

P.1.17. HEAVY METALS IN CHILDREN WITH PHENYLKETONURIA

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Phenylketonuria (PKU) is the most prevalent disorder caused by an inborn error in amino acid metabolism, an increase in blood phenylalanine concentrations. If untreated, PKU leads to profound and irreversible mental disability.
In thirty serum samples from children with PKU and thirty healthy children, with age between 0-12 years old, we determined phenylalanine and heavy metals. We found abnormal serum levels of copper, cadmium, lead, selenium, and zinc.
In order to obtain more information about the possible connection between heavy metals and PKU, several investigations are needed.

Keywords: phenylketonuria, phenylalanine, heavy metals

P.1.18. QUALITY OF LIFE ASSESSMENT FOR POSTOPERATIVE GYNAECOLOGY PATIENTS

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Quality of life has long been an overlooked aspect of postoperative patient healthcare with emphasis usually put on the postoperative surgical result, especially with gynaecologic oncology patients.

The aspects in need for review regarding the short and long term outcomes of the postoperative quality of life are related mainly to postoperative pain, mental health, physical ability, sexual capacity and menopausal symptoms. In this particular matter we propose a series of quality of life charts based upon a number of questions, taken at different time intervals, mainly at days 1 and 7 for the short term quality of life assessment and 1 month, 3 month, 6 months and 1 year intervals for the long term outcomes respectively.

In conclusion, we find that quality of life assessment is also an important tool in defining patient health, a tool which can help in patient physical and mental symptom alleviation.

P.1.19. CERVICAL CANCER - SOCIO-DEMOGRAPHIC VARIANCE FACTORS

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Cervical cancer plays an important role worldwide as it is considered the 4th malignancy judging by incidence, the 3d by prevalence with a total of 8% of deaths by cancer and the 4th place in mortality rate.

When comparing the cervical cancer rates between different countries but also by looking at differrent populations inside a certain region-specific demographic factors arise such as: age, ethnicity, origin, sexual history like early age at sexual debut, having multiple sexual partners or a partner with multiple sexual partners, immunologic status, education, social status, lifestyle, medical programmes etc.

When taking into account and evaluating these risk factors along with time intervals, despite national programmes, the same high levels cancer statistic are seen.

This fact leads to the need for stronger cervical cancer awareness, sexual education and medical programmes in order to reduce the continuously peaking cancer incidence.

S2. New Trends in Nutritional Sciences and Food Control

KN.2.1. BENEFITS AND SAFETY OF FOOD POLYPHENOLS IN HUMAN HEALTH: FOCUS ON THE BRAIN

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Most, if not all, vegetables included in human nutritional habits include in their composition one or several polyphenols. Such molecules have been highlighted as potent antioxidants, and their consumption as food considered beneficial in the pathological conditions involving oxidative stress. Moreover, anti-inflammatory properties have also more recently been assigned to polyphenols. Therefore, their potential role in the prevention and treatment of various pathological conditions connected to oxidation and inflammation (e.g., cancer, and cardiovascular disorders) has been the object of many studies. Among those conditions, neurodegenerative diseases are globally one of the main causes of death and represent an enormous burden in terms of human suffering, social distress, and economic costs. Recent data expanded the polyphenols' mechanisms of action by showing that they are also able to modulate several cell-signalling pathways and mediators.

The proposed benefits of polyphenols, either as protective/prophylactic substances or as therapeutic molecules, may be achieved by the consumption of a natural polyphenol-enriched diet, by their use as food supplements, or with formulations as pharmaceutical drugs/nutraceuticals. It has also been proved that the health effects of polyphenols depend on the consumed amount and their bioavailability. However, their overconsumption may raise safety concerns due to the accumulation of high levels of these molecules in the organism, particularly if we consider the loose regulatory legislation regarding the commercialization and use of food supplements. This presentation will address some of the main beneficial effects of food polyphenols and will focus on neuroprotection and some safety issues related to polyphenols overconsumption.

Keywords: food polyphenols; neuroprotection; human nutrition; safe consumption

O.2.1. DIETARY PATTERNS AND THEIR ROLE IN THE PREVENTION AND TREATMENT OF NEURODEGENERATIVE DISEASES

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In recent years, the burden of neurodegenerative diseases (NDs) has increased due to population aging and has become an important concern of the public health systems in the developed countries. A diet, which is an integrated part of the life style, is one of the major modifiable risk factors for a range of chronic diseases. The effects of dietary patterns in the prevention and treatment of NDs are still under investigations and remain of major interest to both clinicians and scientists.

A critical review was conducted to assess the dietary patterns' role in the prevention and treatment of NDs, including Alzheimer's diseases, Parkinson's disease and amyotrophic lateral sclerosis. There are evidences of protective effects of certain diets (e.g. Mediterranean, ketogenic) and nutrients (e.g. antioxidants) on the risk of NDs development and the disease outcome. Yet, the findings on dietary patterns' relations to the NDs differ across the studies.

Despite of inconclusive data on the effects of dietary patterns on the NDs risk and outcome, there are certain benefits to be achieved in particular subgroup of patients with NDs. Notably, the analyses of foods and beverages' ingredients influence on the clinical course and phenotype of NDs, having in mind their characterization and molecular properties, may provide the new insights into the NDs pathomechanism.

Keywords: dietary patterns; neurodegenerative diseases; prognosis

O.2.2. BITTER TASTE: AN ETHNOPHARMACOLOGICAL PERSPECTIVE AND BEYOND

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Herbal taste has been considered in various ethnomedical systems as a tool indicative of therapeutic potential. For instance bitter medicinal plants are traditionally used as choleretic cholagogue, antiinfectious, febrifuge, digestive stimulant remedies. In order to explore the potential biological basis of this ethnopharmacological concept, our team has constructed a database called PhytoMolecularTasteDB by integrating the taste of 466 phytochemicals with the available information on the evidence based anti-inflammatory activity found in PubMed, Elsevier databases and Google Scholar.

Several studies based on text mining of the traditional medicine books, as well as data mining performed in PhytoMolecularTasteDB, allowed us to discover few interesting facts:

1) bitter phytomolecular taste of Indian medicinal plants is associated with anti-inflammatory activity of the plant; 2) the anti-inflammatory activity of individual phytotastants was found to be significantly associated with bitter taste, astringent orosensation and lack of sour taste, but not with pungent orosensation or with sweet or salty tastes.

The purpose of this presentation will be to correlate the ethnopharmacological concept of bitter taste with these results. The speaker will also briefly describe the potential molecular mechanisms (included that mediated by extraoral bitter taste receptors) involved in anti-inflammatory activity of bitter tastants, as well as future research directions required for confirmation and understanding of the biological mechanism of this linkage.

O.2.3. IN VITRO COMPARISON OF THE BIOACTIVITIES OF JAPANESE AND BOHEMIAN KNOTWEED ETHANOL EXTRACTS

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Knotweed is a flowering plant that is native to temperate and subtropical regions in the northern hemisphere. We evaluated Japanese (*Reynoutria japonica* Houtt.) and Bohemian (*Fallopia x bohemica*) knotweed rhizome and flower ethanol extracts and compared them in terms of their biological activities. The specific polyphenols were identified and quantified using HPLC/DAD, and the antioxidant activity was determined using 2,2-diphenly-1-picrylhydrazyl (DPPH) and cellular antioxidant capacity assays. The anticancer activity was evaluated as the difference between the cytotoxicity to cancer cells compared with control cells. The antimicrobial activity was determined using bacteria and yeast. The antidiabetic activity was tested as the ability of the extracts to inhibit α-amylase. Both rhizome extracts were sources of polyphenols, particularly polydatin and (−)-epicatechin; however, the cellular assay showed the highest antioxidant capacity in the flower extract of *F. bohemica*. The PaTu cell line was the least sensitive toward all knotweed extracts. The flower extracts of both species were less toxic than the rhizomes. However, the activity of the tested extracts was not specific for cancer cells, indicating a rather toxic mode of action. Furthermore, all used extracts decreased the α-amylase activity, and the rhizome extracts were more effective than the flower extracts. None of the extracts inhibited bacterial growth; however, they inhibited yeast growth. The results confirmed that rhizomes of *Reynoutria japonica* Houtt. could become a new source of bioactive compounds, which could be used for the co-treatment of diabetes and as antifungal agents.

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Keywords: antioxidant activity; cellular antioxidant activity; polyphenols; anticancer activity; antimicrobial activity; antidiabetic activity; herbal medicine

O.2.4. PROSPECTS OF DEVELOPMENT OF PREPARATIONS BASED ON MUSHROOM BETA-GLUCANS AND MECHANISM OF THEIR ACTION

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Mushroom beta-glucans are possessing large variety of biological activities. Mechanisms of these actions are not fully identified yet, but beta-glucans are influencing variety of immune modulating cells, regulating their activities, bone marrow cells and GUT microflora. The mechanism of immune action of these polysaccharides is realized through their interaction with specific receptors on the cells of innate immunity. Stimulation of immune responses determines the therapeutic effects caused by beta-D-glucans: antitumor, anti-infective and anti-allergenic effects. Mushroom beta-glucans demonstrate pronounced immune regulatory, anti-inflammatory, anti-tumor, immune modulation actions, including wound healing and vaccine adjuvant effect. They are influencing glucose and lipid metabolism, GUT microbiota, have anti-diabetic effect and can be used in atherosclerosis prevention. Due to stimulation of bone marrow cells they can cause bone fracture healing, osteoporosis prevention, as well as possess radioprotective and chemoprotective action and used for treatment of myelodysplasias. The use of mushroom beta-glucans with medicinal properties as components of complex preparations with a specific focus can be considered a promising direction.

O.2.5. EFFECTS OF VITAMIN E ON VISCERAL FAT- EXPERIMENTAL STUDY

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The aim of this study was to evaluate the effects on lipidosis of PLGA-NPs *(polylactic-CO-glycolic acid nanoparticles)* louded with vitamin E, in Wistar rats who received high fat diet.
For 6 weeks, Wistar male rats (12 months old) were divided in two groups according to the diet, either with high caloric/high fat diet (5.15 kcal/g) or standard diet (3.5 kcal/g). For each group, two subgroups were formed, untreated or treated with vitamin E loaded PLGA-NPs (1 mg/kg body), given by oral gavage.
Rats on obesogenic diet had higher visceral fat storage than the standard diet group and higher levels of serum glucose, glycosylated hemoglobin, alkaline phosphatase, triglycerides and uric acid. The associated treatment prevented the visceral fat development, tissue lipidosis, reduced the increased weights for the studied tissues, had antiinflammatory effects and improved dyslipidemia.
In conclusion, PLGA-NPs loaded with vitamin E associated to high caloric/fat diet prevented the intervisceral and visceral lipid storage development.

O.2.6. RELATION BETWEEN URICEMIA, DYSLIPIDEMIA AND BLOOD CELL ASPECTS

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Blood cells are constantly exposed to soluble uric acid in the circulation and in the overweight subjects the vascular medium is usually dyslipidemic. Higher number of red blood cells or thrombocytes and rigid red blood cells and plachetes with higher medium corpuscular volume (MCV) and higher medium platelet volume (MPV) have proaggregation effects.
The aim of this study is to find the correlations between uricemia, dyslipidemia markers and the quantity/quality of blood cells, in overweight subjects. Twenty healthy subjects and eighty-four overweight adults, 50-70 years old, with 2 criteria of metabolic syndrome but without metabolic syndrome, were observed. Positive correlations were calculated between cholesterolemia and MCV, triglyceridemia and MPV, triglyceridemia and platelet count (r between 0.38-0.44, $p<0.05$), and between uricemia and GGT, blood pressure, glycosilated hemoglobin, waist circumference, atherogenic indexes, CIMT (carotid intima media thickness), and monocytes (r between 0.40-0.58, $p<0.05$). In overweight subjects, hyperuricemia and hypertriglyceridemia warrant more attention because they may influence the vascular function and not only vascular structure.

O.2.7. EVALUATION OF A VERSATILE MELDOLA BLUE BASED MEDIATOR WITH INCREASED STABILITY FOR BIOSENSING APPLICATIONS

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Efficient and stable electron transfer mediators are a key element of many electrochemical biosensors characterized by high sensitivity and operational stability. A novel compound with advantageously low water solubility was obtained by reacting the phenoxazine Meldola Blue with a nickel amine. Investigation of the performance of screen-printed graphite electrodes modified with the new compound revealed their versatility for the mediated detection of NADH and glucose. NADH was detected at potential values higher than -0.12 V vs Ag/AgCl, corresponding to the formal potential of Meldola Blue redox couple. Amperometric sensors with a detection limit of 0.5 µmol L-1 NADH when operated in batch mode at 0.1 V in PBS buffer pH 7.4 were further used as transducers in an enzymatic biosensor for aldehydes. In a separate application, the modified electrodes enabled the non-enzymatic detection of glucose due to Ni2+ contained by the new mediator and its conversion to a Ni3+ catalyst in alkaline medium. Based on the analytical performances for the detection of NADH and glucose, the Meldola Blue-Ni amine mediator shows a high application potential in electrochemical biosensors for various real world applications.

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O.2.8. THE POTENTIAL HEALTH BENEFITS OF RESVERATROL: A REVIEW OF HUMAN STUDIES

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Resveratrol (3,5,4'-trans-trihydroxystilbene), a stilbenic molecule belonging to phenolic compounds, was detected for the first time in wine in 1992. Resveratrol is present in different plant species, but its dietary sources are limited. Grapes and derivatives are the most important sources and among them, wine is responsible for the highest contribution to the total diet. When epidemiological studies suggested the cardioprotective effects of red wine moderate consumption, the investigations on the potential role of polyphenols, exponentially increased. However, the biological effects observed in in vitro studies were not always supported by in vivo investigations.

The aim of the study was to critically review the studies evaluating the correlation among resveratrol intake (as food supplement) and the effects on human health, with particular attention paid to the bioavailability aspects. The most important scientific databases were searched to collect the clinical trials from the inception to May 2020. Low quality, uncontrolled or unblinded studies were excluded. A total of 47 studied were collected in the scientific literature by applicating the selection/exclusion criteria. Cardiovascular and diabetes were the most investigated areas. The most significant positive effects were observed in cardiovascular system, where the intake of 30 mg/day improved the endothelial function in healthy subjects. Contradictory results were found in other physiological functions or diseases.

Only a limited number of studies supports the positive effects of resveratrol on health, also due to its in vivo extensive metabolism (>70%), suggesting that specific strategies are needed to increase resveratrol bioavailability.

Keywords: resveratrol, human studies, biological effects, bioavailability

O.2.9. SEAWEED - THE AQUATIC MIRACLE IN THE FIGHT AGAINST HUMAN PAPILLOMA VIRUS AND CERVICAL CANCER

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The infection with human papillomavirus (HPV) is the leading cause of cervical cancer. Marine-derived polysaccharides and other bioactive compounds have been shown to possess a variety of anti-HPV and related cancer activities. Marine algae-derived products play an important role in preventing inflammatory reactions and carcinogenesis by modulating the effects of oxidative stress. Our study aims to bring together all the previous studies based on the anti-HPV effect of seaweed polysaccharides.

This paper is a review of the English literature published in the last decade. We performed a systematic research in PubMed database using the key words “seaweeds”, “HPV infection”, “cervical cancer” aiming to evaluate the possible mechanisms of anti-HPV actions of marine bioactive compounds and their potential for therapeutic application in cervical cancer. Only original studies were used in our research. None of the

Brown seaweeds with low molecular weight fucoidan, mediated the growth inhibition of HeLa cervical cells. Heterofucans from *Sargassum filipendula,* a brown seaweed, exhibited anti-proliferative effects on cervical cells. Carrageenans from red algae were also observed to inhibit HPV infection by preventing the binding of HPV virions to the cells. Sulfated polysaccharides and terpenoids from brown algae are considered as promising bioactive molecules with anticancer activity, and some of them have been developed into novel antiviral agents.

In conclusion, considering all the previous results, various biologically active compounds of seaweeds have the potential to treat both unapparent HPV infection as well as visible clinical diseases.

Keywords: seaweeds, carcinogenesis, HPV infection, cervical cancer, antiviral, apoptosis

O.2.10. DETERMINATION OF BIOGENIC AMINE-FORMING POTENTIAL OF NATURALLY OCCURING LACTIC ACID BACTERIA (LAB) STRAINS ISOLATED FROM THE GRAPES OF VITIS VINIFERA CV. REFOŠK GRAPE VARIETY

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Biogenic amines are naturally occurring compounds that have been reported in variety of food, such as fish, meat, cheese, vegetables, and wines. When biogenic amines are formed by microorganisms such as lactic acid bacteria (LAB) they may have adverse effect on human health. The most common biogenic amines found in foodstuff are histamine, tyramine, putrescine and cadaverine. LAB are used as starters in the production of several foods and beverages. In wines they are used in malolactic fermentation, where the conversion of malic acid to lactic acid occurs. The aim of this work was to determine biogenic amine-forming capacity of indigenous LAB strains isolated from grapes which were PCR positive and screening medium positive for biogenic amines. Three methods for the confirmation of LAB biogenic amine-forming potential were developed and compared: HPLC-DAD and TLC methods both using derivatization agent dansyl chloride and enzymatic method using horseradish peroxidase (HRP) and diamine oxidase (DAO) enzymes. The applicability of methods was tested on the three known biogenic amine-producing LAB strains: 0006, 9809, 9906 (IOEB, France). The limit of detection (LOD) of the methods was <1 mg/L for HPLC-DAD, 5 mg/L for TLC and 25 mg/L for enzymatic method. Although the LODs between the proposed methods differed, all of the three methods confirmed BA-forming potential of the three strains. Furthermore, the proposed methods were applied for the analysis of three indigenous strains: MKBT-282 (BA+), MKBT-307 (BA-) and MKBT-325 (BA+). The positive or negative BA-forming potential was confirmed with all of the three proposed methods.

Acknowledgements*: The Agrotur/Karst agroturism project, which is implemented within the Cross-Border Cooperation Programme Italy-Slovenia 2014-2020, funded by the European Regional Development Fund and national funds is acknowledged for financial support. The authors also acknowledge Slovenian Research Agency (ARRS) for the financial support (Grant number: ARRS-MR-LP-2017/393).*

Keywords: lactic acid bacteria, biogenic amines, histamine, grape

P.2.1. NEW FUNCTIONAL FOOD PRODUCTS BASED ON BEE PRODUCTS, SILYBUM MARIANUM AND BERRIES

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The defatted milk thistle seeds *(Silybum marianum* (L.), a by-product of the manufacture of the milk thistle seeds oil, became more and more interesting because of their valuable composition. *Silybum marianum* (L.), seeds, has an important functional potential, being a significant source of silymarin (a flavonolignan complex) and 20–35% fatty acids, including linoleic acid. Berries have been valuable source (such as vitamines and antioxidants) humans since before the start of agriculture, and remain among the primary food sources of other primates. Adding a mixture of defatted milk thistle seeds, Wolfberry (*Lycium barbarum*) and blackberry (*Rubus*) in bee products improves the nutritional intake of minerals, vitamines and fiber.
The main objective of this study was to determine the nutritional and functional characteristics of concentrated bee products (honey, pollen and propolis) in addition with milk thistle seeds and berries. The analysis of the nutritional properties of samples from the new bee products enriched with different levels of milk thistle seeds and berries (50% bee products + 20% defatted milk thistle seeds + 15% Wolfberry + 15% blackberry) was done to demonstrate their functionality.

Keywords: milk thistle, honey, Wolfberry, blackberry, dietary fiber, minerals

P.2.2. ARE HOME COOKING EFFECTIVE IN DETOXIFYING GINKGO BILOBA SEEDS?

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Ginkgo biloba seeds are widely used in traditional Asian cuisine, although they are responsible for neurological adverse events occurring mainly in children. Poisoning from ginkgo seeds are due to the presence of ginkgotoxin, also called 4'-O-methylpyridoxine (MPN), chemically related to pyridoxin (vitamin B6). MPN is a neurotoxin that interferes with the biological pathway of GABA synthesis.

The tendency to discover new flavours is more and more frequent among consumers, who can easily find extra-European recipes and products from the Internet marketplace. Several websites publish homemade procedures for preparation and cooking of fresh seeds, which can be harvested from *Ginkgo biloba* plants (quite common in European cities).

To ensure consumer safety, the purpose of this study was the quantification of MPN in seeds before and after cooking with the most frequently home methods (boiled and microwave); commercial ginkgo seeds were also considered in parallel. A reverse phase, ion pairing high performance liquid chromatography method coupled with fluorescent detection (RP-IP-HPLC/FD) was used. Results showed that commercial seeds contained minute amount of MPN, corresponding to 3.67±0.20 µg/g dry weight (approx. -99% than raw seeds). Boiling treatment produced a significant reduction in MPN content (-65%, $p < 0.0001$), while microwave baking was not effective ($p > 0.05$).

To date, in order to protect consumers, only commercial seeds are considered safe enough. Preliminary results show that suitable home-made boiling could partially detoxify ginkgo seeds, but further studies are necessary to confirm these data.

Keywords: *Ginkgo biloba* L., ginkgotoxin, consumers' safety, cooking treatment.

P.2.3. BREAST CANCER AND ITS CONNECTION TO OIL RICH DIETS

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Our diet is rich in various types of oils as the industry nowadays offers a large variety of products. Among the most used, we mention corn oil and olive oil and further on study their dietary role on breast cancer.

The aim of our study is to identify which type of oil in our diet may influence the development of breast cancer in order to avoid its usage. Further, on we propose to also study the anthropological context in which different types of oils used for dietary purposes are being used as a result of inherited culinary customs. We performed an analysis of the scientific literature between 2015-2020 using “oil” and “mammary cancer”. Our research searched PubMed and the inclusion criteria were represented original studies and usage of the English language. None of the articles were excluded due to affiliation.

Our study identified original articles that mention the role of different dietary oils in neoplastic transformation. Oil intake tends to alter the progression of breast cancer by means of modifying the promotor effect. Results clearly show different characteristics of breast cancer progression and rate of diagnosis related to dietary habits: high extra-virgin olive oil diet is correlated to weak correlation to breast cancer.

Inherited culinary habits play an important role in the progression of different types of diseases and their analysis in a current display offers us a complex perspective related to both anthropologic and medical perspectives.

Keywords: oil, mammary cancer, diet, anthropology

P.2.4. RICKETS IN CHILDREN - STILL AN ISSUE. STATISTIC STUDY ON CHILDREN POPULATION IN DISTRICT OF BRASOV BETWEEN 2014-2019

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Despite rickets is “an old disease” it remains a frequent and common affection during childhood associated with poor nutrition, low exposure at sun light, prematurity, chronic pathology.
The aim of our study was to determine the prevalence of nutritional rickets among children in District Brasov, the association with other nutritional deficiency and the efficiency of the prophylaxis promoted by medical policy. It had been performed a retrospectiv study conducted in Children Hospital Brasov over a 5 years period (between January 2014 - January 2019) on infants and children under the age of 6 years. There were reviewed the medical records. The prevalence of rickets was 1,66% among children with predominance in boys (306 cases vs 150 cases in girls), in urban area (340 cases vs 116 cases in village). Most of cases had also malnutrition (398/456) and iron deficiency anemia (299/456). Regarding rickets prophilaxy most of children had experienced no or incomplete prophilaxy (101/456 and 155/456).
Nutritional rickets is still prevalent in District of Brasov and the primary ethiology remains vitamin D deficiency due to incorrect alimentation in infants and toddlers and insuficiency or incorrect administration of vitamin D. Nutritional rickets is associated with other nutritional disorders such malnutrition and anemia.

P.2.5. COMPARATIVE ANALYSES OF THE QUALITY OF MILK MOUNTAIN PRODUCTS, DEPENDING ON FEEDINGSTUFF COMPOSITION

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The paper aims to analyze the relationship between the composition of mountain meadows and the quality of milk obtained from grazing in summer. Ecological gradient and climate change are taken into account in observations on the stratification of vegetation.
A series of observations related to the productivity of mountain meadows are revealed, both in the altitudinal layer and related to global warming. Analyzes are performed on the quality of feed used in the additional ration for grazing. The base is the mountain meadow as a food source, followed in several variations on texture and nutritional supplements. Shared milk analyzes indicate that the composition of the feed has an influence on the quality of milk in the cattle species, with different statistical meanings between the experimental groups.
The results of the paper showed how the elements of the meadow texture are found in the composition of cow's milk, supporting the superior quality of mountain milk.

Keywords: quality, milk, mountain, meadow, vegetation.

P.2.6. COMPARATIVE ANALYSES OF THE QUALITY OF CHEESE MOUNTAIN PRODUCTS, DEPENDING ON FEEDINGSTUFF COMPOSITION

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One of the most discussed issues is the idea of whether mountain food is qualitatively different from other areas. In this sense, the paper aims to optimize the bioconversion on the biotransformation axis "feed-milk-cheese", in relation to geo-climatic and technical-organizational factors in the mountain area.
Analyzes of the main quality parameters of feed specific to mountain meadows in the Romanian Carpathian Mountains (Bucegi Mountains plateau) are performed, compared to the physico-chemical and biochemical properties of "cow's milk" cheese obtained from mountain milk in the experiments.
The results show in the case of some experimental batches that they are less significant, but in others there are significant statistical meanings regarding the relationship between the composition of feed, milk and finally, after the (traditional) processing of Telemea cow cheese, which indicates the technology to follow.

Keywords: cheese, quality, feed, milk, mountain.

P.2.7. BREAD DOUGH QUALITY EVALUATION BY USING ENERGY POWER METER SENSOR

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Rapid evaluation of bread dough quality is one big priority for bread industrial flow engineers. The paper is setting a method based on the sensor PZEM-004T 3.0 Version TTL Modbus-RTU. This is monitoring Voltage, Current, Frequency, Power Factor, Energy Power, for each Phase of the dough mixer engine. Measured data are correlated with Mixolab curves and useful conclusions are extracted for practical situations.

P.2.8. ASSESSMENT OF ANTIOXIDANT PROPERTIES OF WINES BY DIFFERENT IN VITRO METHODS

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Different epidemiological studies have suggested that a moderate consumption of wine can be associated with a series of beneficial effects such as cardioprotective, antimicrobial, neuroprotective, and anti-aging properties. Such protective effects of wines were identified by their content in nutrients (sugars, amino acids) and minerals and especially in various phenolic compounds such as flavonoids, anthocyanins and tannins. These low molecular weight compounds have antioxidant properties, their synergistic action leading to the protection of the human body's cells against the oxidation process.

Numerous in vitro tests have been developed for the antioxidant property measurements and many of them differ from each other in terms of reaction mechanisms, oxidant and target/probe species, reaction conditions and expression of results. However, no method has showed satisfactory correlation with the in vivo determinations and actually there is a need for multi-faceted testing of antioxidant activity. Therefore, a justified substitution of all methods with a less biased one appears to be a desirable aim.

Based on these considerations the aim of this study was the application and comparison of different in vitro spectrophotometric and chromatographic methods to assess the flavonoids/polyphenols content and antioxidant activity of white wines. The spectrophotometric method based on flavonoid-aluminum chloride ($AlCl_3$) complexation was used to determine the total flavonoid content (TFC) while the Folin-Cocalteau's assay was applied for the quantification of total polyphenols (TPC). The total phenolic index (TPI) of wine samples was also determined by spectrophotometric measurements at 280 nm. For the antioxidant activity evaluation, the ferric-reducing/antioxidant power (*FRAP*) assay and thin layer chromatography with 2,2'-diphenyl-1-picrylhydrazyl radical assay (TLC-DPPH) were used. The correlation between the obtained results and the antioxidant activity of wine samples were discussed.

P.2.9. OPTIMIZATION OF QUERCETIN EXTRACTION FROM BROWN ONION (ALLIUM CEPA L.) SKIN

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Industrial waste of fruits and vegetables represents an ecological problem when not treated correctly. Some of these wastes can be used to obtain value-added products, hence contributing to its cost reduction and valorisation. Such is the case for onion skin, which can be used to extract quercetin, a naturally present flavonoid with antioxidant, anti-inflammatory and anti-cancer effects.

The goal of this study was the optimization of quercetin extraction from brown onion skin (*Allium cepa* L.) through a systematic study of the effects of different parameters on the quercetin yield. The methods compared were ultrasound-assisted extraction (USAE) and conventional maceration extraction (CME) and the operational parameters investigated were: solvent type, mass-to-liquid ratio, extraction time and temperature

Antioxidant capacity was evaluated by DPPH· radical scavenging assay, whereas quercetin yield was determined by HPLC/DAD. Antidiabetes activity of onion skin extracts was also investigated using α-amylase inhibition assays. Optimal extraction conditions of quercetin from onion skin were obtained with CME, 50% ethanol as a solvent, 1:100 mass-to-liquid ratio, extraction time of 15 min and extraction temperature of 25 °C. The maximum antioxidant capacity (expressed as quercetin equivalents), obtained by optimised extraction conditions, was 18.7 mg/g and the mass fraction of quercetin was 7.96 mg/g. Furthermore, the onion skin extracts exhibited a dose-dependent relationship between dry extract concentration and α–amylase inhibition, which confirms that onion skin extract can be considered as an anti-diabetes agent.

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Keywords: onion skin, quercetin, antioxidant activity, anti-diabetes activity

P.2.10. FAST ELECTROCHEMICAL ALTERNATIVES FOR RESVERATROL DETECTIONS FROM FOOD SUPPLEMENTS

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Resveratrol is a powerful antioxidant with anti-inflammatory properties. Resveratrol has been identified in the skin of red grapes, in grape leaf's, blueberries, rosehip, peanuts, and wine. It is frequently reported as constituent of food supplements.
Highly sensitive and fast electrochemical methods were described in this paper, having as aims the detection of resveratrol and its antioxidant properties from food supplements.
Differential pulse voltammetry (DPV) and a new redox microsensor were used. As far as we know, this work is the first one using this type of redox microsensor for detection of antioxidant capacity of resveratrol and this type of transducer for DPV method for qualitative and quantitative detection of this bioactive compound. The obtained results using electrochemical methods were successfully compared with HPLC-UV for resveratrol detection.

Keywords: resveratrol, chromatography, differential pulse voltammetry, redox microsensor

P.2.11. VOLTAMMETRIC DETECTION OF SEROTONIN AT SCREEN-PRINTED CARBON ELECTRODES MODIFIED WITH MESOPOROUS CARBON

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Serotonin is an important neurotransmitter with a varied variety of functions in the human body and it is related to appetite, emotions, wellbeing and happiness, and motor, cognitive, and autonomic functions. Detection of serotonin by means of sensors is still challenging and the use of nanomaterials and voltammetric techniques could help in obtaining high quality sensors for screening analysis. This article describes the development and characterization of a new stable and sensitive electrochemical sensor based on carbon electrode screen-printed with mesoporous carbon for the voltammetric detection of serotonin.

The sensor was characterized by microscopy and FTIR spectrometry in order to assess the morphology of the sensitivity layer and the purity. The electrochemical behavior was studied in ferrocyanide and catechol solution, respectively in order to assess the role of mesoporous carbon in the sensibility of sensor. The sensor was further used to study the electrocatalytic oxidation of serotonin in 0.1 M phosphate buffer solution at pH 6 using cyclic voltammetry and differential pulse voltammetry. The carbonaceous layer of sensor is efficient in mediating the electron transport between the electrochemical reaction and the electrode in determining serotonin. The sensor also shows well-separated oxidation peaks of serotonin and ascorbic in the simultaneous determination of these compounds in the same solution. The effect of the experimental variables on the electrochemical behavior was studied (scan rate, pH, simultaneous determination, and concentration). The detection limit determined was 2.3×10^{-7} M. The sensor was validate by quantitative determination of serotonin in foods such as chocolate of different quality.

The electrochemical sensor was used to directly determine serotonin in food samples, showing better sensitivity, stability and reproducibility compared to the unmodified carbon screen-printed electrode.

Keywords: serotonin, cyclic voltammetry, screen-printed electrode.

P.2.12. ELECTROANALYTICAL STUDIES OF METHOXYFENOZIDE

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The increasing use of pesticides is one of the major health and environmental issue. Therefore, it is crucial to develop new methods for the rapid determination of pesticide residues in certain type of food or environments. Methoxyfenozide is a diacylhydrazine insecticide, it exhibits high insecticidal efficacy against a broad range of important caterpillar pests. Based on its physical and chemical properties, there is a high risk of leaching to groundwater. The aim of this work was to develop a first, sensitive electrochemical procedure for determination of methoxyfenozide in spiked water samples (river and tap water).

The analysis was carried out on bare boron-doped diamond electrode. For analytical purposes square wave voltammetry (SWV) was utilized. The influence of various factors such as pH, buffer composition and SW parameters was studied. A conventional three-electrode system was used with a saturated Ag/AgCl reference electrode and a Pt wire counter electrode. Methoxyfenozide signals were stable and repeatable. The best results in terms of signal shape and intensity were recorded in Britton-Robinson buffer at pH 3.0. Linearity of peak current on concentration of methoxyfenozide was found in the range from 0.5 to 70.0 µM with a detection limit of 0.14 M. The applicability of the developed methodology for analysis of tap water and river water was successfully illustrated with spiked samples analysis.

The obtained results allow us to state that it is possible to carry out quantitative analysis of methoxyfenozide on a boron-doped diamond electrode. Additionally, short determination time, low cost and environmental friendliness are the main advantages of the proposed procedure.

Keywords: methoxyfenozide, voltammetry, boron-doped diamond electrode

P.2.13. DEVELOPMENT OF AMMONIA SENSORS BASED ON POLYANILINS: SUPPORT TO QUALITY CONTROL OF MEAT PRODUCTS

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Meat products tend to decompose quickly, which often causes eating disorders in those who consume them. For this reason, it is important to monitor, during storage, the formation of ammonia, which characterizes the stage of product decomposition. The present work aimed to develop a sensor based on polyaniline films, aimed at detecting ammonia in these types of foods. Nickel phthalocyanine (NiPc) was added as a modifier to the synthesized polymer. Films of 10, 20 and 30 bilayers were assembled using the layer-by-layer (LbL) self-assembly technique and cyclic voltammetry (CV). The cyclic voltamograms of the films confirmed the redox peak redox pairs characteristic of Pani and the displacement to the peak oxidation potential when the number of bilayers increased, showing the interaction of the polymer with NiPc.

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Keywords: polyaniline; meat products; sensors, ammonia

P.2.14. RESEARCHES ON THE CHEMICAL COMPOSITION AND THE RHEOLOGICAL PROPERTIES OF WHEAT AND GRAPE SEED FLOURS MIXES

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Grape seeds are considered a valuable by-product for antioxidant and antibacterial agent preparation. The grape seeds contain some active compounds, such as, dietary fibre, polyphenols, flavonols, and resveratrol; it is commonly used as a nutritional supplement. The main aim of this study was to establish the optimum dose of grape seed flour, to be used as a functional ingredient in the bakery products industry, from both chemical and rheological point of view. The laboratory experiments evaluated the functional potential of wheat flour enriched with grape seed flour, in different proportions, by examining the chemical composition and rheological behaviour of dough. Protein, crude fibre, fat, ash and mineral contents were determined. Using ^{1}H-NMR spectral technique, the fatty acids composition was determined, especially the concentrations of short-chain saturated fatty acids (C4-C8), di-unsaturated fatty acids, mono-unsaturated fatty acids and long-chain saturated fatty acids (>C8). 1H-NMR spectra were recorded on a Bruker Ascend 400 MHz spectrometer. The rheological behaviour was analyzed using the predefined “Chopin +” protocol on Mixolab, a equipment of CHOPIN Technologies.

Grape seed flour was incorporated into wheat flour at four different levels, 3%, 5%, 7% and 9% and it was found that incorporation up to a 9% level into the formulation of wheat flour yielded an acceptable product in terms of rheological parameters, with improved chemical, nutritional and functional properties.

P.2.15. POMEGRANATE JUICE AND EXTRACT- IMPORTANT TOOLS IN BREAST CANCER PREVENTION

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Breast cancer is the second most common malignancy of women after skin cancer. In order to both prevent and help cure this disease we searched the scientific literature for evidence related to the action of pomegranate juice and extract. The role of this fruit in different malign pathologies has been long time cited in both scientific and non-scientific literature making thus important to identify its role in the pathophysiological process.

We performed a review of the scientific literature by using the following terms: “pomegranate extract” and “breast cancer”. Our search was performed in PubMed and it included original research only. None of the articles were excluded due to language reasons or affiliation.

The great number of pomegranate varieties along with the important number of bioactive compounds made our search identify a total number of 31 original papers. The articles included in our study mention both prevention and treatment of breast cancer realized on patients or on different cell lines. Anti-aromatase activity and inhibition of testosteron-induced breast cancer cell proliferation was shown when cells were treated with ellagitannin derived compounds in vitro. Punicic acid affects all tumoral cells, both estrogen insensitive and estrogen sensitive but its action it is dependent on lipid peroxidation. Pomegranate products were represented by seed oil, nanoparticles of pomegranate extract with different substances, peel extracts, flower extracts, fruit rind extracts having punicic acid the major component for the hydrophilic fraction.

With one exception all studies included mention pomegranate extracts and juices as having an important role in prevention and treatment of breast cancer. By ingesting pomegranate juice the concentration of urolithins can be increased thus making pomegranate a potent tool in preventing breast cancer.

Keywords: pomegranate extract, breast cancer

P.2.16. EXPERIMENTAL RESEARCHES ON ANTIMICROBIAL ACTIVITY ON PLANTS EXTRACTS

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In the last years there has been observed an increased interest in researching and developing of new antimicrobial agents in different sources to combat microbial resistance. Discovery of new drugs represents an important exclusive aim.

The most common and used method of evaluating the antimicrobial activity is the diffusion method, that consists in an efficient test with high accuracy also used in research in the elaboration of this diploma project.

There has been made a description of the importance of using plant extracts in food industry, following the specialty literature, but also the technologies of extracting essential oils. The essential oils that have been processed and tested, to make a comparison study of their antimicrobial activities, are: savory oil (*Thymus vulgaris*), basil oil (*Ocimum basilicum L.*), mint oil (*Mentha piperita*), tea tree oil (Malaleuca *alternifolia*), eucalypt oil (*Eucalyptus*), sea buckthorn (*Hippophae rhannoides*). The bactericidal activity of these essential oils has been tested after isolation and confirmation of different bacterial strains from food products as results of expertise from laboratory exams.

A remarkable activity has been seen in the case of savory oils on all microorganisms on which it has been tested; at the opposite pole, the sea buckthorn oil proved no sensitivity. The other extracts have been classified as sensitive, medium sensitive or resistant, differently, in function of inhibition area developed around the micro compressor.

P.2.17. EVALUATION OF METHOD FOR EXTRACTION OF ANTIOXIDANTS FROM BLACK CROWBERRY (EMPETRUM NIGRUM)

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Black crowberry is a procumbent shrub, widely known in the northern parts of the continents. It is well adapted to survive the harsh cold conditions. The berries are similar to blueberries, but are darker in colour and have a distinct astringent taste. The berries are rich in bioactive compounds, which makes them very interesting for researchers.

Our goal was to use three different organic solvents at different concentrations to extract these compounds, spectrophotometrically assess the total phenolics, and evaluate their thermal stability. For further analyses we chose the 70% acetone extract, and repeated the extraction on store-bought berries and the berries, collected in nature. We determined the total phenolic content, as well as total monomeric anthocyanin and sugar content, and measured antioxidant capacity using the ORAC assay. We confirmed our hypothesis, that extractions with different solvents differ, but rejected our claim that the 70% ethanol extraction would be the best due to lower phenolic content. We confirmed our hypothesis that the extracts with bioactive compounds vary in stability at different temperatures and pH values. For the experiment of thermal stability, we used a buffer solution. We determined, that with the increasing temperature, the activation energy decreases, and the rate of the reactions increases.

The results show that most likely a two-step process is taking place, which points to a possibility of separating the bioactive compounds using different temperatures. For determination of exact parameters, needed for such separation, and its final confirmation, further analyses are required.

Keywords: black crowberry, antioxidants, phenolics

P.2.18. DRINKING WATER – A SOURCE OF HUMAN EXPOSURE TO BISPHENOL A

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Bisphenol A (BPA) is an intermediate compound, used in the process of obtaining polycarbonate materials and epoxy resins. Scientific literature has reported also different levels of BPA in water bottled in polyethylene terephthalate.
The aim of this study was to identify the levels of BPA in commercially available mineral water samples (carbonated and still) bottled in PET bottles. Effect of several factors such as exposure temperatures, contact time, exposure to direct sunlight, water pH, the presence or absence of carbon dioxide, on the migration of BPA will also be investigated. For the quantification of this compound, a UV-VIS spectrophotometric method was used, based on the reaction between nitric acid and BPA, with the production of yellow nitro derivatives measured at a wavelength of 430 nm. The concentrations of BPA in carbonated mineral water samples were higher compared to those found in the still mineral water samples. It has also been observed that both the pH and the conditions of exposure and maintenance of the samples positively influence the migration of BPA in water.
The results obtained show that the levels found in the water samples can be positively influenced by certain factors, but not significantly, so that there were no exceedances of the maximum allowed limit. The concentrations found can be positively influenced by the method used and the experimental conditions.

Keywords: BPA, polyethylene terephthalate, spectrophotometry, water

S3. New Trends in (Bio)engineering Sciences Applied in Life Sciences

KN.3. ARTIFICIAL INTELLIGENCE PARADIGMS FOR MEDICAL E-LEARNING SYSTEMS

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Recently, artificial intelligence (AI) paradigms have become more widespread within the fields of healthcare, life sciences, biology and medical sciences. Intelligent Medical e-Learning Systems are concerned with the construction of intelligent software that performs diagnosis and make therapy recommendations. These systems are knowledge-based systems and based on symbolic models of disease and their relationship to patient factors. Many types of such are in existence today and are applies to different medical tasks, e.g. generation alerts and remainders, diagnosis assistant, therapy critiquing and education. This talk presents some of the intelligent computing techniques based on AI concepts and methodologies used in developing smart e-learning systems in medical domain.

The talk presents the most efficient paradigms, namly: bio-inspired techniques, case-based reasoning, and data mining. In addition, the paper presents some examples of the developed systems by the author and his colleagues at AIKER-Labs for cancer, heart, brain tumour diagnose and thrombosis diseases.

O.3.1. INTELLIGENT VENTILATOR FOR EMERGENCY SITUATION

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The large number of people affected by SARS-CoV2 has created an urgent need medical ventilator on a global scale, demand that exceeds the current capacity of the chains supply and production. This motivated the development of a smart ventilator for emergencies, which can be produced quickly, on a large scale, with component parts easy to procure, but complying with applicable medical requirements and easy to use.
Given the development of telemedicine and the IoT, it was decided to integrate a part intelligent control devices so that the devices can be operated and monitored remotely, centralized.

Keywords: medical ventilator, emergencies, telemedicine, COVID-19

O.3.2. ROBOT CONTROL USING ARTIFICIAL INTELLIGENCE BASED ON MACHINE LEARNING

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Intelligent robot systems are getting more proficient due to the increase in computer power and networks' speeds, the advancements of low-powered/low-cost embedded systems, and, the advance made in the artificial intelligence field. Our project is centered around a seven-degrees-of-freedom (7-DoF) robotic arm composed of dynamixel servos, mounted on a Pioneer P3-DX robotic platform. The software was built based on the Robot Operating System (ROS) middleware, kinetic version that runs on Ubuntu 16 LTS environment. The ROS was chosen because it offers good means of generalization leading to an app that can potentially control any 7-DoF robotic arm with a few driver-based adaptations and, by extension, any n-DoF robotic arm with changes in the model layer. This versatility is due to the multi-layer nature of the software that isolate the direct kinematics, inverse kinematics, and the planner. Another key-feature of the planner is that, in the process of inverse kinematics, it can use an obstacle-avoidance algorithm while checking for self-collision, step done in a virtual environment before the movement starts.
The motivation of this project comes from the endless applications of robotic arms, and, having 7-DoF (comparable with a human arm), enable the arm to be potentially used in medical applications such as: rehabilitation, prosthetics and chirurgical robots.

Keywords: robots; manipulators; rehabilitation robotics; robot kinematics; medical robotics.

O.3.3. SENSITIVE PROPERTIES OF SCREEN PRINTED CARBON ELECTRODE MODIFIED WITH MELDOLA'S BLUE FOR VOLTAMMETRIC DETECTION OF PHENYLALANINE

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Phenylalanine is one of the most studied amino acid in the last decade due to the large number of cases of people suffering from metabolic disease phenylketonuria (PKU). Thus, many sensors and biosensors have been developed in order to detect this disorder as early as possible, as simple and fast, but also at low costs.

The objective of this work was to study the electrochemical properties of chemically modified electrode with electroactive compound Meldola's Blue for the sensitive determination of phenylalanine.

Detection of essential amino acid phenylalanine was carried out by cyclic voltammetry method applied to carbon screen printed electrode modified with Meldola's Blue. This method provides information about the electrochemical reactions and the oxidation-reduction processes that take place on the electrode surface when it is immersed in the solution to be analyzed.

The carbon screen printed electrode modified with Meldola's Blue was characterized initially in aqueous solution of potassium chloride (KCl) and in potassium ferocyanide (K4[Fe(CN)6]). The voltammetric behavior observed in potassium chloride solution, which this is an inactive solution, is related to the Meldola's Blue immobilized on the electrode surface. In the potassium ferrocyanide solution the oxide-reduction peaks could be observed, these processes being controlled by the electron transfer as it is obtained by kinetics studies. In the case of the phenylalanine solution there were recorded useful voltammetric signals, which led to the observation of the anodic and the cathodic peaks, thus concluding the possibility of applying such a sensor for the detection of phenylalanine at the levels found in plasma. The detection of the phenylalanine was optimized in order to develop a novel electroanalytical method. The practical applicability of the sensor was demonstrated by the precise and accurate quantification of phenylalanine in pharmaceutical products (L-Phenylalanine 500mg, tablets from different producers).

The sensor based on Meldola's Blue developed in this study is appropriate for the analysis of phenylalanine in pharmaceutical products.

Keywords: phenylalanine, voltammetry, Meldola's Blue, screen-printed electrode.

O.3.4. VOLTAMMETRIC SENSOR FOR THE ANALYSIS OF ATORVASTATIN IN PHARMACEUTICALS

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Drug determination is one of the important tools for the analysis of pharmaceuticals. Therefore, the development of simple, sensitive, rapid and reliable method for the determination of one specific drug is of great importance. Atorvastatin, an antihyperlipoproteinemic drug,acts by inhibiting 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase, an enzyme found in liver tissue that plays a key role in the biosynthesis of cholesterol. It is used to reduce total cholesterol, low-density lipoprotein, cholesterol, apo-B, triglycerides levels, and C- reactive protein(CRP) as well as to increase high-density lipoprotein (HDL) levels [1,2].

The aim of this study is to develop a novel method for the detection and quantification of atorvastatin in pharmaceutical samples.

For this purpose, the carbon screen-printed electrodes modified with carbon nanofibers will be characterized by electrochemical methods. The active surface area was determined from the kinetics of the redox process of ferrocyanide at the electrode surface.

A statin (atorvastatin) was studied, which is only pharmaceutical product available by medical prescription. Developing of one voltammetric method to the analysis of pharmaceutical product (Sortis 20 mg) was carried out. The first step was to optimize the experimental parameters such as the electrolyte and itsconcentration, pH and temperature, which have led to sensitivity and selectivity of the sensor. Other optimizations taken into account was those of the detection technique, such as the potential range and the scan rate. In the optimal conditions atorvastatin was detected and quantified in the pharmaceutical products.

The quantification of atorvastatin in standardized pharmaceutical products by the voltammetric method has significant advantages in terms of accuracy and accuracy at doses commonly used in patients.

Keywords: carbon nanofibre, sensor, voltammetry, atorvastatin

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O.3.5. BIOCOMPATIBLE HYDROXYAPATITE-BASED COATINGS FOR MEDICAL APPLICATIONS

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The biomaterials functionality into the human body, are driven not just by its physical and mechanical properties and also by degradation and bioactivity which are important processes, subsequently involved in the osseointegration of metallic implants. The main goal of this work was to enhance the antibacterial properties of hydroxyapatite (HAP) by Ag addition and to observe the Ag effect through in vitro studies. The coatings were prepared using a RF-magnetron sputtering method. As acellular solutions the following media have been used: simulated body fluid (SBF), Dulbecco's Modified Eagle's medium (DMEM) and phosphate buffer solution (PBS) over a period of 21 days of immersion. Also, the corrosion investigations in all three solutions were carried out. Results about the resistance to Candida albicans, Staphylococcus aureus or Salmonella Typhimurium or Streptococcus pyogenes are presented. The results indicate that the dissolution of Ag doped coating provides a stronger driving force for nucleation and growth of new phases in vitro than the undoped hydroxyapatite. Probably this effect is due to Ag which favors the dissolution process through which a sufficient amount of Ca^{2+} ions that are necessary for CaP nucleation are released, leading to a localized increase of pH which favors the formation of new HAP phase. Small Ag amounts gives good antibacterial properties, and assure the high bioactivity abilities in DMEM and PBS solutions.

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P.3.1. ELECTROCHEMICAL DETERMINATION OF CATECHOL BASED ON CARBON ELECTRODE MODIFIED WITH GRAPHENE AND GOLD NANOPARTICLES

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An important pharmaceutical intermediate and basic chemical raw material, dihydroxybenzene, is widely used in the fields of medicines, dye, cosmetics and other related industries [1]. Due to its high toxicity, catechol (CA) is considered as pollutant to environment and human beings by the US Environmental Protection Agency [2].

This study presents the voltammetric detection of CA using carbon electrode modified with graphene and gold nanoparticles by means of cyclic voltammetry in environmental samples.

The influence of the potential scan rate on the peaks currents of 10^{-3} M CA solution for the screen-printed carbon electrode and for the screen-printed carbon electrode modified with graphene and gold nanoparticles were studied using cyclic voltammetry at various scan rates, between 100 and 1000 mV/s.

The anodic peak currents of CA are linearly depending with the square roots scan rates, indicating that the oxidation process of catechol is a diffusion - controlled process [3]. With the increase of the scan rate, the oxidation peak potentials of CC shift positively and the reduction peak potentials shift negatively. This phenomenon suggests that the reactions for CC are quasi-reversible processes [4]. The active surface area of the electrodes and the roughness factors were calculated using the linearly fit equation, which correspond to Randles-Sevcik equation.

The electrochemical studies have demonstrated that the electrode chemically modified with graphene and gold nanoparticles has a larger active surface area comparative with the carbon electrode. The larger surface area of the electrode is related to the better electrocatalytic performances and the higher sensitivity of the modified electrode.

Keywords: catechol, graphene, gold nanoparticles, cyclic voltammetry

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P.3.2. ADVANCES OF COMPUTATIONAL INTELLIGENCE IN NEUROMUSCULAR DISORDERS DIAGNOSIS

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Recently, computational intelligence (CI) techniques are used widely by medical researchers of neuromuscular disorders (NMD) to increase the diagnostic performance and accuracy. The processing and classification of electromyography signals play a major role in the diagnosis of NMD such as Amyotrophic Lateral Sclerosis (ALS).

This paper aims to give a scientific analysis of the different feature extraction and classification techniques that have been applied for the diagnosis of NMD through electromyography signal. Moreover the paper presents a review of most common CI techniques used for feature extraction and classification tasks.

Keywords: EMG electromyography, Computational Intelligence, Neuromuscular disorder, Medical Informatics

P.3.3. AQUATIC TOXICITY OF NANOPARTICLES TO GREEN MICROALGAE CHLORELLA VULGARIS

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The nanoparticles have many application in photocatalytic processes, solar cells, solar self-cleaning coatings, cosmetics and sunscreens, antibacterials in dentistry. In the past years, the nanoparticle production highly increased resulting in their increase discharge into the aquatic environment. Knowing the toxicity of these nanoparticles is a subject that needs to be addressed.
The aquatic toxicity of the TiO_2- based nanoparticles on green algae Chlorella Vulgaris was explored.
Different growth parameters such as temperature, the concentration of nutrients, and illumination were investigated. Effect of nanoparticle (in range 0....2 g/L) in the suspension on the algae growth was also examined. The cellular concentration was measured by a spectrophotometric method (optical density of the microalgal sample at 680 nm). The growth inhibitions of Chlorella Vulgaris in logarithm growth phase exposed to various test suspensions of nanoparticles were measured. Blank control containing no nanoparticles was included in each experiment.
Different types of interactions occur when algae are incubated with a specific type of nanoparticles. Microalgae growth depends on temperature, the concentration of mineral nutrients used as growth medium (Bold medium), intensity and duration of illumination. The algae without nanoparticles exhibited growth inhibition in the dark compared to light, indicating that lighting was an essential factor influencing the algal growth. Algal growth was found to be inhibited as the nanoparticle concentration increased.
The results of this study provide to our perception of the parameters affecting the aquatic toxicity of titanium oxide-based nanoparticles and give a basis for further investigations.

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Keywords: aquatic toxicity, nanoparticles, titanium oxide, Chlorella Vulgaris;

P.3.4. TOXICITY OF NANOPARTICLES IN PUBLIC HEALTH

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Nanoparticles are defined as natural or synthetic particles which have applications in medicine and engineering. The increase in the use of nanomaterials will consequently lead to their increased presence in human environment and, therefore, potentially increasing human exposure (water, soil, and air). The ways of exposure to nanoparticles are by ingestion, inhalation and cutaneous.
This paper aims to analyze the conception of nanoparticles in public health given the frequency of their use and the interaction of the human body with them.
This review paper aims to highlight the way the human body interacts with nanoparticles and possible toxicological features highlighted in vivo and in vitro studies.
Any toxic effects of nanomaterials it's specific to the type of base material, shape, size, and coatings**.** The most common nanoparticles are those that are found in the air because of the pollution and climate change. They can cause respiratory diseases, and in combination with UV radiation can cause cancers**.** Nanoparticles can be found in food, paints and cosmetics, construction materials and also in biomedical imaging and electronic industries. They can cause DNA damage and additional reporters of oxidative stress, breathing problems, lung irritation, stomach pains, mild allergic reactions and citotoxicity. The interaction between the cellular response and nanoparticles was recorded with a PCR arrary, and after that with Western blott kit for confirmation.
Conclusion: Several research groups have found toxic effects of nanomaterials but the exactly causes for the toxicity are mostly unknown. But it's hard to determine the toxicity of nanoparticles due to the wide range of nanoparticle concentrations, variety of cell lines as well as culturing conditions and lack of understanding of mechanism. It's important that analytical techniques permit real-time, in situ monitoring to optimize production processes, thus minimizing waste and energy costs.

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Keywords: toxicity, nanoparticles, human health, public health

P.3.5. NANOTECHNOLOGY APPLICATIONS IN FOOD PACKAGING

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Nanotechnology finds its applications in various disciplines or industries. Food packaging makes no exception, being an area in which nanotechnology is already showing tremendous progress and multiple uses. Both active and smart packaging benefit from the development of nanotechnology. In this sense, oxygen removers, carbon dioxide control and odour control, freshness indicators or self-cleaning and self-healing containers represent a part of the innovations generated by the advancement of nanotechnology in food packaging and are subject of this study.

As most of the novel or modern technologies, nanotechnology still faces a barrier in consumer acceptance and it might need additional steps to reach to more markets and to gain popularity. Moreover, a globally accepted legal definition for nanomaterials and nanotechnology used for food related purposes is still under discussion and it is a topic of utmost importance for food scientists.

P.3.6. DETECTION OF PYOCYANIN WITH A THERMOSENSITIVE HYDROGEL AND Au/Ag NANOALLOY

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The rapid detection of bacterial strains represents a hot topic thoroughly discussed across the biomedical field. Along with nosocomial pathogen agents that entail medical and financial challenges for diagnostic and treatment, the development of rapid and easy-to-use sensing became an important goal. Moreover, antibiotic resistance considered by World Health Organization one of the "biggest threats to global health, food security, and development today" enables this topic as high priority. *Pseudomonas aeruginosa*, a ubiquitous bacterial strain, has various quorum sensing systems that are a direct cause of their virulence. One of them is represented by pyocyanin, a blue pigment with electroactive properties synthesized from early stages of bacterial colonization.

The selective detection of this biomarker via electrochemical sensors for personalized and efficient therapy.

A thermosensitive polymer, modified with Au/Ag nanoalloy was employed for the rapid and accurate detection of pyocyanin, a virulence biomarker of *Pseudomonas aeruginosa*.

The sensor displayed a linear range from 0.12 to 25 µM, and a limit of detection of 0.04 µM (signal/noise=3). It was successfully tested in real samples spiked with the target analyte without any pretreatment other than a dilution step. The electrochemical sensor allowed the detection of pyocyanin with high recovery in whole blood in a time frame of 5-10 minutes.

The sensors for bacterial biomarkers can contribute to the rapid detection of various bacterial strains and to the development of decentralized sensing assays.

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Keywords: bacteria, nosocomial, pyocyanin, sensor

P.3.7. CHALLENGES IN MODERN MEDICAL FACILITY BUILDINGS DUE TO INFECTION CONTROL. ARE HIGH-RISE MODERN HOSPITALS THE SOLUTION?

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This article looks at challenges in the modern hospital building mass related to infection control, hygiene, patients and staff health. What lessons have we learned from the 20th century and from the start of the 21st century, and can these be of help in fighting the current Covid-19 pandemic or future ones? Modern medical facilities design should be aiming at better preventing the spread of diseases in addition to treating the original causes.
The limitations of previous and current disease control methods have been exposed by the Covid-19 pandemic, and these factors must be considered in the future on planning of medical facilities. Comparing methods and the latest results in treating Covid-19 patients, should lead to improvements in the way of designing medical facilities. How does size of buildings, height vs. smaller, less densely situated buildings, and HVAC systems impact hygiene and disease control? If there are such design features, can these be utilized to enable reductions in spread of disease in medical facilities, preventing hospital acquired infections and reducing the risk of antibiotic resistance?

Keywords: prevention, protection, hygiene-control, modular

P.3.8. CHEMICAL CONTAMINATION IN PACKAGING MATERIAL OF PHARMACEUTICAL USE

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The use of packaging materials is important in the pharmaceutical industry. The pharmaceutical industry uses, as primary packaging materials, glass bottles, blister packs, caps and closures, glass vials, sealed tubes. The primary packaging is in direct contact with the product so it must be safe. The developed packaging materials should comply with the official standards to be initiate in the market.

The aim of this study is to perform global component migration analyses on these types of packaging, to see if there is a possibility of migration of components from the pharmaceutical package into the drug, so as not to alter in any way its therapeutic properties.

The testing of plastic packaging materials was done according to the SR EN 1186:2003 standards, using different extraction conditions and simulants. After the end of the extraction period, the extract was analysed to find the conformity of the evidence with the legislation in force. The samples of cardboard packaging were tested according to the standards in force regarding the degree of migration of specific compounds, such as bisphenol A or formaldehyde, but also to evaluate the migration of heavy metals. For the glass packaging, an analysis of lead and cadmium release was performed.

The results obtained from the processing of the extracts obtained were below the maximum limits allowed for each category of packaging, respectively, plastic, paper and cardboard, glass.

Because the results were below the required limits, these packages can be used for contact with pharmaceuticals without producing any chemical contamination.

Keywords: plastic material, packaging materials, chemical migration

P.3.9. THE EFFECTS OF PEDOCLIMATIC CONDITIONS ON THE QUALITY INDICATORS OF FERMENTATION PROCESS FROM THREE VARIETIES OF RED GRAPES

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Grape ripening phase involves morphological and anatomical changes in the grape which is incurred due to the accumulation of the sugars content and other compounds in the tissues of the berry. The concentration of sugars accumulated in the berries reaches maximum value, as a result of the physiological activity of the plant.
The aim of this study is to reveal the importance of climatic conditions of the year 2018 comparing to 2019 on grape maturation and quality parameters for 3 red cultivars in Valea Calugareasca vineyard: Cabernet Sauvignon, Merlot and Feteasca neagra. The experimental measurements were conducted during August-September of 2018 and 2019 on quality parameters such us: sugar content, total acidity, 1000 grain weight, glucoacidimetric index.
The results show that in 2019 quantitative grapes have smaller berries due to poor precipitation, but with a higher sugar content,as follows: 230 g/l for Merlot compared to 215 g/l in 2018, 215 g/l for Cabernet Sauvignon due to197g/l in 2018 and 235 g/l for Feteasca neagra compared to 225 g/l in 2018 . In conclusion, the climatic conditions have a demonstrated influence on the quality of grape composition, grape maturity and consequently on the quality of wines.

Keywords: climatic conditions, grape maturation, sugar content, total acidity, technological maturity

P.3.10. Si DOPED TiCN COATINGS FOR LOAD BEARING IMPLANTS

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During the years, as compared to the transition metal nitrides or carbides, the corresponding carbonitrides were found to exhibit better mechanical properties, corrosion and wear resistance as well biocompatibility.
The goal of the current work is to comparatively investigate the mechanical characteristics (roughness, hardness, adhesion, elastic modulus), corrosion resistance in DMEM at 37 C and biocompatible characteristics of TiSiCN coatings as a possible candidate for load bearing implants. Also, TiCN was used as a reference coating. All coatings were deposited by cathodic arc evaporation method on CoCr alloy substrates which are successfully used as common alloys in orthopedic surgery medical applications.

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P.3.11. ELECTROCHEMICAL DETERMINATION OF FERULIC ACID IN COSMETICS USING SCREEN-PRINTED CARBON NANOFIBER ELECTRODES MODIFIED WITH GOLD NANOPARTICLES

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Ferulic acid (FA) derives from the metabolism of phenylalanine and tyrosine and FA have a significant antioxidant action. FA provides protection of biologic tissues against damage from solar radiation [1], which makes it suitable to be included in the composition of cosmetic products for skin protection.

The aim of the study is to analyze the electrochemical properties of a gold nanoparticle-modified screen-printed sensor (CNF-GNP/SPE) to detect FA in different cosmetic products using cyclic voltammetry (CV).

The electrochemical behavior of CNF-GNP/SPE was studied in different electrolyte aqueous solutions, such as 10^{-1} mol×L^{-1} phosphate buffer solution of pH 7.0 and potassium ferrocyanide solution 10^{-3} mol×L^{-1}. In the next step, the CNF-GNP/SPE sensor was used for the study the electrochemical behavior of FA in a 10^{-3} mol×L^{-1} solution (pH 7.0). CV was used at different scan rates, when CNF-GNP/SPE is immersed in potassium ferrocyanide, to determine the electroactive surface of the electrode. This data was used for the determination of FA diffusion coefficient when it is the analyte.

The influence of scan rates in the CV signal studies has shown that electrochemical processes of ferrocyanide ion or FA are diffusion controlled. FA detection by CV at the sensor surface was sensitive and reproducible. The CNF-GNP/SPE sensor was used to perform a calibration curve using different FA concentrations. The linearity between current and FA concentration was achieved for a large concentration range. The detection limit was in the micromolar level. The FA from three cosmetic products was determined by using CNF-GNP-SPE. In all cosmetics, the characteristic peaks of the analyte are observed, and the currents were used for quantification.

The study showed that the method based on CNF-GNP/SPE and CV is a fast, sensitive and efficient method for detecting FA and estimating its concentration in cosmetics.

Keywords: ferulic acid, cyclic voltammetry, sensor.

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P.3.12. BIM-HEALTHY - HEALTH DETERMINANTS RELATED TO HOUSING SANITATION

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According to the World Health Organization (WHO), housing must ensure the protection of individuals against weather conditions, threats of any kind on their personal integrity or their lives, while facilitating the rest and a satisfactory level of hygiene and sanitation.
Improving the housing conditions in terms of building materials, inadequate living space, injury hazards or indoor conditions (temperature, light, humidity, etc), can increase the quality of life by preventing the associated diseases, reducing poverty and lowering the environmental impact.
Healthy housing promotes the health of people that live in buildings by identifying and minimizing the existing risk factors even from beginning, from designing and construction of a building, later from its use and maintenance and, finally, after its deconstruction.
The present study analyses the relations between building conditions and the health of their inhabitants, proposing some quantifiable parameters in order to obtain a final grade for a specific housing model.
Parameters taken into account are related to indoor/ outdoor climate like temperature, humidity, or natural light, to pollutants like waste water, noise, air quality or chemical agents, to living conditions regarding safety, accessibility or crowding or even to social and economic environment.

Acknowledgements: *This study is part of BIMHealthy project - HOUSING AS A STRATEGY FOR HEALTH PROMOTION FROM AN INTERSECTORIAL AND MULTI-DISCIPLINARY APPROACH, number 2019-1-ES01-KA203-065060, co-funded by the Erasmus+ Programme of the European Union.*

P.3.13. INVESTIGATION OF TENSILE PROPERTIES OF SOME ECOFRIENDLY FOOD PACKAGING FILMS

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The biopolymers mainly used for processing of food packaging films consist of proteins, polysaccharides and lipids.

Films made from chitosan and gelatin, have good gas barrier properties and are increasingly used for food applications, as well as food packaging.

This study aimed at the obtaining and characterization of two films based on chitosan-gelatin in the weight ratio 50:50, reinforced with nano-clay in amount up to 5%, and plasticized with 5% (w/w) glycerol 1.5% (w/v) chitosan medium molecular weight was prepared in 1% solution of acetic acid and 10% (w/v) gelatin was dissolved in distilled water.

The biocomposite films were investigated by tensile properties, Tensile strength and elongation at break measurement were carried out using the Instron's tensile testing system according to ISO 5893 at a speed rate of 50 mm/min.

The film containing chitosan-gelatin plasticized with glycerol showed a tensile strength of 1.8 MPa and an elongation at break of 120%. The introduction of nano-clay into chitosan-gelatin composition led to an increase of tensile strength by 1.88 times, while the elongation at break decreased by 1.39 times, compared with the formulation without nano-clay.

The obtained films were analyzed in the UV-VIS field (ALPHA HELYOS spectrophotometer) to determine their transparency. The sample containing nano-clay showed an increased opacity of 4.1 times compared with the sample without reinforced agent.

These films, based on the chemical structure and physical-mechanical properties, led to the conclusion that they could contribute to development of a new biodegradable candidate for food packaging.

Keywords: biopolymers, tensile properties, spectroscopy, chitosan, gelatin, nano-clay, food packaging

P.3.14. SILVER NANOPARTICLES' SYNTHESIS MEDIATED BY ALPHA-AMYLASE

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Synthesis of metallic nanoparticles of well-defined size, shape and composition still remains a challenge and therefore a major area of research in nanotechnology.
This study aims to summarize the emerging efforts to address current challenges and solutions in the treatment of infectious diseases, particularly through the use of silver nanoparticles biosynthesized via green pathways. In this regard, alpha-amylase from three different strains of *Bacillus* species were used for the green synthesis of metallic nanoparticles, without the use of harsh, toxic and expensive chemicals commonly used in conventional physical and chemical processes.
The antibacterial activity was tested against gram negative bacteria, *Escherichia coli*.
The gram negative bacteria growth inhibition zone was observed on the plates containing silver nanoparticles, thus showing their potential antibacterial effect, which can be explained by cell membrane damage, oxidative stress, and injury to proteins and DNA, caused by the nanoparticles.

P.3.15. PROPOSED FRAMEWORK BASED ON INTERNET OF THINGS (IOT) TECHNOLOGY FOR SMART HEALTHCARE SERVICES

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Smart healthcare is of great interest to researchers and governments due to the increasing development of new smart cities.
However, there is no current standard practice to format the cloud computing infrastructure and to assist the healthcare system architect in designing a comprehensive solution for the basic services that are required by the healthcare users while taking into consideration a balanced approach towards their specific functional and non-functional needs such as openness, scalability, concurrency, interoperability and security factors.
The integration of digital healthcare services with web technologies and intelligent computing needs a concrete framework.
Recently, Internet of Things (IoT) technology enables communication among real world objects to interact in an intelligent way. In turn, IoT is all about connectivity and automation that require intelligent algorithms to make the smart objects work together. So, the importance of IoT technology in healthcare lies in its unquestionably an aid to patients and specialists.
The main objective of this paper is to analyze the different existing frameworks that discuss smart healthcare services and proposed a smart framework based on the IoT paradigm.

***Acknowledgements**: I would like to thank my co-authors for their countless support and guidance.*

Keywords: Healthcare services, Intelligent Healthcare Frameworks, Internet of Things for healthcare, Healthcare Informatics.

P.3.16. ADVANCES IN APTAMERS FOR BIOMEDICAL APPLICATIONS: ANTIBIOTIC DETECTION AND TREATMENT MONITORING

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Over the last decade, researchers have made it easier to detect small molecules or cure different diseases from an early stage, using specialized molecules such as DNA or RNA sequences. Aptamers are short single-stranded RNA or DNA oligonucleotides capable of folding into complex 3D shapes that bind to specific target molecules, with the role of mimicking antibodies and improving the functional outcome. The superior characteristics that aptamers possess over antibodies have unprecedented advantages. Aptamers are synthesized via an *in vitro* chemical process named as systematic evolution of ligands by exponential enrichment (SELEX). Due to their excellent specificity and high affinity to targets, aptamers gained great attention in various biomedical applications. They have been widely used in disease diagnosis, drug delivery, therapy as well as theragnostic studies [1].
One of the emerging nowadays problem is the antibiotic resistance which appear due to an uncontrolled and excessive usage of antibiotics. Rapid detection of antibiotics through aptamer-based electrochemical biosensors (aptasensors) has attracted considerable attention because of good selectivity, specificity, and sensitivity. Considering the development achieved in nanoscience and nanotechnology, a powerful tool for antibiotic detection, as well as therapeutic drug monitoring, is played by the conjugation of aptamers with functional nanomaterials [2]. This presentation highlights the recent progress in aptamer-based methods for antibiotic detection focusing on the latest studies from the past five years.

Acknowledgement*: This work was supported by grants of the Romanian National Authority for Scientific Research and Innovation, CCCDI-UEFISCDI, project no. ERANET-RUS-PLUS-PLASMON-ELECTROLIGHT/46/2018, within PNCDI III and in the frame of European Social Found, Human Capital Operational Programme 2014-2020, project no. POCU/380/6/13/125171.*

Keywords: aptamer, antibiotic, diagnosis, treatment monitoring

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P.3.17. TAILORED Ag DOPING OF HYDROXYAPATITE BY HiPIMS

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Vertebral body replacement is still a challenge for spine surgeons. Among the complications, surgical site infections are particularly critical and difficult to treat. Poor bone regeneration and mechanical instability are further issues, also correlated with infections. Hydroxyapatite (HA), as major inorganic component of bone, is biocompatible with tissues when used on implants. The main goal of the research is to provide antibacterial efficacy by tailored Ag doping of HA coatings, potentially capable of assuring a tailored ion-release, also engineered to prevent cytotoxicity and the development of resistant bacterial strains.

We report on the deposition on Ti and subsequent characterization of Ag-doped HA coatings, for spine implant application. High power impulse magnetron sputtering (HiPIMS) of a silver target and the RF magnetron sputtering of three HA targets, operated in Ar, were used to synthesize Ag-doped HA coatings. The fine control of Ag content in the deposited coatings composition was possible by the HiPIMS discharge, due to the fine control of the Ag deposition rate, by using different pulse frequencies and pulse duration periods. The content of Ag spanned from 15 to 1.5 at.%.

The coatings deposited on polished Ti discs were characterized by various analytical techniques (SEM, XRD, RBS, FT-IR, electrochemical tests and contact angle) in terms of surface morphology and texture, crystallinity, chemical, elemental composition, in vitro corrosion resistance in simulated body fluid and surface hydrophilicity. While low Ag content indicated no significant modifications of coatings properties, higher contents increased the corrosion resistance and hydrophilicity and decreased the surface roughness.

Acknowledgement: *This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation CCCDI - UEFISCDI, project no COFUND-ERANET EURONANOMED 3-NANO-VERTEBRA, within PNCDI III.*

S4. NOMARES Workshop - New materials for electrochemical recognition of inorganic and biological species - / L'Atelier Nouveaux - Matériaux pour la Reconnaissance Electrochimique des Mineraux et des Espèces Biologiques – 2020

PL.4. GENTAMICIN-LOADED HYDROXYAPATITE/CHITOSAN COMPOSITE COATING AIMED FOR BIOMEDICAL USE

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Bone implant materials are increasingly attracting attention in the biomaterials field. Among them, hydroxyapatite (HAP) has stood out as a prospective biomaterial due to excellent osseointegration ability, owing to its similarity with natural bone. However, due to the lack of adhesive and antibacterial properties, it is usually combined with polymers and antibacterial agents. Natural polymer chitosan (CS) was proven as an effective component of HAP-based composites, improving the adhesion and serving as a drug carrier. Inclusion of antibiotics into composite biomaterials has gained a lot of attention, as it is thus possible to achieve the desirable antibacterial activity. Gentamicin (Gent) was shown to be one of the most effective antibiotics in treating bone infections.

Composite antibacterial HAP/CS/Gent coating was obtained on titanium plate using electrophoretic deposition (EPD) and characterized by X-ray diffraction (XRD), field emission scanning electron microscopy (FE-SEM), Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron analysis (XPS) and electrochemical impedance spectroscopy (EIS). Biological assays pointed to high potential of HAP/CS/Gent coating for medical applications. Test in suspension and agar diffusion method indicated strong antibacterial activity against *Staphylococcus aureus* and *Escherichia coli,* while MTT and DET tests indicated low cytotoxicity against MRC-5 (human origin fibroblasts) and L929 (mice origin fibroblast) cell lines. The coating ability to induce and promote osseointegration was proved by ALP assay, suggesting that HAP/CS/Gent coating is an excellent candidate for bone tissue engineering [1,2].

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KN.4.1. PHOTO-INDUCED REDOX CATALYSIS FOR HYDROGEN PRODUCTION WITH MOLECULAR AND HYBRID SYSTEMS

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The conversion of solar energy into fuel molecules, such as dihydrogen by light-driven water splitting, is the subject of considerable interest as it constitutes a sustainable and carbon neutral way to face current energy challenges. A largely investigated approach to reduce protons into H_2, relies on molecular photocatalytic systems in homogeneous solution. A chromophore, or "photosensitizer" (PS), absorbs light energy and transfers electrons to the catalyst, which activates the chemical reaction [1, 2]. In such systems, a sacrificial electron donor (SD) acts as the primary source of electrons. This talk will present our efficient molecular systems for the visible-light-driven H_2 production in water using rhodium[3, 4] and cobalt[5] molecular catalysts and the ruthenium tris-bipyridine as photosensitizer.

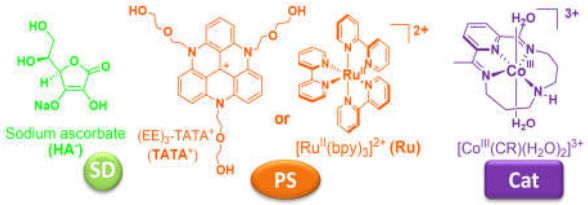

Fig. 1. Molecular photocatalytic system

We also recently explore promising alternatives to rare and expensive metal based photosensitizers and demonstrate the great potential of a water soluble triazatriangulenium organic dye[6] as well as of semiconductor nanocrystals (quantum dots) free of toxic cadmium, $CuInS_2/ZnS$ [7, 8] as efficient and robust visible-light-absorbing PSs for H_2 production when associated with a molecular cobalt catalyst.

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KN.4.2. HIGHLY STABLE COBALT OXIDE-POLYPYRROLE NANOCOMPOSITE FOR ELECTROCATALYTIC WATER OXIDATION

Jérôme Fortage (1)*, Daniela V. Morales (1), Catalina N. Astudillo (1), Veronica Anastasoaie (1,2) Eleonora-Mihaela Ungureanu (2), Bruno Urbano (3), Bernabé L. Rivas (3), Chantal Gondran (1), Dmitry Aldakov (4), Cyrille Costentin (1,5), Marie-Noëlle Collomb (1)

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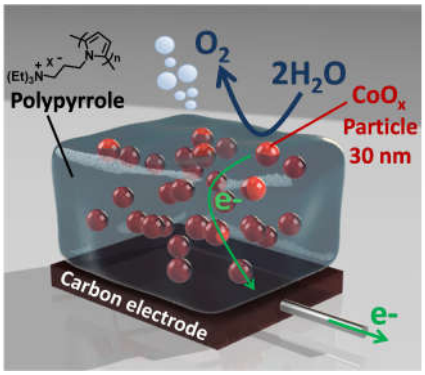
Developing electrolyzers operating under neutral or near-neutral conditions with catalysts based only on earth-abundant metals is highly desirable in view to reduce the cost of hydrogen production from water splitting reaction and avoid the environmental issues related to corrosion usually encountered with alkaline electrolyzers [1]. Herein, we report a highly active and stable anode material for oxygen evolving reaction (OER) in mild-pH conditions based on cobalt oxide-nanoparticles embedded into a poly(pyrrole-alkylammonium) matrix (denoted PPN^+-CoO_x). Examples of hybrid materials combining metal oxide nanoparticles as OER catalysts within a polymer film are still rare [2]. However, they are very promising to control the formation and the size of metal particles in view to enhance the electrochemically active surface area and thus the electrocatalytic performances. Our strategy consists in electroprecipitating Co^0 nanoparticles by reduction of an anionic cobalt oxalate complex into the cationic PPN^+ film, the latter being previously deposited onto an electrode surface by electropolymerization. The Co^0 nanoparticles within the composite were then partially *in-situ* oxidized under air exposure into CoO, and then fully oxidized into CoO_x by successive scans between 0 and 1.2 V *vs* Ag/AgCl in a borate buffer at pH 9.2. This nanocomposite material is highly structured with about 30 nm-large CoO_x nanoparticles well dispersed into the polypyrrole film conferring a high OER electrocatalytic activity at near neutral pH of 9.2 with exceptional values of mass activity and turnover frequency of 3.01 A mg^{-1} and 0.46 s^{-1} respectively, at an overpotential of 0.61 V and with a cobalt loading of 1.34 µg cm^{-2}. These performances place the PPN^+-CoO_x electrode among the most active anodes described in the literature employing cobalt oxide under mild pH conditions. In addition, when the PPN^+-CoO_x material is electrodeposited on porous ITO in view to enhance the physisorption of the film on the electrode, its electrocatalytic activity is stable over more than 24 h, demonstrating the beneficial role of the polypyrrole matrix in the achievement of very stable and highly active anodes for water oxidation.



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O.4.1. NICKEL AND COBALT OXIDE-POLYPYRROLE-CARBOXYLATE NANOCOMPOSITE ELECTRODE MATERIALS FOR ELECTROCATALYTIC WATER OXIDATION

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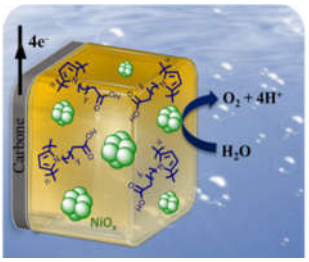
In the actual energy context, molecular hydrogen (H_2) is considered as an attractive clean energy carrier, an excellent alternative to fossil fuels and a way to store the electricity overproduction. The actual challenge is to produce H_2 on a large scale and an attractive cost, without using fossil fuels. Water electrolysis which consists to couple oxidation of water to O_2 at the anode (oxygen evolution reaction, OER), and the subsequent reduction of the protons to H_2 at the cathode is one a very promising sustainable approach to produce H_2. OER remains the bottleneck of the water-splitting process due to its high activation barrier, slow electrode kinetics associated with a large anodic overpotential [1]. Herein, we report new and efficient anode materials for electrocatalytic water oxidation based on nickel or cobalt oxide-nanoparticules embedded into a poly(pyrrole-carboxylate) matrix (denoted [PPy(CO_2^-)-MO_x]). The versatility of the complexation-electrooxidation method we used to design such materials allowed to easily access efficient anodes with a large versatility of OER catalysts. Indeed, the carboxylates functions in the polypyrrole matrix allow to "trap" various metals cations (Ni^{2+}; Co^{2+}; Cu^{2+}; …) inside the polymer and a further electro-oxidation in aqueous solution, leads to the formation of small size and well-dispersed metal oxide nanoparticules which increase dramatically the active surface area of these OER catalysts. For Ni and Co oxides, we have already observed large catalytic currents at 1.2 V vs Ag/AgCl in aqueous borate buffer (pH 9.2) (4.5 and 10.5 mA/cm^2 for [PPy(CO_2^-)-NiO_x] and [PPy(CO_2^-)-Co_x], respectively) associated with the highest mass activities described in the literature for nanocomposites materials [2]. These results offer a proof of concept and new perspectives for the design of efficient catalytic materials for various reactions.



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O.4.2. SYNTHESES OF VINYL-AZULENE DERIVATIVES AS MATERIALS FOR MODIFIED ELECTRODES PREPARATION

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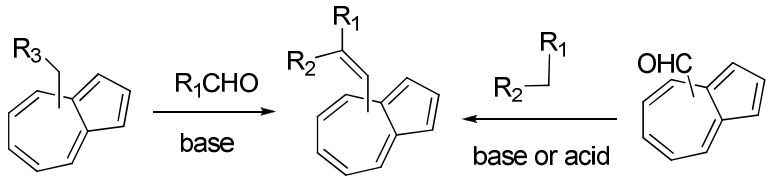
Vinylazulenes are generally less stable compounds, especially when the vinyl group is attached to the five-atom, electron-rich ring. However, these combinations can be stabilized by substituting the vinyl group with electron-attracting groups, in this way being able to fix selectively on electrodes. These substituents can be aryl, heteroaryl or functional groups, such as COOR, CONHR, $COCF_3$, $C(COO)_2CMe_2$, etc. They also have the role of complexing with the metals in the solution to increase the sensitivity of the electrode. Their synthesis is performed in several ways: a) the interaction between an aromatic aldehyde and the activated methyl groups located in the azulene ring in the C4, C6 or C8 positions; b) the interaction between an aromatic aldehyde and the activated methyl groups by substitution with +PPh3 group (Wittig reaction) for the all the other azulenic positions; c) reaction between azulenecarbaldehydes and activated methylene groups, such as malonates, malonamides, Meldrum acid [1]. Some obtained molecules were fixed on vitreous carbon electrode and use for metal detection in wastewaters [2].



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O.4.3. GaN NANOSTRUCTURING

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In this study we used bulk GaN crystal wafers obtained by Hybrid Vapor Phase Epitaxy (HVPE) [1] which were analyzed using Scanning Electron Microscopy (SEM), Energy Dispersive X-Ray Spectroscopy (EDX) and X-Ray Diffraction (XRD).
The wafers were electrochemically etched in solutions of HNO_3, HCl and even in the eco-friendly NaCl. Several anodization voltages were used, and it was shown that, together with the electrolyte, they lead to the formation of arrays of pores or nanowires [2, 3, 4]. We studied the obtained morphologies using Scanning Electron Microscopy (SEM) in order to evaluate the porosification of the bulk GaN.

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O.4.4. NEW OXOVANADIUM(V) COMPLEXES BASED ON BENZALDEHYDE-DERIVATIVES SCHIFF BASES

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Vanadium compounds have shown antibacterial, antifungal, antitumor, and antidiabetic activities [1-3]. Following the condensation of benzaldehyde derivatives, such as 2-hydroxybenzaldehyde (sal), 3-etoxy-2-hydroxybenzaldehyde (Et-sal) and 5-bromo-2-hydroxybenzaldehyde (Br-sal) with D-valine or L-valine (D/L-val), and coordination with $VOSO_4 \cdot 3H_2O$, new polynuclear oxovanadium (V) compounds have been synthesized, each with its S and R enantiomers, respectively.

All obtained compounds have been characterized by elemental analysis, powder and single-crystal X-ray diffraction, as well as spectroscopic (IR, UV-Vis and circular dichroism) measurements. The crystal structure of the compounds revealed distorted octahedral coordination geometry of the vanadium centers. The biological activity of these compounds is under evaluation; some preliminary results will be discussed.

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O.4.5. COMPUTATIONAL ELECTROCHEMISTRY: PREDICTION OF OXIDATION/REDUCTION POTENTIALS BASED ON QUANTUM MECHANICAL ELECTRONIC STRUCTURE METHODS

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Several compounds recently synthetized [1] and characterized, containing azulene ring and tetrazole moieties attached at an azo bond have been investigated by computational tools using density functional theory (*DFT*) aiming to predict the oxidation and reduction potentials. The predictive study includes frontier orbital energy approach and global reactivity parameters assessment according Koopmans' theorem [2]. As results, calculated energies of the highest occupied molecular orbital (*HOMO*) and the lowest unoccupied molecular orbital (*LUMO*), their energy gap, ionization potential (*I*), electron affinity (*A*), electronegativity (χ), chemical potential (μ), and global electrophilicity index (ω) are reported in an attempt to correlated them with electrochemical behavior. Computations were performed using Spartan'18 Wavefunction, Inc. Irvine, CA, U.S.A [3] using B3LYP algorithm with 6-31+G (d, p), basis set [4], for equilibrium geometry, at ground state.

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O.4.6. PLATINUM NANOPARTICLES SYNTHESIZED BY KRF PULSED LASER ABLATION

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The platinum nanoparticles (Pt NPs), have attracted much attention due to their properties that make them suitable for many practical applications such as: catalysts, sensors, electronics, etc. The Pulsed Laser Ablation in Liquid (PLAL) is a versatile, rapid and environmentally friendly technique which enables the synthesis of noble metal nanoparticles. For most of the applications the precise control of the particle size is crucial [1].

In the present work, we report the successful synthesis of spherical Pt NPs with different diameters (6 – 20 nm) via KrF pulsed laser ablation in liquids. The Pt target was both immersed in water, and in a mixture of acetone and water (1:4), and then exposed to laser pulses with different repetition rates within [10-50] Hz range. Additionally, during synthesis, the energy per pulse (200 – 700 mJ) was controlled. These experiments performed at different repetition rates and different energies were carried out in order to optimize the amount and the diameters of the Pt nanoparticles.

The Pt NPs were analyzed using our state of the art complex electron microscope, capable of recording simultaneously, at the same location on the sample, three types of images: SEM (Scanning Electron Microscopy), ZC (atomic mass contrast) and STEM (Scanning Transmission Electron Microscopy), which are named *co-localized images.* A representative example of the co-localized images recorded on the synthesized samples is shown in Figure 1. In top of these co-localized images, we have also performed an EDX (Energy Dispersive X-Ray) analysis, at the same sample location, the obtained results proving the successful synthesis of platinum nanoparticles. The inter-planar distance value measured from the UHR-STEM images was found to be in good agreement with the theoretical one. Furthermore, the UV-Vis spectroscopy has also confirmed the presence of Pt NPs.

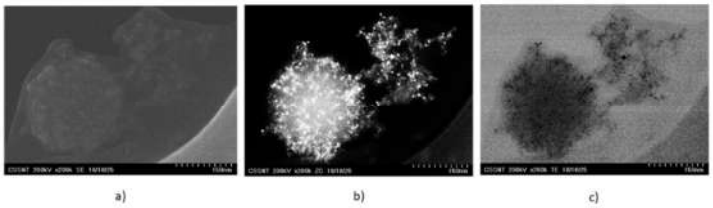

Figure 1. Images of Pt NPs at the same location at x200K: a) SEM, b) ZC and c) STEM

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O.4.7. 3-D COODINATION POLYMERS WITH KAGOMÉ LAYERS LINKED BY BIPYRIDINE-BASED LIGANDS

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Coordination polymers show great potential in applications such as adsorption, separation and storage of gases, heterogeneous catalysis, drug delivery, sensor technology and magnetism due to their structural properties, namely: high regularity, tunable pore sizes, high surface area [1, 2].

Three-dimensional Cu-based coordination polymers were obtained using $Cu(ClO_4)\cdot 6H_2O$ and $Cu(BF_4)\cdot 6H_2O$ salts and different exo-bidentate bipyridine-based ligands, such as: 4,4'-bipyridyl (bipy), 1,2-bis(4-pyridyl)ethane (bpa), 1,2-bis(4-pyridyl)ethylene (bpe), and 4,4'-azopyridine (azopy). The synthesized compounds have the general formula $\{[Cu_3(CO_3)_2(L)_3](Y)_2\}_n$, where L = bipyridine-based ligand and Y = ClO_4^- or BF_4^- anions.

Single-crystal and powder X-ray diffraction along with spectroscopic techniques, such as FTIR and UV-Vis in solid state, as well as elemental and thermal analyses were used in characterization of these compounds. All obtained compounds are isostructural. The 2-D Kagomé layers are formed by direct atmospheric CO_2 fixation and are stacked one onto another, connected via the bipyridine-based ligands, forming hexagonal channels. Along the channels disordered anions are found. The influence of the organic ditopic ligands used as linkers on the size of the formed cavities, as well as the adsorption properties of these compounds are discussed.

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P.4.1. HEAVY METALS IONS DETECTION ON AZULENE-AZOTHIADIAZOLE BASED CMEs

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The 2-(azulen-1-yldiazenyl)-5-phenyl-1,3,4-thiadiazole (**L**) monomer have been successfully characterized by cyclic voltammetry, differential pulse voltammetry and rotating disk electrode voltammetry. The complexing properties of the ligand been investigated for heavy metal ions recognition in water solutions by anodic stripping technique [1, 2]. Cyclic voltammetry, electrochemical impedance spectroscopy, atomic force microscopy and scanning electron microscopy [3] methods were used to check the film formation.

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P.4.2. DEVELOPMENT OF BIOELECTRODES BASED ON CARBON NANOTUBES WITH PROTEIN COMPRESSION

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The most widely used materials for manufacturing bioelectrodes today are carbonbased materials. Much recent work has focused on the use of carbon nanotubes (CNTs) due to their high electrical conductivity, high specific surface, their easy functionalization, chemical inertia, attractive mechanical properties and biocompatibility [1]. These advantages of the CNTs make them particularly indicated in the enzymatic connection to the electrodes.

In particular, electrode materials have been developed from the aqueous or non-aqueous dispersion of CNT by forming a self-supporting sheet of carbon nanotubes called "buckypaper". Despite their lightness, their simplicity of functionalization and their good electrochemical properties, these electrodes can be functionalized by only a monolayer of enzymes [1]. Another original approach to develop the bioelectrodes consists in the compressing of a mixture of CNTs with enzymes powder to obtain solid pellets. Advantages of these bioelectrodes are the significantly higher amount of immobilized enzymes and storage effect which can extend electrode life. These bioelctrodes were elaborated using different membranes or film for fluid configuration or to protect bioelectrode against enzyme inhibitors [2].

Here, we report a simpler procedure for fabrication of bioelectrodes without an external layer, the formation of solid pellets has been investigated with bilirubin oxidase (BOx), laccase and FAD dependent glucose dehydrogenase (FAD-GDH). The compression of carbon nanotubes and BOx leads to stable bioelectrodes, while those with laccase and FAD-GDH exhibit significant swelling at the contact with the aqueous electrolyte. For deeply investigation the redox mediators such as 1,4 naphthoquinone and 1,10 phenanthronline 5,6 quinone were included into the mixture of bioelectrodes with FAD GDH. Cyclic voltammograms of biocathodes based on laccase and BOx exhibit electrocatalytic activity in the presence of oxygen reflecting a direct electron transfer between immobilized enzymes and MWCNT. Electrochemical characterization of the bioanodes based on FAD GDH and redox mediators confirm the presence of electrocatalytic activity.

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P.4.3. GRAPHENE MODIFIED ELECTRODE WITH CLICKABLE THIOSEMICARBAZONE BASED RECEPTOR FOR MERCURY IONS DETECTION

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Mercury ions represent one of the most dangerous contaminant of the environment. Also, these ions can create numerous health problems. Thus, its monitoring and detection represent a stringent issue. This task can be efficiently accomplished by electrochemical detection using properly designed electrodes.

With the introduction of "*click chemistry*" concept by Sharpless and co. in 2001 [1], this approach became very rapid as one of the most used route in designing the architecture and functions of different types of electrodes surfaces with important applications (e.g. nanomaterials, (bio)sensors). Nevertheless, this approach has rarely used for engineering modified electrodes with applicability in the detection of metal ions from the environment [2].

Here, we report the chemical synthesis of a new ligand based on thiosemicarbazone and its immobilization on a graphene electrode surface through a "click chemistry" protocol for obtaining modified electrodes. The complexing properties of these electrodes towards mercury ions were also investigated. They showed a remarkable selectivity towards Hg(II) among other heavy metal ions and allowed a detection limit at nanomolar level for Hg(II).

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P.4.4. MODIFIED ELECTRODES BASED ON 4-(5-ISOPROPYL-3,8-DIMETHYLAZULEN-1-YL)-2,6-BIS((E)-2-(THIOPHEN-3-YL)VINYL)PYRYLIUM PERCHLORATE

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Heavy metals are toxic and non-biodegradable elements, with the tendency to bioaccumulate in the environment, and later they can be transmitted in the food chain becoming harmful for humans. In order to offer an alternative to spectral methods for the determination of these unwanted metal ions from surface waters, this study explored the possibilities of applying voltammetric methods using new complexing polymer-coated modified electrodes based on electropolymerization of 4-(5-ISOPROPYL-3,8-DIMETHYLAZULEN-1-YL)-2,6-BIS((E)-2-(THIOPHEN-3-YL)VINYL) PYRYLIUM PERCHLORATE in millimolar solutions. Electrochemical experiments were conducted by cyclic voltammetry, differential pulse voltammetry and rotating disk electrode using a three electrodes system and mixed synthetic solutions of cadmium, lead, copper and mercury. The new modified electrodes have been used for the determination of lead in surface water samples.

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P.4.5. PHYSICO-CHEMICAL AND ELECTROCHEMICAL CHARACTERIZATION OF REDOX GLYCONANOPARTICLES IN AQUEOUS SOLUTION FOR BIOSENSOR AND BIOFUEL CELL DESIGN

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Afin d'améliorer les caractéristiques de dispositifs analytiques tels que les biopiles et les biocapteurs [1-3], comme déjà réalisé au laboratoire, de nouvelles glyconanoparticules (GNPs) ont été développées. Elles ont été obtenues par autoassemblage dans différentes proportions de deux copolymères amphiphiles: le polystyrène-*bloc*-b-cyclodextrine (PS-*b*-bCD) et le polystyrène-*bloc*-maltoheptaose (PS-*b*-MH), qui comprennent tous deux un bloc identique hydrophobe, le polystyrène, et un bloc hydrophile étant soit la cyclodextrine , soit le maltoheptaose. Afin de connaître la morphologie et la taille de ces nano-objets, des caractérisations par diffusion de la lumière, microscopie électronique à transmission et à balayage ont été effectuées. Après fonctionnalisation des GNPs par des molécules rédox, leurs propriétés électrochimiques ont été évaluées par voltampérométrie cyclique en solution et immobilisées sur électrodes de carbone recouvertes de nanotubes de carbone. De plus, l'insertion de ces nanoparticules pour la réalisation de bicapteurs enzymatiques à glucose a été évaluée en réalisant différents asssemblages biomoléculaires en utilisant les interactions d'inclusion entre les cyclodextrines des GNPs et les groupements adamantane de la glucose oydase modifiée; la glucose oxydase ayant été choisie comme modèle.

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P.4.6. SCREEN PRINTED ELECTRODES (SPE) BASED ON Au-Pt ALLOY FOR NITRITE ELECTROCHEMICAL DETECTION

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The appearance of pollutants, such as nitrites in groundwater and surface water, poses a major risk to human health and the aquatic environment. Lately, the toxicity due to the excessive presence of nitrites as supplements or preservatives in food or as derivatives of nitrate reduction - used excessively as fertilizers, has led to the urgent need for continuous monitoring of water quality. There are many methods used to determine nitrites and nitrates, based on spectrophotometry[1], ion chromatography[2], chemiluminescence[3] or electrophoresis[4], but none of them are considered as satisfactory as electrochemical methods. The need for quantification of nitrite concentrations and on-site and in-situ analysis has conducted to the development of new electrode materials.

New electrochemical sensor based on Pt-Au alloy for nitrite detection is reported in this work.

The sensor exhibited a linear response on concentration range between 0.4 and 4 mM with the limit of detection and quantification of 4.7 mg / L and 15.8 mg / L, respectively.

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Keywords: nitrite sensor, electrochemical detection, SPE, Au-Pt alloy

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P.4.7. ELECTROCHEMICAL STUDIES ON EXPIRED FUROSEMIDE DRUG AS CORROSION INHIBITOR FOR CARBON STEEL IN NEUTRAL MEDIA

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The aim of the paper is to underline the inhibitive propriety of the expired diuretic drug Furosemide on the C50 (1049) steel in neutral medium. Studies were performed on concentration levels between $10^{-6} \div 10^{-3}$ mol L^{-1} using a temperature range between 293 K and 333 K. In order to emphasize the electrochemical behavior of Furosemide cyclic voltammograms were drawn using the maximum value of the concentration from the above range mentioned, at different scan rates. The data provided from the linear sweep voltammetry technique, the corrosion current i_{corr} and corrosion rate C_R were used both to determine the activation energy E_a by Arrhenius plot method, as well as for elucidate the adsorption mechanism based on Langmuir isotherms.

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P.4.8. SYNERGISTIC ACTION OF COMPLEX FORMULATION USED FOR TISSUES REGENERATION

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The actual tissue regeneration treatment is based mainly on hyaluronic acid, sometimes combined with antibiotics. However, for serious wounds healing, the treatment was not always significantly efficient. In such context, we proposed a complex topic formulation that use the synergistic action of hyaluronic acid and melatonin. Melatonin is known as an antioxidant [1] and an active compound in the bone resorption inhibition. Its specific action is beneficially completed by the anti-bacterial and anti-inflammatory effects of the hyaluronic acid [2, 3]. The synergistic effect of the two active components present simultaneously in the same complex formulation, was put in evidence through derivative UV-Vis spectrophotometry, fluorescence analysis (spectrophotometry and microscopy), FTIR analysis and SEM. The electrochemical investigations proved that the complex formulation is very stable based on the obtained Zeta potential value.

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P.4.9. (E)-5-(AZULEN-1-YLDIAZENYL)-1H-TETRAZOLE MODIFIED ELECTRODES FOR HEAVY METAL SENSING

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The electrochemical characterization of (E)-5-(azulen-1-yldiazenyl)-1H-tetrazole (**L**) [1] has been performed by cyclic voltammetry, differential pulse voltammetry and rotating disk electrode voltammetry. Modified electrodes were obtained by controlled potential electrolysis. [2] They were examined by atomic force microscopy and scanning electron microscopy to see the influence of charge and potential on the deposited poly**L** films morphology. The recognition of heavy metal ions using these polyL modified electrodes has been done by preconcentration and anodic stripping. [3] The modified have been tested for mercury, cadmium, copper, and lead ions sensing.

***Acknowledgement**: The authors are grateful for the financial support from: UEFISCDI Romanian project 39PCCDI/2018 INTELMAT*.

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P.4.10. COUNTING OF CD45-CELLS BY AUTOMATIC FLUORESCENCE MICROSCOPE EASYCOUNTER BC USING ANTI-CD45+ ANTIBODY CONJUGATE

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Leukocytes or white blood cells (WBCs) are immune cells that fight infection, neoplasms and other inflammatory conditions, and mediate allergic responses. The normal number of WBCs in the blood is 4,500 to 11,000 WBCs per microliter. Both elevated and low leukocyte counts can be markers of infection and malignancy. Different kinds of WBCs expressed different count of CD45 glycoprotein. The expression of CD45 was the highest on lymphocytes (279,369±101,409), intermediate on monocytes (52,398± 15,192), and the lowest on granulocytes (26,890 ±7,856). Counting of leukocytes can be performing by automatic fluorescence microscope using the biomarker expression of CD45. Staining for the expression of CD45, a common leukocyte biomarker and fluorescent intercalating reagent that stains dead cells, can distinguish healthy leukocytes from dead cells. The aim of this study was the counting of total WBCs by using conjugate of anti-CD45 antibody with fluorescent dye and dead WBCs with monomethyne cyanine dye, Sofia Green. For this purpose leukocytes were isolated from PBCs by Ficoll – Paque PREMIUM reagent. Then a conjugate between monoclonal CD45+ antibody and dR110 (6-carboxy-4,7-dichlororhodamine 110) fluorescent dye was prepared by carbodiimide method. The obtained conjugate was purified by affinity chromatography. The forming of the conjugate was proved by its fluorescence spectrum. The total count of leukocytes was measured by using automatic fluorescence microscope EasyCounter BC and anti-CD45+antibody-DR110 conjugate. The dead cells were counted by EasyCounter BC with the fluorescent dye Sofia Green. The obtained results were compared with those received by optic microscope Olympus. It was found that the results are closely, but the coefficient of variations of EasyCounter BC was 2 time less than results obtained with optic microscope.

P.4.11. CONDUCTING POLYMER - SILVER NANOPARTICLES COMPOSITE MATERIAL: A NOVEL SENSING ELEMENT FOR ANTIOXIDANTS ELECTROANALYSIS

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In this work, a new sensors' preparation method based on the use of sinusoidal voltages (SV) has been applied in the development of an electrochemical sensor for caffeic acid detection. The new SV procedure has been applied successfully in the electrodeposition of poly(3,4-ethylenedioxythiophene) (PEDOT) and enzymes onto microelectrodes arrays [1-5] as well as in the in-situ preparation of metal nanoparticles [6, 7]. The SV procedure was used in this work for the in-situ electrodeposition of Ag nanoparticles (AgNPs) onto the PEDOT coating for sensor's development. The electrochemical properties and the morphology of the AgNPs-PEDOT sensing material have been investigated by cyclic voltammetry and scanning electron microscopy. The proposed electrochemical sensor was applied successfully in the electroanalysis of caffeic acid in real samples with good analytical performances, such as low detection limit, high sensitivity, wide linear response range, and good accuracy.

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P.4.12. SENSITIVE ELECTROCHEMICAL DETECTION OF LIPOIC ACID AT CONDUCTING POLYMER MODIFIED ELECTRODE

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In this work, poly(3,4-ethylenedioxythiophene) (PEDOT) coatings have been prepared by the electrochemical polymerization of the corresponding monomer in aqueous solutions under various experimental conditions including potentiostatic (PS) or sinusoidal voltage (SV) procedures. The influence of the doping ions polystyrene sulfonate (PSS) and dodecyl sulfate (SDS) on the electrochemical properties and analytical performance of the PEDOT sensing materials towards lipoic acid (LA) detection has been investigated. The study on the role of the doping ions and the electrochemical synthesis routes provided the opportunity to obtain a versatile, free of fouling effects and sensitive sensing platform based on peculiar PEDOT coatings [1-8]. The LA electrochemical oxidation has been studied by cyclic and differential pulse voltammetry in aqueous buffered solutions at pH in 5 and 7. The PEDOT coatings prepared by PS and SV procedures displayed a wide linear response range toward LA oxidation, with low limit of detection and good accuracy and repeatability. The anti-fouling capacity and the analytical performance of the prepared PEDOT sensing layers open the way to the potential applications in real samples analysis including both medical and food supplements matrices.

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P.4.13. COMPARATIVE STUDIES FOR RHODANINE AND ITS DERIVATIVES IN VIEW OF HEAVY METAL IONS RECOGNITION

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The electrochemical study of the rhodanine, benzylidene rhodanine, p-diethylaminobenzalrhodanine (5-[[4-(dimethylamino)phenyl]methylidene]-2-sulfanyli-dene-1,3-thiazolidin-4-one-IUPAC) [1] was performed by using a glassy carbon, gold and platinum working electrodes and employing two methods: differential pulse voltammetry (DPV) and cyclic voltammetry (CV) according to the described methodology [2, 3].

The CV and DPV studies for rhodanine and its derivatives were recorded at different concentrations in 0.1M TBAP/ CH_3CN. Polymeric films were formed by successive cycling at different potentials and by CPE [2]. The modified electrodes were used for detection of heavy metal ions. The film formation at rhodanine or its derivatives concentration of 2 mM in 0.1M TBAP/CH_3CN was proved by recording the CV curves of the electrodes modified in transfer solutions containing ferrocene in 0.1M TBAP/ CH_3CN. Synthetic samples of heavy metal ions (Cd(II), Pb(II), Cu(II), Hg(II)) of concentrations between 10^{-6} – 10^{-4} M were analyzed using the prepared chemically modified electrodes. The most intense signal was obtained for Pb(II) ion (detection limit 10^{-6}M), which shows that Pb(II) ion can be detected in waste waters.

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P.4.14. MODIFICATION OF TITANIUM IMPLANTABLE SURFACES WITH BIO-INSPIRED STRUCTURES

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Implanted biomaterials based on titanium and titanium alloys play a key role in the success of orthopedic and dental procedures being the most commonly used materials for permanent implants in contact with bone. In the last decade, numerous studies reported the ability of titanium surface modifications to reduces bacterial adhesion, inhibit biofilm formation and to improve other implant surface properties.

The silk fibroin and polydopamine are two natural polymers favorable for a wide range of biomedical applications. These are used as carriers of drugs and their sustained release in different medical applications [1,2].

For this study, silk fibroin and polydopamine was selected as a coating layer for titanium (Ti) surface modification. A polydopamine layer was formed on Ti surface by self-polymerization and the silk fibroin layer was electrodeposited on the surface. These two compounds were used for amoxicillin embedment on Ti modified surface. All samples were characterized by SEM, FTIR, Vickers hardness, and electrochemical tests (EIS, CV, Tafel).

It has been established that these coatings could be used for local drug administration.

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P.4.15. DETECTION OF LEAD IONS BY VOLTAMMETRY ON AZULENE BASED CMEs

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(Z)-5-(azulen-1-ylmethylene)-2-thioxo-thiazolidin-4-one has been examined as ligand for heavy metal ions recognition [1]. The electrochemical characterization was carried out by CV, DPV and RDE. Different conditions for complexing films preparation have been examined. Direct electropolymerization in pulses by controlled potential electrolysis lead to the immobilization of the complexing monomer on the electrode surface. The film formation has been put in evidence by electrochemical (CV, EIS) and optical (AFM, SEM) methods [2]. The complexing properties of the ligand and their modified electrodes have been investigated towards Cd(II), Pb(II), Cu(II), Hg(II) ions in water solutions by anodic stripping technique. The obtained results confirmed that CMEs are a powerful and sensitive tool for lead ions identification and detection.

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P.4.16. RECOGNITION OF HEAVY METAL IONS BY USING ELECTRODES MODIFIED WITH E-5-((5-ISOPROPYL-3,8- DIMETHYLAZULEN-1-YL)DIAZENYL)-1H-TETRAZOLE

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The electrochemical study of the azulene compound (E-5-((5-isopropyl-3,8-dimethylazulen-1-yl)diazenyl)-1H-tetrazole (**L 2636**) was performed by using a glassy carbon working electrode and employing three methods: differential pulse voltammetry (DPV), cyclic voltammetry (CV) and rotating disk electrode voltammetry (RDE). The synthesis of the azulene compound **L 2636** was performed according to the described methodology [1].

The CV, DPV and RDE studies for **L 2636** were recorded at different concentrations in 0.1M TBAP/ CH_3CN. The polymeric film was formed by successive cycling at different potentials and by CPE [2]. The modified electrodes were prepared for detection of heavy metal ions at [**L 2636**] = 2 mM in 0.1M TBAP/CH3CN. The film formation was proved by recording the CV curves of the electrodes modified in ferrocene solutions in 0.1M TBAP/ CH3CN. Synthetic samples of heavy metal ions (Cd(II), Pb(II), Cu(II), Hg(II)) of concentrations between 10-8 – 10-4 M were analyzed using the prepared chemically modified electrodes. The most intense signal was obtained for Pb(II) ion (detection limit 10-8M), which shows that Pb(II) ion can be detected in waters even at low concentrations.

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P.4.17. MICROSENSOR FOR INORGANIC CLINICAL VECTORS

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Last decades marked a significant advance in the development of new sensing devices able to assess the level of various inorganic ions that could be used as clinical markers in different diseases.

The present work introduces a new coated wire ammonium selective microelectrode. Such electrode could assess the ammonium level in various body fluids. Due to its accessible manufacturing procedure, flexible design and cheap materials such microdevice might be a suitable solution for biological fluids analysis compared to the more sophisticated and more expensive sensors based on microtechnology [1].

The obtained microelectrode presented a rapid response time (6s) and a very good Nernstian electrochemical answer towards ammonium cation with excellent behavior in the presence of interfering anions and cations: HCO_3^-, CO_3^{2-}, $H_2PO_4^-$, HPO_4^{2-}, Mg^{2+}, Ca^{2+}, Li^+, Na^+, K^+. The working range between 10^{-6} and 10^{-1} mol/L of the microelectrode was not affected by the pH variations, therefore it could be used successfully for biological fluids with pH ranging between 6.2 and 7.4. The high reproducibility of the microelectrode answer has been evidenced.

The experimental results obtained, correlated with our previous results [2, 3], highlight without doubts that the proposed microsensor for inorganic chemical species might be an important tool in diagnosis procedure.

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P.4.18. CHEMICAL SENSING WITH UNMODIFIED TELECOM OPTICAL FIBERS

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Beyond telecommunication, optical fibers have found applications in many different fields of sensing[1]. We use distributed fiber optic strain sensing to examine swelling of the fiber's polymer cladding. The distributed sensing technique that uses unmodified low-cost telecom fibers opens a new dimension of applications that include leak detection, monitoring of water quality and waste systems. On a short length scale, the technology enables "lab-on-a-fiber" applications for food processing, medicine, or biosensing for instance. The chemical sensing is realized by modifying optical fibers, namely, by using swelling in the coating material of the fiber to detect specific chemicals. Simultaneous readout of multiple integrated sensors increases the reliability and reduces the measurement uncertainty over single sensor experiments. Although generic and able to work in various areas such as environmental monitoring, food analysis, agriculture or security, the proposed chemical sensors can be targeted for water quality monitoring, or medical diagnostics where they present the most groundbreaking nature. Moreover, the technique is without restrictions applicable to longer range installations.

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P.4.19. CALORIMETRIC MASS FLOW MONITORING BY FIBER OPTICAL TEMPERATURE SENSING

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We use distributed fiber optic temperature sensing to examine temporal and spatial heat distribution along the length of a locally heated fluidic conduit [1]. In this work we show that by using pulsed heating, we can provide quantitative flow rates independent of the thermal diffusivity of the fluid and heat loss in the system. We demonstrate on simple experiments with water and ethanol, that flow rates can be detected over several orders of magnitude. Unlike turbine or pressure based sensors this technique is not flow intrusive, works in harsh conditions, including high-temperatures, high pressures, corrosive media, and strong electromagnetic environments. In this Calorimetric flow measurement a heating pulse is applied then without further heating the propagation of the heat is monitored. We demonstrate the technique on a short fluidic system with a length of one meter. This range finds applications in low volume drug delivery, diagnostics as well as process and automation technology. Moreover, the technique is without restrictions applicable to longer range installations. Existing fiber optics infrastructures for instance on oil pipelines or down hole installations only require the addition of a heat source to obtain reliable flow monitoring capability.

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P.4.20. OPTIMIZATION OF BRILLOUIN OPTICAL TIME DOMAIN ANALYSIS FOR FIBER OPTICAL TEMPERATURE SENSING

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We report on the development of a first Brillouin optical time domain analysis (BOTDA) sensing platform at Politehnica University in Bucharest Romania. BOTDA allows measuring strain and temperature quantitatively using optical fibers. The Brillouin gain spectrum is reconstructed by injecting a high-power pump pulse to interrogate the local-stimulated Brillouin scattering (SBS) and then sweeping the continuous probe wave frequency over a wide spectral range. We used a semiconductor amplifier (SOA) instead of the commonly used electro optical modulators (EOM) to shape the light into short pulses. The SOA offers higher extinction ratio and higher dynamic range than EOMs. An SOA has no polarization rotation dependencies, and the spectrum of an SOA remains the same along the entire pulse, whereas when directly pulsing a laser diode, undesirable spectral effects can occur. Fully automated data acquisition and processing using a LabVIEW implementation has been implemented with which we demonstrate first temperature measurements over 50 kilometer long fibers.

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P.4.21. CALORIMETRIC MASS FLOW SENSING WITH LOCALLY HEATED OPTICAL FIBERS

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We developed a novel method to monitor mass flow based on distributed fiber optical temperature sensing [1]. The technique examines temporal and spatial heat distribution along the full length of a locally heated fluidic conduit. Our experimental results, that reveal heat flow under forced convection in one dimension along the entire fluidic, are in good agreement with two dimensional finite element analysis that couples fluid dynamic and heat transfer equations. Bidirectional flow rates can be detected over three orders of magnitude. Unlike turbine or pressure based sensors this technique is not flow intrusive, works in harsh conditions, including high-temperatures, high pressures, corrosive media, and strong electromagnetic environments. We demonstrate the technique on a short fluidic system with a length of one meter. This range finds applications in low volume drug delivery, diagnostics as well as process and automation technology. Moreover, the technique is without restrictions applicable to longer range installations. Existing fiber optics infrastructures for instance on oil pipelines or down hole installations only require the addition of a heat source to obtain reliable flow monitoring capability.

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