PREZENTIS
SCIENCE & HEALTH CONFERENCES

2nd International Conference on

Human Genetics







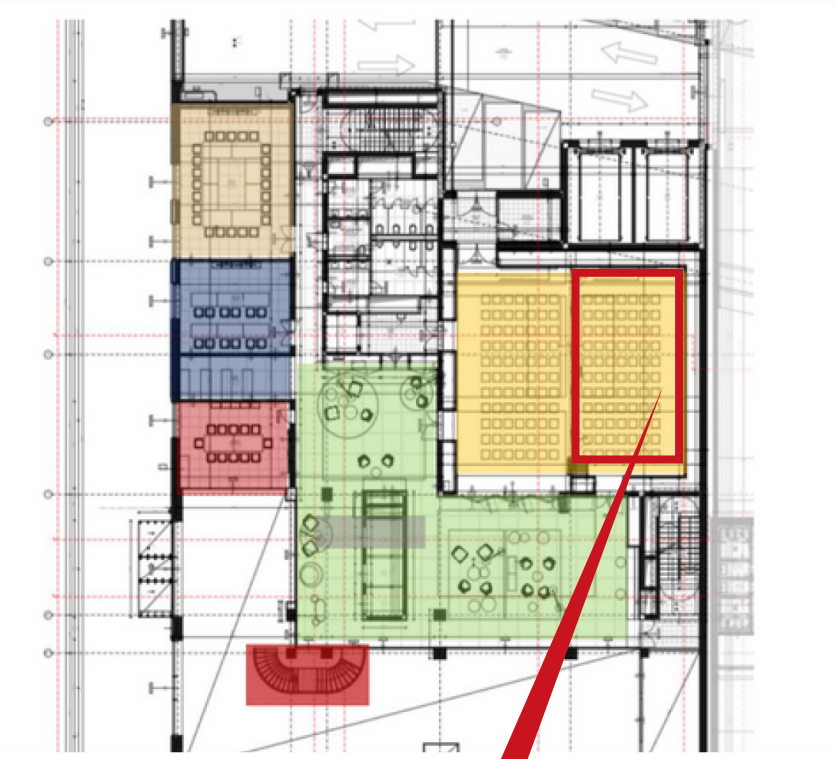
Budapest, Hungary

September 21-22, 2026

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7 Bell Yard, London
WC2A 2JR, UK

Floor Map



Conference Hall



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no password needed

CONFERENCE PROGRAMME

DAY 1 - SEPTEMBER 21, 2026

Meeting Hall: Astor	
09.30-09.50	**Registrations**
09.50-10.00	**Introduction**

Keynote Presentations

10.00 - 10.40

Title: CA Mathematical Approach to Demonstrate R to T Wave Concordance of The Human ECG

Alexander Passow, Leipzig University, Germany

10.40 - 11.20

Title: Application of Updated Clinical Recommendations for The Use of NGS

Natalia Isaeva, First Genetics JSC, Russia

Networking & Refreshments: 11.20 - 11.35 @ Pre-conf

11.35 - 12.15

Title: Application of Human Stem-Cell Derived 3D Tissues for Drug Development

Balazs Sarkadi, Innocell LTD, Hungary

12.15 - 12.55

Title: Prospecting Cytotoxicity of Metal-Doped Tin Oxide Nanoparticles: The Hill Model Approach

Paulo Cesar De Morais, Catholic University of Brasilia, Brazil

Group Photo 12.55 - 13.05

Lunch: 13.05 - 14.00 @ Simmer Restaurant

Oral Presentations

Session Chair	**Balazs Sarkadi,** Innocell LTD, Hungary
Session Chair	**Alexander Passow,** Leipzig University, Germany
Sessions	Biomedical Engineering | Cytogenetics | Stem Cells for Regenerative Medicine | Parkinson's Disease | Neural Engineering and Neurotechnology | Biosensors and Bioelectronics | Genomics | Tissue Engineering | Population Genetics | Biomechanics and Rehabilitation Engineering |Cardiac Genetics | Biomaterials and Biodevices | Forensic Genetics | Pharmacogenetics and Pharmacogenomic | Human Genomics and Genetic Diseases | Bioinformatics

14.00 - 14.30

Title: Genetic Susceptibility in Pediatric Uveitis: From HLA Risk Variants to Precision Medicine

Maria De Pastina, University of Galway, Ireland

14.30 - 15.00

Title: *In-silico* Kinetic Modelling of Polyphenol-Inhibited Starch Digestion in Diabetic Patients

Ankita Nath, National Institute of Technology Rourkela, India

15.00 - 15.30

Title: Advanced Composite Materials for Controlled Antimicrobial Delivery: A Promising Strategy against Biofilm Formation and Antimicrobial Resistance

Jana Soukupová, Palacký University, Czech Republic

15.30 - 16.00

Title: Influence of Tissue Orthotropy and Convexity on Diffusion of Localized Loads in Biological Materials

Neta Blum, Technion, Israel

Networking & Refreshments: 16.00 - 16.30 @ Pre-conf

16.30 - 17.00

Title: Exploring Ruthenium-Triazolopyrimidine Complexes as Next-Generation Antitumor Prodrugs

Iwona Łakomska, Nicolaus Copernicus University in Toruń, Poland

Day-1 Concludes followed by Certificate Distribution

DAY 2 - SEPTEMBER 22, 2026

Meeting Hall: Astor

Keynote Presentations

10.00 - 10.40

Title: Preclinical Development of Gene Therapy for The Inherited Neurodegenerative Disease, Creatine Deficiency Syndrome (CTD)

Balazs Sarkadi, Innocell LTD, Hungary

10.40 - 11.20

Title: EEG Neurofeedback and Inflammatory Response during The IGNIS/Axiom-4 Mission

Marcin Dornowski, University of Physical Education and Sport Gdansk, Poland

Networking & Refreshments: 11.20 - 11.40 @ Pre-conf

11.40 - 12.20

Title: Unveiling Tumor Growth Control under Polymeric Magneto-Nanodots

Paulo Cesar De Morais, Catholic University of Brasilia, Brazil

Oral Presentations

12.20 - 12.50

Title: Sustainable Biomanufacturing of The Therapeutic Peptide LL-37 using Transgenic Barley

Lenka Dzurová, Palacký University, Czech Republic

Lunch: 12.50 - 14.00 @ Simmer Restaurant

14.00 - 14.30

Title: Sexual Dimorphism as A Tool for Evolutionary Prediction and Control

Sapunov Valentin B, Medical and Social Institution, Russia

Poster Presentations 14.30 - 15.00

Poster Judge: **Alexander Passow, Leipzig University, Germany**

BGPP - 1

Title: Polyphenol-Induced Structural Modifications of Potato Starch and Its Effect on Enzyme Inhibition and Digestibility

Ankita Nath, National Institute of Technology Rourkela, India

BGPP - 2

Title: Molecular Features of Liquid Biopsy using NGS: Key Technical and Statistical Notes in Real Laboratory Practice

Yulia Naumova, First Genetics JSC, Russia

BGPP - 3

Title: New Antioxidant Triphenol-Derived Hydrazide-Hydrazone Thiazole: Formation and Analysis of Inclusion Complex with β-CD using Experimental and Computational Approaches

Adrian Pîrnău, National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

BGPP - 4

Title: Investigation of The Inclusion Complex Formation between A Vanillin-Thiazolidine-2,4-Dione-Derived Antioxidant and β-Cyclodextrin by NMR, ITC, Spectrophotometry, Conductometry and Molecular Docking

Mihaela Mic, National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

BGPP - 5

Title: Engineering Water-Stable HA-PDA Hydrogels through Controlled Dopamine Polymerization

Maria O Miclăuș, National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

BGPP - 6

Title: HA-DA Supramolecular Conjugates as Precursors for Stable HA-PDA Hydrogels

Ioana Grosu, National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

BGPP - 7

Title: A Case of Report Late-Onset Biotinidase Deficiency Presenting as Neuromyelitis Optica Spectrum Disorder

Tamara Kuptsova, Morozov Children's City Clinical Hospital, Russia

BGPP - 8

Title: Thanatophoric Dysplasia Type I: Prenatal Ultrasound Findings *vs* Postnatal Genetic Verification

Vera Larionova, Morozov Children's City Clinical Hospital, Russia

Video Presentations

VP-01

Title: Theoretical Basis of Primary and Secondary Healing in Peripheral Nerve Injury: Based on Schwann Cell Phenotypic Switching

Bo He, The First & Third Affiliated Hospital of Sun Yat-sen University, China

VP-02

Title: Reframing Access to Advanced Therapy Medicinal Products (ATMPs) in Europe: A Patient-Centered Call to Action for Policy and Systemic Reform

Mariano Votta, Responsible EU Affairs at Cittadinanzattiva, Italy

VP-03

Title: Quantitative Assessment of Myocardial Perfusion using Dynamic Computed Tomography Imaging and Machine Learning

Mohammed Owahidur Rahman, AGH University of Krakow, Poland

VP-04

Title: Silent CNS Neoplasms Revealed at Autopsy: Neuroimaging and Clinicopathological Lessons from Incidental Meningioma and Extramedullary Multiple Myeloma

Jayeshkumar Kanani, Surat Municipal Institute of Medical Education and Research, India

Day 2 Concludes followed by Certificate Distribution & Vote of Thanks

Day 1

Keynote Presentations

CA MATHEMATICAL APPROACH TO DEMONSTRATE R TO T WAVE CONCORDANCE OF THE HUMAN ECG

Alexander Passow
Leipzig University, Germany

Abstract

R-to-T-wave concordance within the same lead of the human electrocardiogram (ECG) has been under discussion for decades, as the QRS complex with its R-wave represent depolarization and the T-wave repolarization. Extracellular recorded monophasic action potential (MAP) of the human heart muscle fibre resembles the first derivation of the intracellular MAP over time, showing R-to-T-wave discordance.

While a single fibre monophasic electrophysiology lacks many aspects of the ECG, bipolar registration for the different layers of the ventricular wall (transmural gradient) gives more detailed information about the local MAP, as endo-, meso- and epicardium show a MAP time difference (voltage gradient) dependent positioning of the T-wave, within a simultaneously recorded epicardial ECG. Without an integrated consideration of the heterogenous (endo-, meso- and epimyocardial) MAP, T-wave concordance cannot be explained, as it would provide a homogenous model like the single heart muscle fibre MAP. A closed form representation of the potential difference to explain concordance was found.

We developed a 3-dimensional, time dependent setup simulating the transmural gradient. The time-dependent spatial integrals, which account for the extracellular loading-density (which is inversely related to MAP) along all layers show concordance. These functions allow to calculate the electric potential at any point in space at any given time within the QT-Interval. The closed form solution of the electric potential enables to identify the corresponding T-wave morphologies. Inversely, pathological patterns in the action potential can then be identified from the ECG. Our approach is an attempt to overcome the inverse problem and to reduce empiricism, as change of T-wave morphology can be assigned.

Biography

Alexander Passow is a Postdoctoral researcher at Leipzig University's Medical Faculty and Senior Researcher at Cardisio GmbH. He is Founder and Principal Owner of STARTIS AG (Switzerland) and JP Omega Ltd. (UK) and a Partner at Principalium Capital AG. With a background spanning quantitative finance and medical research, he previously held roles at Deutsche Bank, HSBC and Gottex Fund Management. He earned a PhD in Mathematics from TU Darmstadt and an MSc in Finance from the University of Lausanne. His work focuses on advanced quantitative methods bridging finance and cardiology.

APPLICATION OF UPDATED CLINICAL RECOMMENDATIONS FOR THE USE OF NGS

N Isaeva I, Y Naumova, Myslevtsev and R Bikanov
First Genetics JSC, Russia

Abstract

Background/Objectives: With the advent of targeted therapy in modern oncology, dramatic changes have occurred in approaches to cancer treatment. One of the promising areas is agnostic (tumor-agnostic) antitumor therapy, which is aimed at treating solid tumors without taking into account their type and location. This technique helps select a drug based on the specific genetic mutations or biomarkers that the drug targets.

Currently, since 2017, the FDA has approved 7 different drugs targeting molecular-specific biomarkers in solid tumors. The first drug approved for use was pembrolizumab, aimed at tumors of any location with high microsatellite instability (MSI-H). Larotrectinib and entrectinib were approved in 2018 and 2019 for patients with NTRK gene translocations. For patients with a high tumor mutation burden (TMB), pembrolizumab was also approved in 2020. PD-1 checkpoint inhibitors was approved for the treatment of patients with MSI-H. Then the combination of dabrafenib and trametinib received approval for the treatment of patients with tumors with the BRAF V600E mutation. Selpercatinib was approved to treat patients with RET gene mutations or fusions and FGFR fusions or mutations are indicators for pan-FGFR inhibitors.

In addition, other drugs are currently being studied for various biomarkers, such as ALK, HER2 and NRG1, KRAS G12C.

Methods: In our work, we examined the presence of the tumor agnostic biomarkers in a group of 365 patients with pathomorphologically confirmed locally advanced, metastatic, or recurrent solid tumors of various locations. Archival tumor tissue blocks, formalin-fixed and paraffin-embedded (FFPE) were used for NGS. Nucleic acids were isolated using the RecoverAll™ Total Nucleic Acid Isolation Kit for FFPE (Invitrogen™) according to the manufacturer's protocol. Nucleic acid concentrations were assessed using a Qubit 2.0 fluorometer and RNA quality was assessed using the RIN score using the 2200 TapeStation automated gel electrophoresis system. For library preparation we used Oncomine™ Comprehensive Assay (161gene) and Oncomine™ Focus Assay (52gene), Thermo Fisher Scientific. Sequencing was performed on the F-Genetics high-throughput sequencing system. The obtained results were analyzed using Torrent Suit and Ion Reporter software.

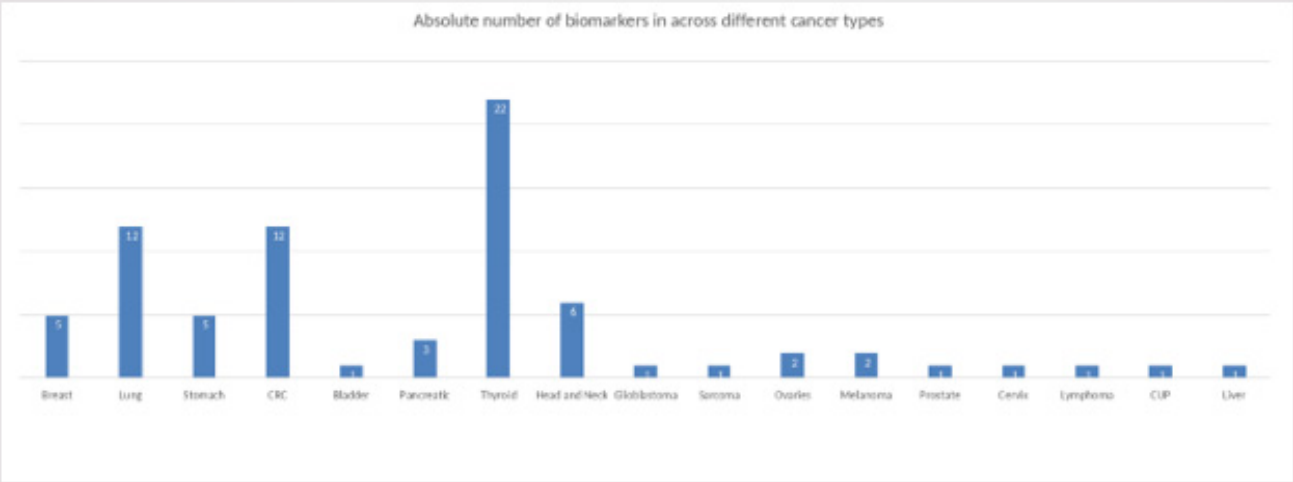
Results: At least one biomarker was found in 64 patients (except for patients with TMB, since this analysis was not performed). As a result, of the total number of patients, these biomarkers were detected in 18% of cases.

Of this number, 35% of findings are BRAF V600E, 20% of findings are HER2 mutations, 16% of findings are FGFR gene mutations. MSI-H and NTRK and RET and ALK and KRAS gene mutations accounted for a total of 32% of the findings. Mutations of the NTRK and NRG1 genes were not found in our sample.

The entire sample was considered based on the number of findings per patient. There were the most patients with 1 mutation - 36%. Patients with 2 findings - 21%, with 3 findings - 7%, with 4 findings - 5%. There were also isolated cases of patients with 5, 6, 7 and 8 mutations.

The TP53 gene, which is a prognostic marker for tumor development, was also examined. This gene expresses the P53 protein, which is a tumor suppressor by regulating the rate of cell proliferation. However, this gene is often mutated in cancer, which leads to increased chromosomal instability and decreased survival.

Of the entire sample, mutations in the TP53 gene were detected in 12% of cases, where 23% were due to colorectal cancer. Also, 21% were due to ovarian cancer. The remaining 56% occurred in various isolated cases.



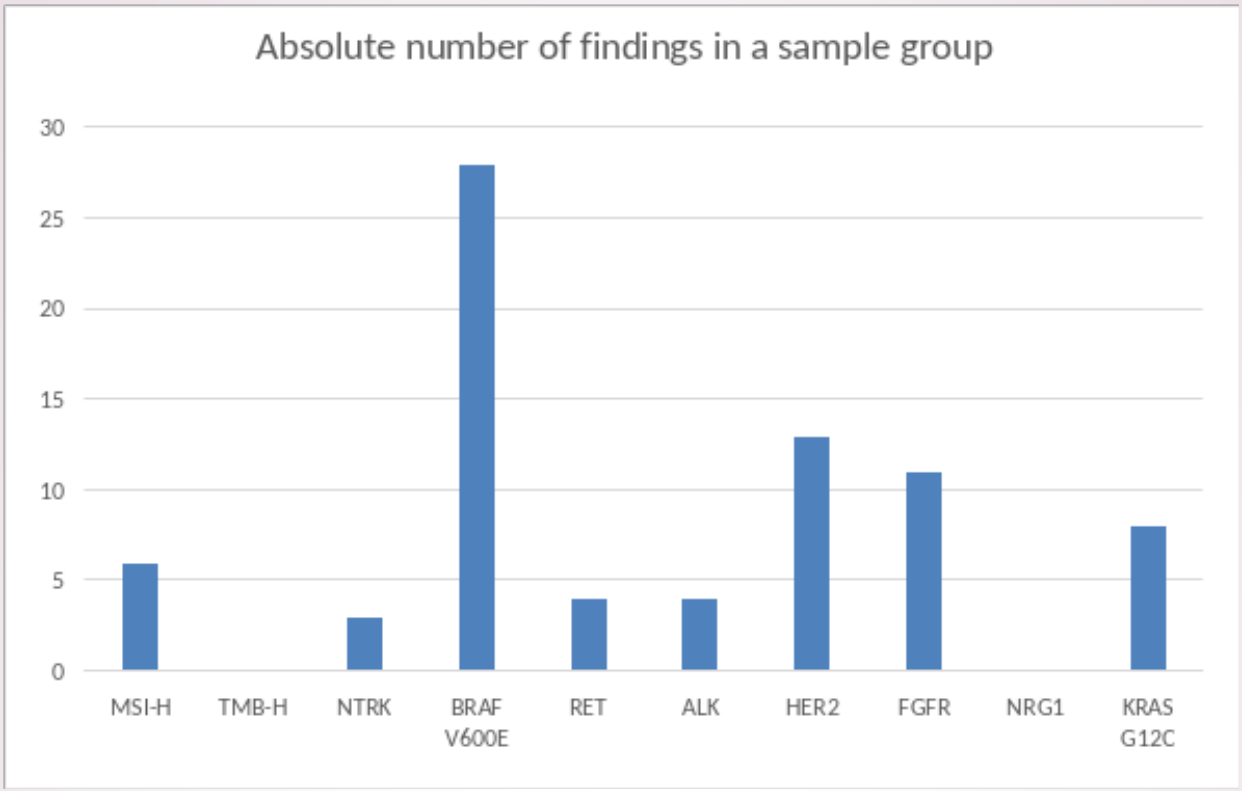
List of tumor-agnostic genomic alterations

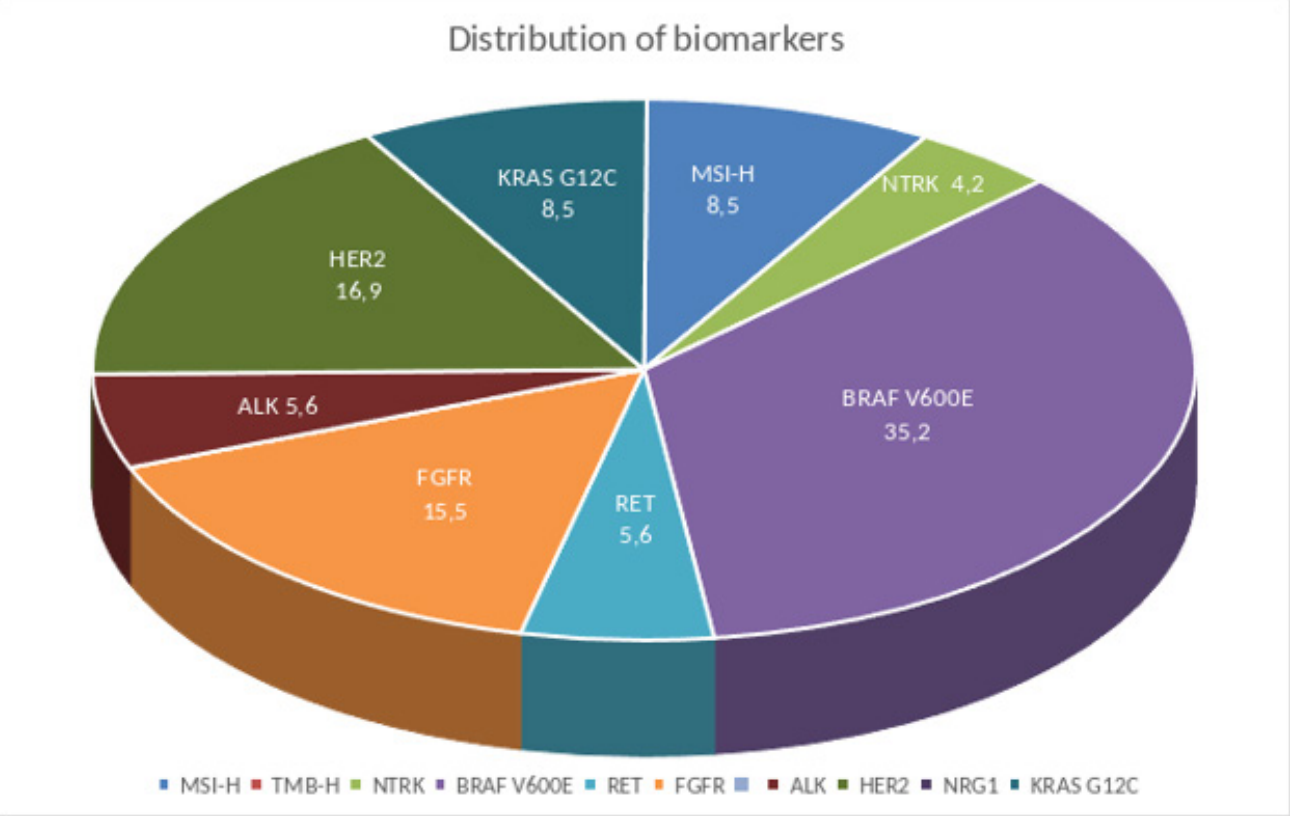
Gene/Signature	Alteration	Tumor site	% from all findings
MSI-H/dMMR	MSI-H/dMMR	50% colorectal cancer 16% sarcoma 16% stomach cancer 16% ovarian cancer	8.5
TMB-H	TMB-H	Not tested	-
NTRK1/2/3	Fusions	100% thyroid cancer	4.2
BRAF	Mutations (p. V600E)	64% thyroid cancer 18% colorectal cancer 7% lung cancer 7% melanoma 4% prostate cancer	35.2

RET	Fusions, Mutations	50% lung cancer 25% head and neck 25% thyroid cancer	5.6
FGFR1/2/3	Amplifications, Fusions, Mutations	27% breast cancer 9% lung cancer 9% stomach cancer 9% colorectal cancer 9% head and neck 9% glioblastoma 9% ovarian cancer 9% CUP 9% liver cancer	15.5
ALK	Fusions, Mutations	75% lung cancer 25% colorectal cancer	5.6
HER2	Amplifications, Mutations	23% lung cancer 23% head and neck 15% breast cancer 15% stomach cancer 8% bladder cancer 8% cervix cancer 8% lymphoma	16.9
NRG1	Mutations	Not found	0
KRAS G12C	Mutations	38% Pancreatic cancer 25% colorectal cancer 12% lung cancer 12% stomach cancer 12% head and neck	8.5

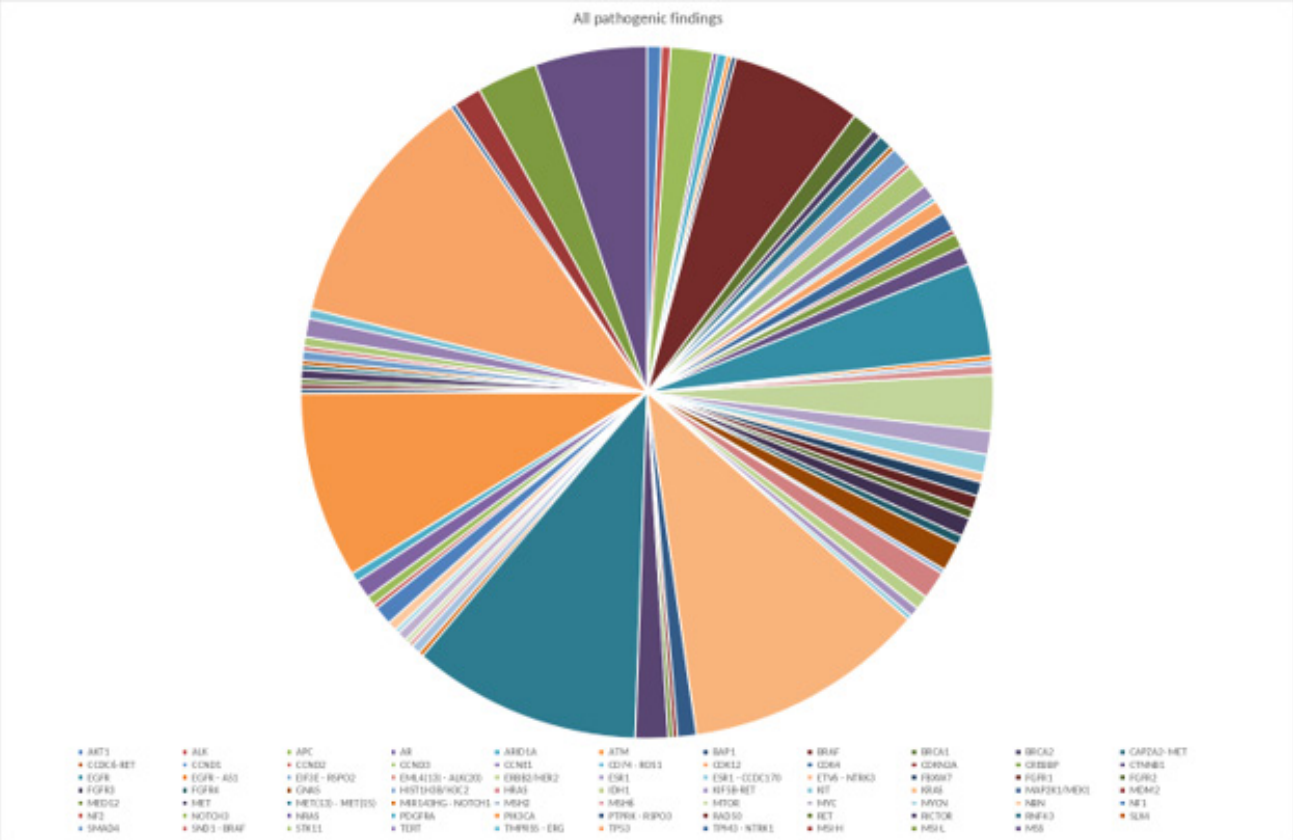
Currently used agnostic biomarkers

Potential agnostic biomarkers

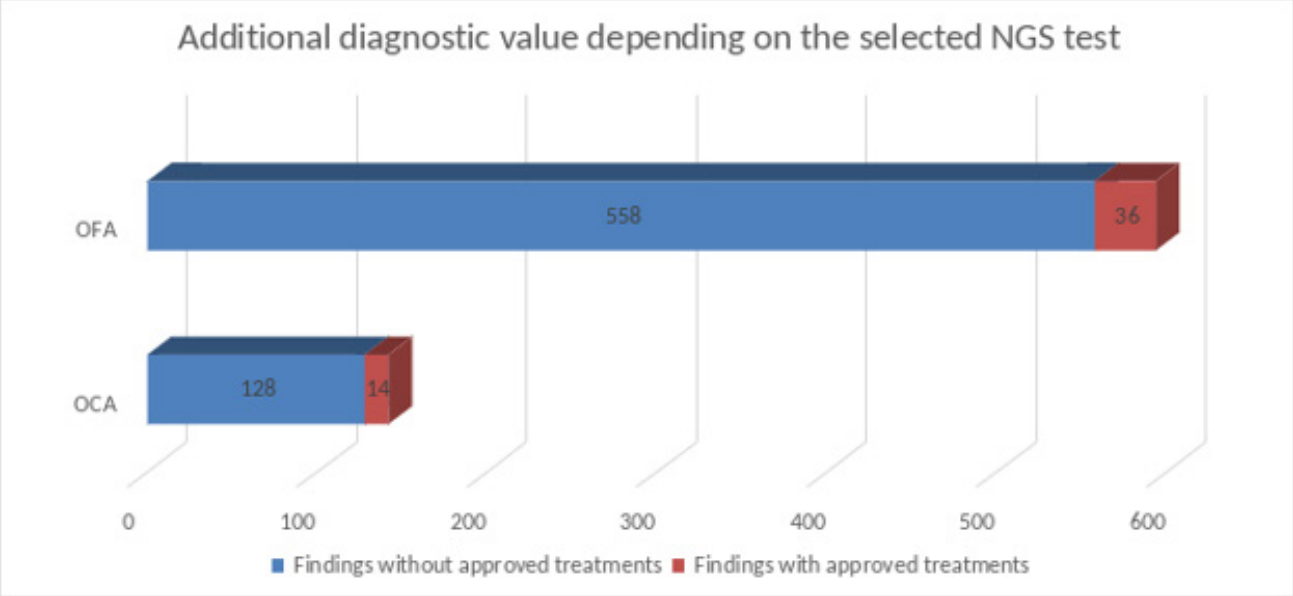

Absolute number of findings in a sample group
30
25
20
15
10
5
0
MSI-H
TMB-H
NTRK
BRAF V600E
RET
ALK
HER2
FGFR
NRG1
KRAS G12C


Distribution of biomarkers
KRAS G12C 8,5
MSI-H 8,5
NTRK 4,2
HER2 16,9
ALK 5,6
BRAF V600E 35,2
FGFR 15,5
RET 5,6
MSI-H
TMB-H
NTRK
BRAF V600E
RET
FGFR
ALK
HER2
NRG1
KRAS G12C

All pathogenic findings in a sample group



Additional diagnostic value depending on the selected NGS test



Biography

Natalia Isaeva graduated from Pirogov Russian National Research Medical University with a degree in molecular biology in 2013. Since 2013, she has been working in Fox Chase Cancer Center, Philadelphia, USA for "Targeting the KRAS-MYC signaling axis in the fight against pancreatic cancer, from 2015 to 2017 was educated and graduated as clinical geneticist and was engaged as a specialist in field of genetics in oncology and reproductive area in Federal Budgetary Scientific Institution Central Research Institute of Epidemiology of Rospotrebnadzor and since 2018 she is a deputy head of a largest NGS laboratory in reproductive health, with unique oncogenetics portfolio.

APPLICATION OF HUMAN STEM-CELL DERIVED 3D TISSUES FOR DRUG DEVELOPMENT

Balazs Sarkadi
Innocell LTD, Hungary

Abstract

Human induced pluripotent stem cells (iPSCs) provide an excellent source for the generation of differentiated tissues, including liver, blood vessel, cardiac or neural cell types. These tissues, allowing New Approach Methodologies (NAMs) can be successfully applied for *in vitro* drug development or toxicology studies, in most cases capable of replacing animal models. Recently, 3D cultures and organoids have become indispensable tools in drug development and evaluation, as various organoids can be obtained in vitro, representing most organs in the human body. Unlike 2D cultures, 3D models allow the formation of complex tissue structures, cell-cell communication and cell-matrix interactions, enabling the study of complex biological processes in a broad range of applications including drug discovery, regenerative medicine and disease modeling. While surgically obtained human cells and organoids have serious problems in availability and reproducibility, iPSC-derived human 3D organoids have the potential to become useful preclinical models for research and drug development. Specific disease models from gene-edited human pluripotent stem cells can be reproducibly generated and after targeted differentiation these can serve as preclinical models for screening new drugs for efficient treatment. However, such human models require specific conditions, including a GLP environment for organoid generation and drug screening. In this regard important steps should be taken to achieve standards for proper iPSC-derived organoid development, as well as for screening or toxicology studies, satisfying all EMA and FDA regulatory requirements.
Supported by 2024-1.1.1-KKV_FÓKUSZ-2024-00022.

Biography

Balázs Sarkadi, MD, Ph.D., spent several years as a post-doc and then as a visiting scientist at major universities in the United States and Canada. He is research professor at Semmelweis University, member of the Hungarian Academy of Sciences, past president of FEBS, ICRO and ITTS, member of several international research societies including the Academia Europeae and the Royal Society of Medicine. He obtained numerous awards, including the Denis Gabor award for research application development. His research has been focusing on membrane proteins which play a major role in the multidrug resistance of cancer, in general pharmacology and in stem cell function. His recent work is related to transporters in pluripotent stem cells and in stem-cell derived differentiated tissues and organoids, the application of organoids in drug development. He has published more than 320 papers in international scientific journals, with a citation number over 25,000, with an h-index of 75. He has several international patents already in commercial applications.

PROSPECTING CYTOTOXICITY OF METAL-DOPED TIN OXIDE NANOPARTICLES: THE HILL MODEL APPROACH

Paulo Cesar De Morais[1,2]
[1]Catholic University of Brasilia, Brazil
[2]University of Brasilia, Brazil

Abstract

In this Keynote Talk, the traditional disc diffusion-test bioassay is revisited within the perspective of using a mathematical approach grounded on the standard as well as on the modified Hill model. Importantly, the Hill model was established in 1910 to account for the binding of oxygen molecules to hemoglobin and since then has been used as a standard model for evaluation of a wide plethora of experimental situations, including cell viability assays. As for the challenging material, Cu-doped tin oxide (SnO_2) spherical nanoparticles (mean size 8.3 nm) will be tested against two bacteria cultures, namely the Gram positive *Staphylococcus aureus* (*S. aureus*) and the Gram negative *Escherichia coli* (*E. coli*). Although limited in terms of variety of challenging materials and bacteria cultures, the success of the proposed mathematical approach while explaining the experimental data is quite impressive. The outcomes of the present analysis point quite favorably toward the general use of it in the very near future. New concepts, such as the biological size and the biological size dispersity, for instance, will emerge naturally from the data analysis reported in the talk.

Biography

Paulo Cesar De Morais (H63), PhD, full Professor of Physics at the University of Brasilia (UnB) - Brazil up to 2013. Appointed as UnB's (Brazil) Emeritus Professor (2014); Visiting Professor at the Huazhong University of Science and Technology (HUST) - China (2012-2015); Distinguished Professor at the Anhui University (AHU) - China (2016-2019); Full Professor at the Catholic University of Brasília - Brazil since 2018; 2007 Master Research Prize from UnB. He held two-years (1987-1988) position with Bell Communications Research, New Jersey - USA. Doctoral degree in Solid State Physics (1986) from the Federal University of Minas Gerais - Brazil. With more than 14,500 citations, He has published more than 500 papers (Web of Science), presented about 300 international invited talks (35 countries) and filed 17 patents. He has appeared in recent World ranking of top scientists, such as 2020-Stanford, 2022-Research.com, 2023-AD Scientific Index, 2023-Research.com, 2024-Elsevier, ONE Research Community, 2025-AD Scientific Index, 2025-Research.com, 2025-Stanford-Elsevier and 2026-Research.com.

Day 1

Oral Presentations

GENETIC SUSCEPTIBILITY IN PEDIATRIC UVEITIS: FROM HLA RISK VARIANTS TO PRECISION MEDICINE

Maria De Pastina
University of Galway, Ireland

Abstract

Pediatric uveitis is a disease that causes preventable visual impairment and blindness in children, particularly among patients who have juvenile idiopathic arthritis (JIA). Although advances in screening and treatment have improved clinical outcomes, the factors that predispose certain children to develop uveitis are still not completely understood. Recent genetic research suggests that susceptibility to pediatric uveitis is strongly influenced by inherited variation within immune-regulatory genes. Studies have consistently identified variants within the human leukocyte antigen (HLA) region, particularly HLA-DRB1, with additional associations reported for HLA-DPB1 and HLA-A, as genetic risk factors associated with JIA-related uveitis. Genome-wide association studies have further demonstrated that specific amino acid changes within HLA-DRB1 significantly increase disease risk, highlighting the importance of antigen presentation and immune regulation in disease pathogenesis. Several non-HLA immune-regulatory loci, including TRAF1-C5, IRF5, MEFV, PTPN2, JAZF1 and PSMA3, have also been proposed as susceptibility factors, though further replication and validation is needed. These variants may further alter individual risk and contribute to inflammatory pathways that are involved in ocular disease. Advances in genomic, transcriptomic and proteomic technologies have expanded understanding of the molecular mechanisms underlying pediatric uveitis and have begun to identify several potential biomarkers for future clinical applications. Emerging evidence suggests that combining genetic markers with established clinical risk factors may improve how children at highest risk for developing these sight-threatening complications are identified. This abstract pulls together current findings from genetic association studies, molecular biomarker research and emerging genomic technologies to provide an integrative overview of pediatric uveitis susceptibility. By linking discoveries in immunogenetics with evolving approaches to risk stratification, the growing potential for precision medicine in the prevention, monitoring and treatment of pediatric uveitis is highlighted.

Biography

Maria De Pastina is an undergraduate student of Genetics and Genomics at the University of Galway, Ireland. Originally from Baltimore, Maryland, USA, she moved to Ireland in 2021 and graduated from Salerno Secondary School in Galway in 2024 before entering the School of Biological and Chemical Sciences at the University of Galway. She served as her first-year class representative and has participated in volunteer work in the biological field by working with birds of prey. Maria participated in Immunoexplorers' "Etch A Cell" project identifying immune cells within kidney tissue with the Francis Crick Institute in UK, London and is currently a Research Assistant intern in the field of biochemistry in the Tuohy Lab at University of Galway. In 2025, she was a moderated as well as presented *"An Integrative Perspective on Lactase Persistence: Epigenetics, Microbiome Adaptations and Health Outcomes"* at the International Conference on Human Genetics in Rome, Italy.

IN-SILICO KINETIC MODELLING OF POLYPHENOL-INHIBITED STARCH DIGESTION IN DIABETIC PATIENTS

Ankita Nath and Ravi Kant Avvari
National Institute of Technology Rourkela, India

Abstract

Polyphenols are naturally occurring plant-derived secondary metabolites that play a significant role in regulating postprandial blood glucose levels by modulating carbohydrate digestion and absorption. Among these, flavonoids and phenolic acids have been extensively studied for their ability to reduce glycemic response through multiple mechanisms, including inhibition of digestive enzymes, reduction of oxidative stress and modulation of glucose transport pathways. Given the increasing prevalence of prediabetes and type 2 diabetes or Diabetes Mellitus, there is a growing interest in exploring dietary polyphenols as potential nutraceutical agents for glycemic control.

The present study investigates the inhibitory effects of selected dietary polyphenols - tannic acid and gallic acid- on enzymatic starch hydrolysis using a mathematically developed in silico gastrointestinal digestion model. This model is designed to simulate physiological digestion conditions relevant to prediabetic and diabetic individuals. Computational simulations were carried out using MATLAB, enabling the dynamic modeling of starch breakdown and subsequent glucose formation under conditions that closely mimic the human gastrointestinal environment. The inhibitory effect of polyphenols was studied to evaluate their influence on the catalytic efficiency of the major carbohydrate-digesting enzymes, namely α-amylase and α-glucosidase. Simulation results demonstrated that these polyphenols significantly inhibit enzymatic starch degradation in a competitive inhibition manner, leading to a reduced rate of glucose release and a moderated postprandial glycemic response. The extent of inhibition was concentration-dependent, with higher concentrations producing more pronounced effects, interfering with substrate-enzyme interactions and thereby slowing the catalytic process of starch hydrolysis. Kinetic modeling based on rate-law equations and Michaelis-Menten dynamics provided further insights into the mechanism of inhibition. In addition to enzyme inhibition, the model also predicts that polyphenols may influence intestinal glucose transport mechanisms, potentially reducing glucose absorption across the intestinal epithelium and further contributing to glycemic control.

Overall, the results demonstrate the capacity of dietary polyphenols to modulate starch digestion kinetics and attenuate postprandial hyperglycemia. The integration of computational modeling with biochemical insights provides a useful framework for evaluating nutraceutical strategies aimed at diabetes management and supports the potential role of polyphenol-rich foods in glycemic control.

Biography

Ankita Nath is a research scholar in the Department of Biotechnology and Medical Engineering at the National Institute of Technology Rourkela, Odisha, India, where her work focuses on starch digestion and its implications for diabetes management. Her research lies at the intersection of food chemistry, nutritional biochemistry and metabolic health, with a particular emphasis on understanding the enzymatic kinetics of starch hydrolysis and its modulation by dietary polyphenols. She is actively engaged in developing *in vitro* digestion models and mathematical frameworks to predict glycemic responses, contributing to the design of functional foods with improved metabolic outcomes. A GATE and CSIR-NET qualified researcher, Ankita has maintained an excellent academic record throughout her undergraduate and postgraduate studies. She also brings two years of industry experience in clinical research from

Zifo R&D Solutions, where she gained exposure to data analysis, research documentation and regulatory practices. Deeply committed to advancing scientific knowledge, Ankita has presented her research at multiple international conferences across India and has contributed to several book chapters in her field. Her current research aims to bridge experimental findings with computational modeling to provide a comprehensive understanding of starch digestion dynamics and their relevance in diabetes management. Beyond her academic pursuits, Ankita is an artist and an avid animal lover, appreciated for her punctuality, integrity and warm, collaborative nature.

ADVANCED COMPOSITE MATERIALS FOR CONTROLLED ANTIMICROBIAL DELIVERY: A PROMISING STRATEGY AGAINST BIOFILM FORMATION AND ANTIMICROBIAL RESISTANCE

Jana Soukupová[1], Soňa Jančíková[1], Kateřina Poláková[1] and Radek Zbořil[1,2]
[1]Univerzita Palackého v Olomouci, Czech Republic
[2]VŠB - Technická univerzita Ostrava, Czech Republic

Abstract

Antimicrobial resistance (AMR) is one of the most significant global healthcare challenges, creating an urgent need for innovative materials capable of preventing microbial colonization while minimizing the risks associated with conventional antimicrobial treatments. Composite materials represent a highly promising class of biomaterials due to their tuneable composition, customizable surface properties and ability to incorporate functional antimicrobial components.

Silver nanoparticles (AgNPs) exhibit broad-spectrum antimicrobial activity; however, their practical use is often limited by concerns regarding cytotoxicity and uncontrolled nanoparticle release. To overcome these limitations, we have developed substrate@AgNP composite systems in which AgNPs are immobilized within or on suitable carrier materials, providing prolonged antimicrobial activity while improving safety and stability.

Particular attention is devoted to functionalization of 1. biodegradable polymer matrices, such as poly(lactic-co-glycolic acid) (PLGA) in different morphological organisations, 2. block-co-polymer particles or 3. layered natural materials, including montmorillonite (MMT). In PLGA-based systems, gradual polymer degradation enables sustained release of antimicrobial species, preventing excessive local concentrations and ensuring long-term efficacy. In MMT-based composites, AgNPs can be deposited not only on the external surface but also within interlayer spaces, forming reservoirs that allow controlled and prolonged antimicrobial release. These structural features significantly reduce the risk of nanoparticle leaching and contribute to enhanced performance and safety.

The developed composites exhibit effective antimicrobial activity and the potential to inhibit microbial colonization and biofilm formation. Their application is particularly attractive for implant coatings, wound-care materials, tissue-engineering scaffolds and antimicrobial nanofibrous systems. By combining high antimicrobial efficacy with controlled release and improved biocompatibility, these advanced composite materials represent a promising strategy for reducing infection risks and addressing the growing challenge of antimicrobial resistance.

Biography

Jana Soukupová, Ph.D. received her Ph.D. in Physical Chemistry from Palacký University, Czech Republic. Her doctoral research focused on the synthesis, modification and functionalization of metal nanomaterials, with particular emphasis on tailoring their properties for advanced applications. In 2014, she joined the Biointerfaces Institute at the University of Michigan, USA, working under the supervision of Prof. Joerg Lahann. During her stay, she gained extensive experience in the design and fabrication of polymer materials, including electrospinning technologies at both laboratory and production scales. This interdisciplinary experience significantly broadened her research perspective and led to her current focus on composite materials combining functional nanomaterials with polymeric or natural carriers. Her research interests include antimicrobial nanocomposites, controlled-release systems, nanofibrous materials and the development of advanced materials for biomedical and environmental applications.

INFLUENCE OF TISSUE ORTHOTROPY AND CONVEXITY ON DIFFUSION OF LOCALIZED LOADS IN BIOLOGICAL MATERIALS

Neta Blum, David Durban and Baruch Karp
Technion, Israel

Abstract

The diffusion of localized mechanical loads in biological tissues plays a central role in tissue mechanics, implant design and mechanobiology. However, while Saint-Venant's principle provides the classical framework for assessing the spatial decay of localized perturbations in engineering materials, its applicability to soft biological tissues is not sufficiently understood due to their pronounced anisotropy, near-incompressibility and nonlinear constitutive behavior. This work investigates the influence of tissue orthotropy and constitutive convexity on the exponential decay of self-equilibrated localized loads in biological materials.

The analysis considers both structurally orthotropic linear elastic compressible materials and incompressible hyperelastic tissues subjected to finite pre-stretch, with particular emphasis on tissue-implant interfaces represented by mixed free-clamped boundary conditions. An eigenvalue formulation is employed to determine the leading axial decay rates governing the diffusion rate and decay length of localized perturbations.

The results demonstrate that increasing orthotropy consistently reduces the decay rate, allowing localized disturbances to propagate over substantially larger distances than predicted by classical isotropic theory. Hyperelastic tissues exhibit additional sensitivity arising from deformation-induced orthotropy and the convexity of the strain-energy function, with finite pre-stretch further reducing decay rates. The presence of a rigid interface amplifies these effects, producing lower rates of decay compared with free-boundary configurations. These findings indicate that the classical SVP assumption of rapid localization of end effects cannot generally be extended to biological tissues. In fact, load diffusion is governed by strong coupling between constitutive response, tissue orthotropy and boundary constraints.

The proposed analytical framework provides new insight into mechanical interactions near implants, vascular interventions and tissue defects and may contribute to improved biomechanical modeling, tissue engineering and the design of biomedical devices where localized stress transfer is of critical importance.

Biography

Neta Blum completed her Ph.D. in Aerospace Engineering at the Technion - Israel Institute of Technology in 2026. Her research combines modern biomechanical models and nonlinear continuum mechanics, with particular emphasis on the decay of localized loads in biological materials, tissue orthotropy, hyperelasticity and tissue/implant interactions. She received both Bachelor and Master degrees (Mechanical Engineering) from the Technion through the Lightning Excellence Program. Her work bridges classical solid mechanics and biomedical engineering, applying principles originally developed for aerospace structures to better understand the mechanical behavior of soft biological tissues and improve biomedical applications. For more than a decade, she has also led research and development in the technology industry. Beyond academia, Neta is the founder and CEO of AT, a nonprofit organization that empowers high school girls to pursue leadership and careers in science and technology. She has presented findings of her scientific work at leading international conferences worldwide.

EXPLORING RUTHENIUM-TRIAZOLOPYRIMIDINE COMPLEXES AS NEXT-GENERATION ANTITUMOR PRODRUGS

Iwona Łakomska[1] and Marzena Fandzloch[2]

[1]Nicolaus Copernicus University in Toruń, Poland
[2]Institute of Low Temperature and Structure Research, Poland

Abstract

Ruthenium(III) complexes are considered promising candidates for the next generation of metal-based anticancer prodrugs owing to their favorable pharmacological properties, unique mechanisms of action and the possibility of selective activation within the tumor microenvironment. Among the factors governing their biological performance, the nature of the coordinated ligands plays a crucial role in determining their stability, lipophilicity, biomolecular interactions and in vitro cytotoxic activity.

In this work, we explore a series of novel Ru(III) complexes containing substituted 1,2,4-triazolo [1,5-a]pyrimidine ligands as potential antitumor prodrugs. The complexes, with the general formulas $[RuCl_3(L)_3]$, $[RuCl_2(DMSO)_3L]$ and $[RuCl_3(L)_2(H_2O)]$, where L represents 5,7-diethyl-7-isobutyl-5-methyl-, 5,7-di-tert-butyl-, or 5,7-diphenyl-1,2,4-triazolo-[1,5-a]pyrimidine, were synthesized and comprehensively characterized using spectroscopic methods, magnetic measurements and single-crystal X-ray diffraction.

The biological potential of the complexes was evaluated against two human cancer cell lines, T47D breast carcinoma and A549 non-small-cell lung carcinoma, as well as normal murine fibroblasts (L929). Their lipophilicity was also determined to assess the influence of ligand substitution on the physicochemical properties governing cellular uptake and biological activity. Complexes containing bulky substituents, particularly those based on 5,7-diphenyl- and 5,7-di-tert-butyl-1,2,4-triazolo[1,5-a]pyrimidine, exhibited the highest in vitro cytotoxic activity, demonstrating a clear relationship between ligand structure, lipophilicity and anticancer potency. Mechanistic studies revealed intracellular generation of reactive oxygen species and interactions with DNA, albumin and apotransferrin, providing insight into their possible mode of action.

These findings demonstrate that the rational modification of triazolopyrimidine ligands offers an effective strategy for tailoring the physicochemical and biological properties of Ru(III) complexes and supports their further development as next-generation antitumor prodrugs.

Biography

Iwona Łakomska is a distinguished Polish chemist and Full Professor at the Faculty of Chemistry of Nicolaus Copernicus University in Toruń. Her research focuses on bioinorganic and coordination chemistry, particularly the synthesis, structural characterization and biological evaluation of transition-metal complexes with potential anticancer applications. She leads the Bioinorganic and Coordination Chemistry Research Group, contributing to the development of metal-based therapeutics and advanced functional materials. A graduate of Nicolaus Copernicus University in Toruń, she earned her PhD in 1996, habilitation degree in 2009 and the title of Professor of Chemical Sciences in 2018. She has held key academic positions, including Dean of the Faculty of Chemistry (2020-2024) and Director of the Academia Copernicana Interdisciplinary Doctoral School (since 2024). Her international experience includes research internships and study visits at leading European institutions. She is the author of numerous scientific publications and has received prestigious awards, including scholarships from the Foundation for Polish Science and the L'Oréal Poland for Women and Science Programme, organized in cooperation with UNESCO.

Day 2

Keynote Presentations

PRECLINICAL DEVELOPMENT OF GENE THERAPY FOR THE INHERITED NEURODEGENERATIVE DISEASE, CREATINE DEFICIENCY SYNDROME (CTD)

Balázs Sarkadi[1,3], Ágota Apáti[1], Aloise Mabondzo[2], Zsuzsa Erdei[3] and Áron Szepesi[3]

[1]HUN-REN RCNS, Hungary
[2]Paris Saclay University, France
[3]InnoCell Biotechnology Ltd Budapest, Hungary

Abstract

In this project we carry out the preclinical development of gene therapy methodologies for treating creatine transporter deficiency (CTD), an inherited childhood disease. This rare X-linked genetic disorder is caused by mutations in the SLC6A8 gene, which normally supports brain cells for creatine uptake. The lack or malfunctioning of this transporter causes developmental delay, severe intellectual disability, speech impairment and in some cases autism-like behavior or seizures. In the project we focus on demonstrating safety and efficiency of relevant gene therapy methods. Therefore, we generate human induced pluripotent stem (hiPS) cell-based 3D disease model systems, then prepare two kinds of gene therapy vectors for introducing the SLC6A8 transporter into human central nervous system (CNS) progenitor cells and organoids. We generate both recombinant adeno-associated viral (rAAV) vectors and lipid nanoparticles (LNP) for brain delivery, which have already been shown to be applicable for efficient gene therapy in heritable diseases. rAAV is the current gold standard for multiple and especially CNS-related gene therapies, some of these therapies being already in clinical applications. Since neurons do not considerably divide and proliferate, in these cells the episomal introduction of the therapeutic cDNA should provide long-term correction. LNPs are the rising stars of gene therapy, because of multiple advantages over viral gene delivery, including increased targeting possibility and less toxicity. In this project we use both transient (episomal) and stable (transposon-based) expression of the genetic constructs, providing a therapeutic correction of the missing transporter protein. *Supported by LIFE_SCIENCES_I-2025-00014.*

Biography

Balázs Sarkadi, MD, Ph.D., spent several years as a post-doc and then as a visiting scientist at major universities in the United States and Canada. He is research professor at Semmelweis University, member of the Hungarian Academy of Sciences, past president of FEBS, ICRO and ITTS, member of several international research societies including the Academia Europeae and the Royal Society of Medicine. He obtained numerous awards, including the Denis Gabor award for research application development. His research has been focusing on membrane proteins which play a major role in the multidrug resistance of cancer, in general pharmacology and in stem cell function. His recent work is related to transporters in pluripotent stem cells and in stem-cell derived differentiated tissues and organoids, the application of organoids in drug development. He has published more than 320 papers in international scientific journals, with a citation number over 25,000, with an h-index of 75. He has several international patents already in commercial applications.

EEG NEUROFEEDBACK AND INFLAMMATORY RESPONSE DURING THE IGNIS/Axiom-4 MISSION

Marcin Dornowski
University of Physical Education and Sport Gdansk, Poland

Abstract

Long-duration spaceflight is associated with physiological stress and immune dysregulation, frequently reflected by increases in inflammatory biomarkers such as C-reactive protein (CRP). Neurofeedback has been proposed as a non-pharmacological intervention capable of enhancing neurophysiological self-regulation and reducing stress-related biological responses. To explore whether EEG neurofeedback training implemented within the Neurofeedback EEG project during the IGNIS/Axiom-4 mission was associated with attenuation of inflammatory responses in astronauts. Two astronauts were assessed before and after mission completion. One participant received EEG neurofeedback training (experimental condition), while the second participant received a placebo intervention. Serum CRP concentrations were measured pre- and post-flight. Given the pilot nature of the study and the extremely limited sample size, analyses were descriptive and focused on individual response profiles. Distinct post-mission inflammatory trajectories were observed. The astronaut exposed to EEG neurofeedback demonstrated stable CRP concentrations with no clinically meaningful increase following mission completion. In contrast, the astronaut assigned to the placebo condition exhibited a post-flight elevation in CRP, indicating activation of inflammatory processes. These findings suggest that neurofeedback may have contributed to maintaining physiological homeostasis and limiting stress-related inflammatory responses during and after spaceflight exposure. Preliminary observations from the IGNIS/Axiom-4 Neurofeedback EEG project indicate that EEG neurofeedback may represent a promising countermeasure against spaceflight-associated inflammation. Preservation of stable CRP levels in the neurofeedback participant, compared with increased CRP in the placebo participant, supports the hypothesis that neurofeedback-mediated self-regulation can positively influence psychophysiological adaptation to extreme environments. Larger controlled studies are required to confirm these findings and determine the mechanisms underlying the observed effects. Keywords: EEG neurofeedback, CRP, inflammation, astronaut, space medicine, Axiom-4, IGNIS mission, psychophysiology.

Biography

Marcin Dornowski is an Associate professor in Medical and Health Sciences; Postgraduate Studies in Sport Psychology; Harvard Medical School and University of Zurich - Postgraduate Program: Clinical Trials; Investigation Program Head, Department of Sport Theory and Human Motor Performance, Faculty of Physical Culture, AWFiS Gdańsk; Chair, Medical Section of the Space Research Committee, Polish Academy of Sciences; Vice-Rector for Student Affairs and Education; Expert, Polish Space Agency; Member, Polish Astromedical Society.

UNVEILING TUMOR GROWTH CONTROL UNDER POLYMERIC MAGNETO-NANODOTS

Paulo Cesar De Morais[1,2]
[1]Catholic University of Brasilia, Brazil
[2]University of Brasilia, Brazil

Abstract

Polymeric (PLGA) nanodots has proven extremely useful for drug delivery, thanks to its high biocompatibility, biodegradability and toxicologically safe degradation products. This talk will emphasize the use of nanosized (~140 nm mean diameter) PLGA loaded with selol and maghemite nanoparticles (~9 nm mean diameter). The platform comprising selol-maghemite-loaded PLGA nanoparticles is very promising for solid tumor growth hindering in combination with magnetohyperthermia. The effectiveness of using the as-fabricated selol-maghemite-loaded PLGA nanodots (NcSel) associated with different tumor treatment protocols will be explored. One-week treatment of combined therapy comprising magnetic hyperthermia and selol-loaded nanoparticles in reduced dosages is able to hinder primary breast tumor growth in aged animal model. Moreover, different biological observations are in excellent agreement with the parameters extracted from the logistic modelling. Importantly, biocompatibility analyses revealed that the adverse effects of the treatments are negligible. Taken together, the results herein reported lead us to suggest the translation of this nanotherapeutic approach for future clinical trials. In short, the use of NcSel plus MHT as a short-term neoadjuvant therapy, for example, may represent a less costly, safe and effective alternative in cancer control in aged patients. It is also expected that the shorter treatment period will contribute to the adherence of cancer patients.

Biography

Paulo Cesar De Morais (H63), PhD, full Professor of Physics at the University of Brasilia (UnB) - Brazil up to 2013. Appointed as UnB's (Brazil) Emeritus Professor (2014); Visiting Professor at the Huazhong University of Science and Technology (HUST) - China (2012-2015); Distinguished Professor at the Anhui University (AHU) - China (2016-2019); Full Professor at the Catholic University of Brasília - Brazil since 2018; 2007 Master Research Prize from UnB. He held two-years (1987-1988) position with Bell Communications Research, New Jersey - USA. Doctoral degree in Solid State Physics (1986) from the Federal University of Minas Gerais - Brazil. With more than 15,000 citations, He has published more than 500 papers (Web of Science), presented about 300 international invited talks (35 countries) and filed 18 patents. He has appeared in recent World ranking of top scientists, such as 2020-Stanford, 2022-Research.com, 2023-AD Scientific Index, 2023-Research.com, 2024-Elsevier, ONE Research Community, 2025-AD Scientific Index, 2025-Research.com, 2025-Stanford-Elsevier and 2026-Research.com.

Day 2

Oral Presentations

SUSTAINABLE BIOMANUFACTURING OF THE THERAPEUTIC PEPTIDE LL-37 USING TRANSGENIC BARLEY

Lenka Dzurová[1], Edita Holásková[1], Jiří Milek[2], Jitka Frébortová[1] and Ivo Frébort[1]

[1]Palacký University, Czech Republic
[2]ÚSOVSKO AGRO s.r.o., Czech Republic

Abstract

The increasing prevalence of antibiotic-resistant pathogens has created an urgent need for alternative antimicrobial strategies. Antimicrobial peptides (AMPs) are promising candidates due to their broad-spectrum activity and low propensity to induce resistance. Among them, the human cathelicidin LL-37 possesses both antimicrobial and immunomodulatory properties, making it attractive for applications in human and veterinary medicine as well as in cosmetics. However, widespread utilization of LL-37 is limited by the cost of large-scale production.

Using a patented grain-targeted expression technology (EP3684936; CATRIN and ÚSOVSKO), we developed transgenic barley plants producing biologically active LL-37 in seeds. The peptide is expressed as a fusion protein with maltose-binding protein (MBP), incorporating a cleavable linker and an endoplasmic reticulum retention signal to enhance accumulation and stability. Functional analyses confirmed that the recombinant LL-37 retains biological activity. Importantly, the fusion protein MBP_rhLL-37 may be suitable for topical applications without prior enzymatic processing, as common skin proteases can cleave the fusion domains and release the active peptide.

In parallel, the residual barley biomass generated after peptide extraction is being evaluated as a substrate for biogas production. This approach enables the integration of therapeutic peptide manufacturing with renewable energy generation, minimizing waste and increasing the overall value of the production process.

The presented platform demonstrates the potential of plant molecular farming to provide cost-effective production of antimicrobial peptides while supporting circular bioeconomy principles through biomass valorization and energy recovery.

Biography

Lenka Dzurová, is a researcher and lecturer at the Czech Advanced Technology and Research Institute (CATRIN), Palacký University Olomouc, Czech Republic. She obtained her Ph.D. in Biophysics and has broad expertise in molecular biology, biochemistry, enzymology, protein crystallization and microbiology. During her scientific training, she completed research stays at several leading European institutions, including universities in Italy, France and Germany. Her current research focuses on plant biotechnology, recombinant protein production and the development of sustainable biotechnological approaches for biomedical applications. Following a maternity-related career interruption, she successfully re-established her independent research activities, securing competitive research funding, publishing in peer-reviewed journals, presenting at international conferences and supervising students. Her work has resulted in scientific publications, intellectual property outputs and technologies with potential practical applications.

SEXUAL DIMORPHISM AS A TOOL FOR EVOLUTIONARY PREDICTION AND CONTROL

Sapunov Valentin B
Medical and Social Institution, Russia

Abstract

The division of species into males and females accelerated the pace of evolution. The theory of this process was developed by Russian scientist V. Geodakyan. Based on this theory, it is possible and carried out to make evolutionary forecasts and solve problems in the field of medicine. The ontogenetic rule of sexual dimorphism states: in individual development, female characteristics are formed first, then male ones. The phylogenetic rule of sexual dimorphism states: new characters are first formed in males, then transferred to females. Traits that are more characteristic of males are evolutionarily progressive. Traits that are more characteristic of females are evolutionarily regressive. The division of species into males and females accelerated progress by allowing genetic recombination and division of functions in the species' survival system. Significant sexual dimorphism of primates ensured a high rate of evolution and the emergence of humans as a socio-biological being. Species with low sexual dimorphism are evolutionarily conservative. In humans, men are on average larger than women. Therefore, the height of people in history has increased. This became especially noticeable in the 20th - 21st centuries, when artificial electromagnetic fields allegedly began to influence growth. The medical consequences of the accidents in Chernobyl and Fukushima first affected the genetic apparatus of men and later of women. These rules make it possible to predict the dynamics of infectious diseases such as AIDS and COVID. In recent years, the number of women among patients has increased. This means that these infections are on the decline. A socio-biological approach to the dynamics of microevolution and morbidity, based on the analysis of sexual dimorphism and sex ratio, can be an important tool for medical and biological forecasts.

Biography

Sapunov Valentin was burn 1953. Education: Leningrad State University, Biological Faculty (1975), Faculty of Applied Mathematics (1987). Academic qualification: Ph.D of Genetics (1980), Dr. Sci of Biological Physics (1990). Took part in 55 international meetings. Member of Peter Academy of Sciences and Arts, New York Academy of Sciences. Emeritus member of European Geosciences Union. Founder of physiological genetics of microevolution as branch of biology. Founder of social biology as science on interaction of social and biological compounds of humanity. Professor of Medical and social Institute, St. Petersburg.

Day 2

Poster Presentations

POLYPHENOL-INDUCED STRUCTURAL MODIFICATIONS OF POTATO STARCH AND ITS EFFECT ON ENZYME INHIBITION AND DIGESTIBILITY

Ankita Nath and Ravi Kant Avvari
National Institute of Technology Rourkela, India

Abstract

Dietary polyphenols are emerging as promising nutraceuticals for regulating postprandial hyperglycemia by modulating starch digestion and glucose absorption. This study investigated the inhibitory effects of naturally occurring polyphenols - tannic acid (TA) and gallic acid (GA)- towards potato starch digestion from the perspective of starch-polyphenol and enzyme-polyphenol interactions. Native potato starch was complexed with each polyphenol and characterized using X-ray Diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM). Enzyme inhibition kinetics against α-amylase and α-glucosidase, along with the digestion kinetics of the starch-polyphenol complexes, were also evaluated. Structural characterization revealed distinct interaction patterns between starch and polyphenols. TA and GA primarily altered the surface morphology of starch granules. They interacted with the helical regions of starch through strong secondary bonding interactions, leading to more stable starch-polyphenol complexes. Enzyme inhibition studies demonstrated pronounced suppression of both α-amylase and α-glucosidase activities. The IC_{50} values against α-amylase and α-glucosidase were more than 0.6 mg/mL for both GA and TA. Kinetic analyses revealed that TA and GA acted predominantly as competitive inhibitors for the α-amylase and α-glucosidase enzymes. Digestion studies of the starch-polyphenol complexes demonstrated a significant reduction in starch hydrolysis and glucose release compared with starch treated with free polyphenols, indicating that complex formation enhances the resistance of starch to enzymatic degradation. The incorporation of polyphenols within the starch matrix modifies the structural organization of starch, thereby limiting enzyme accessibility to glycosidic linkages and slowing substrate hydrolysis. These results suggest that the nature and strength of starch-polyphenol interactions play a critical role in regulating digestion kinetics and glycemic response. Among the polyphenols investigated, TA and GA exhibited pronounced reduction in starch digestibility, highlighting their potential for developing low-glycemic starch-based functional foods and nutraceutical formulations for dietary management of diabetes.

Biography

Ankita Nath is a research scholar in the Department of Biotechnology and Medical Engineering at the National Institute of Technology Rourkela, Odisha, India, where her work focuses on starch digestion and its implications for diabetes management. Her research lies at the intersection of food chemistry, nutritional biochemistry and metabolic health, with a particular emphasis on understanding the enzymatic kinetics of starch hydrolysis and its modulation by dietary polyphenols. She is actively engaged in developing in vitro digestion models and mathematical frameworks to predict glycemic responses, contributing to the design of functional foods with improved metabolic outcomes.

MOLECULAR FEATURES OF LIQUID BIOPSY USING NGS: KEY TECHNICAL AND STATISTICAL NOTES IN REAL LABORATORY PRACTICE

Yulia Naumova, A Shikeeva, R Bikanov and N Isaeva
First Genetics JSC, Russia

Abstract

Background: Liquid biopsy (LB) using next-generation sequencing (NGS) has emerged as a transformative tool in oncology, offering a non-invasive method to detect genetic alterations using circulating tumor nucleic acid (ctNA). While early clinical trials reported high sensitivity, specificity and concordance with tissue biopsy, technical parameters assessment is very important in reliability and clinical implication.

Methods: We conducted prospective analysis of patients with advanced solid tumors who underwent NGS-based liquid biopsy (ctNA). Nucleic acids were isolated using the MagMAX™ Cell-Free DNA Isolation Kit according to the manufacturer's protocol. Nucleic acid concentrations were assessed using a Qubit 2.0 fluorometer and NA quality was assessed using the RIN score using the 2200 TapeStation gel electrophoresis system. For library preparation we used Oncomine™ Pan-Cancer Cell-Free Assay (52gene). Sequencing was performed on the Ion GeneStudio™ S5 System. The obtained results were analyzed using Torrent Suit and Ion Reporter software.

Results: Among 62 patients analyzed, mutations were identified in 66% of cases. Of this number, 32% of patients have one finding, 16% - 2 findings, 5% - 3 findings, 10% - 4 findings. There were also two cases with 5 and 6 finding. Median turnaround time was 20 days. Treatment options were found in 15% of cases based on LB findings.

According the mutation type, 71 Single Nucleotide Variant and 10 Copy Number Variation mutations were found. Gene fusions were not found.
Across all findings Median concentrations of ctNA were 2.3 ng/μL (ranged from 0,15 to 14,2 ng/μL).
QC metrics were also assessed. Median quantity of reads was 14293363 (ranged from 3340186 to 61856657). Median on target reads were 90%.

Conclusion: Clear technical recommendations and bioinformatic QC data allows to make liquid biopsy more applicable and common in different types of cancer.

Biography

Yulia Naumova graduated from Moscow State University with a degree in Bioengineering and Bioinformatics in 2023. Since 2018, she has been engaged in scientific research in various fields of molecular biology. Until 2022, she was engaged in the creation of G-quadruplex aptamers to thrombin and prothrombin, which can regulate blood clotting, as well as the creation of antidotes for them. Since 2022, her scientific interests have shifted to NGS and specifically to the use of NGS in oncology.

NEW ANTIOXIDANT TRIPHENOL-DERIVED HYDRAZIDE-HYDRAZONE THIAZOLE: FORMATION AND ANALYSIS OF INCLUSION COMPLEX WITH β-CD USING EXPERIMENTAL AND COMPUTATIONAL APPROACHES

Adrian Pîrnău[1], Mihaela Mic[1], Călin G. Floare[1], Ovidiu Oniga[2], Smaranda Dafina Oniga[2], Ovidiu Crisan[2], Laurian Vlase[2] and Gabriel Marc[2]

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, Romania
[2]Iuliu Haţieganu University of Medicine and Pharmacy, Romania

Abstract

A new water-soluble not-colored antioxidant (Z)-N'-(4-(3,4-dihydroxyphenyl)- 3-ethylthiazol-2(3H)-ylidene)-4-hydroxybenzohydrazide hydrochloride (DHTH) was obtained and characterized. The interaction between DHTH and β-CD was studied by experimental thermodynamic methods such as isothermal titration calorimetry (ITC) and 1H NMR spectroscopy and confirmed by in silico calculations. Thermodynamic data indicated that the inclusion process is driven by enthalpy, predominantly as a result of the guest-host hydrophobic interactions. 1H NMR measurements were applied to study the interaction with β-CD by changing the studied compound concentration in the solution. UV-vis titration and in vitro antiradical assay were performed, to study the antioxidant activity of DHTH, free and included in β-CD. A molecular docking study added supplementary insight to the experimental analyses regarding the binding conformation of the new polyphenolic compound to β-CD.

Biography

Adrian Pirnau is Ph.D in Physics from Babes Bolyai Cluj-Napoca in 2007. Major accomplishments: NMR spectroscopy on liquids; modern techniques of NMR relaxometry and diffusometry, the study of bioligand - macromolecule intermolecular interactions, investigated by spectroscopic techniques; characterization of molecular systems by ^{1}H NMR.

INVESTIGATION OF THE INCLUSION COMPLEX FORMATION BETWEEN A VANILLIN-THIAZOLIDINE-2,4-DIONE-DERIVED ANTIOXIDANT AND β-CYCLODEXTRIN BY NMR, ITC, SPECTROPHOTOMETRY, CONDUCTOMETRY AND MOLECULAR DOCKING

Mihaela Mic[1], Adrian Pîrnău[1], Călin G Floare[1], Maria O. Miclăuș[1], Ana Ștefănescu[2], Gabriel Marc[2], Laurian Vlase[2], Ovidiu Oniga[2], Smaranda Oniga[2] and Ovidiu Crișan[2]

[1]National Institute for Research and Development of Isotopic and Molecular Technologies, Romania
[2]Iuliu Hațieganu University of Medicine and Pharmacy, Romania

Abstract

A new antioxidant vanillin-thiazolidine-2,4-dione derivative bearing a tertiary amine (VTTA) as hydrochloride salt was obtained, characterized and confirmed using spectral methods and single-crystal X-ray diffraction. The objective of the current research was to evaluate the inclusion of VTTA in β-cyclodextrin (β-CD) at molecular scale with multiple methods (nuclear magnetic resonance, isothermal titration calorimetry, conductometry, spectrophotometry and molecular docking) and was assessed the antioxidant activity of VTTA and VTTA:β-CD complex.

From the results of the isothermal titration calorimetry were identified the thermodynamic descriptors of the inclusion, suggesting the process is both enthalpy- and entropy-driven, where the hydrophobic interactions play a predominant role in the formation the complex. 1H NMR data confirmed the equimolecular inclusion in water. Two-dimensional NMR analysis provided insight into the positioning of the benzene of VTTA within β-CD. Conductometry titration confirmed the equimolecular formation complex. The CUPRAC assay indicated that the complexation of VTTA with β-CD does not reduce the antioxidant activity of the title compound.

Acknowledgements: This work was supported through the "Nucleu" Program within the National Research Development and Innovation Plan 2022–2027, Romania, carried out with the support of MEC, project no. 27N/03.01.2023, component project code PN 23 24 01 05.

Biography

Mihaela Mic is Ph.D in Physics from Babes Bolyai Cluj-Napoca in 2007. Major accomplishments: characterization of the bioligand-macromolecule complexes; Isothermal Titration Calorimetry (ITC); molecular recognition processes; characterization of the stimuli-responsive polymeric nanoparticles; characterization of inclusion complexes based on cyclodextrins.

ENGINEERING WATER-STABLE HA-PDA HYDROGELS THROUGH CONTROLLED DOPAMINE POLYMERIZATION

Maria O. Miclăuș, Xenia Filip, Iulia Varga, Ana Maria Raluca Gherman, Irina Kacso, Ioana Grosu and Claudiu Filip

National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

Abstract

Hyaluronic acid (HA)-based hydrogels are extensively employed in regenerative medicine, wound healing and tissue engineering owing to their excellent biocompatibility and hydration capacity. However, their limited mechanical stability and rapid degradation in aqueous environments remain major challenges that restrict their long-term biomedical performance. In this work, a systematic experimental study was conducted to identify the synthesis conditions leading to the formation of water-stable HA-polydopamine (PDA) hydrogels prepared directly from native HA through in situ dopamine polymerization.

Hydrogels were synthesized by varying the molecular weight of HA (15-2200 kDa), oxidation pathway ($NaIO_4$ or $KMnO_4$) and reaction medium (PBS, pH 5, or TRIS, pH 8.5), while maintaining comparable precursor compositions. Hydrogel formation was initially assessed by the inverted-vial test and subsequently by evaluating the retention of structural integrity after 24 h immersion in water. Representative hydrogels were further characterized by solid-state NMR and scanning electron microscopy (SEM).

The results demonstrate that hydrogel formation is strongly governed by the combined influence of HA molecular weight, oxidation pathway and reaction medium. Increasing HA molecular weight significantly enhanced gel consistency and water stability, whereas the choice of oxidant and pH affected both dopamine polymerization and the resulting hydrogel morphology. Solid-state NMR confirmed the formation of PDA within the hydrogel network, while SEM revealed distinct porous architectures depending on the synthesis conditions. The systematic correlation between synthesis parameters and hydrogel stability enabled the identification of favorable experimental conditions for obtaining structurally stable HA-PDA hydrogels.

These findings provide practical design guidelines for the preparation of water-stable HA-PDA hydrogels and highlight the potential of controlled dopamine polymerization as a versatile strategy for developing advanced HA-based biomaterials.

Biography

Maria O. Miclăuș is a Research Scientist at the National Institute for Research and Development of Isotopic and Molecular Technologies (INCDTIM), Cluj-Napoca, Romania. She received her Ph.D. in Physics from Babeș-Bolyai University. Her research focuses on crystal engineering, supramolecular chemistry and advanced functional materials, with recent interests in polymer-based biomaterials for biomedical applications. She combines crystallization, solid-state characterization and physicochemical analysis to investigate structure-property relationships in molecular and polymeric systems. She has participated in several national and international research projects and has authored numerous scientific publications.

HA-DA SUPRAMOLECULAR CONJUGATES AS PRECURSORS FOR STABLE HA-PDA HYDROGELS

Ioana Grosu, Maria Miclăuș, Iulia Varga, Xenia Filip, Andrea Simion, Ana Maria Raluca Gherman, Flavia Martin, Irina Kasco and Claudiu Filip
National Institute for Research and Development of Isotopic and Molecular Technologies, Romania

Abstract

The incorporation of catechol-containing compounds into hyaluronic acid (HA)-based biomaterials has emerged as an attractive strategy for improving hydrogel stability while preserving the intrinsic biocompatibility of HA. Building upon our previous demonstration that dopamine (DA) forms stable supramolecular conjugates with HA through predominantly non-covalent interactions, this work investigates the use of these assemblies as precursors for the preparation of HA-polydopamine (PDA) hydrogels.

HA-DA conjugates were subjected to controlled dopamine polymerization using different oxidation pathways, either in the absence or presence of additional dopamine. The influence of oxidizing agent and reaction medium on hydrogel formation was systematically evaluated. Macroscopic gel formation was assessed visually, while representative hydrogels were characterized by differential scanning calorimetry (DSC), solid-state NMR and scanning electron microscopy (SEM) to establish correlations between synthesis conditions, molecular organization and morphology.

The results show that preformed HA-DA conjugates readily support the formation of HA-PDA hydrogels without requiring chemical cross-linking. The oxidation conditions significantly influenced the physicochemical properties of the resulting hydrogels, affecting their thermal behavior, molecular organization and microstructure. Solid-state NMR confirmed the coexistence of HA and PDA structural motifs within the hydrogel network, while SEM observations revealed characteristic changes in pore organization and surface morphology depending on the oxidation pathway. Collectively, these results demonstrate that supramolecular HA-DA conjugates provide a versatile platform for generating structurally stable HA-PDA hydrogels under mild aqueous conditions.

The proposed strategy offers a simple and biocompatible route toward multifunctional HA-based hydrogels and further expands the potential of dopamine-derived supramolecular systems for biomedical applications.

Biography

Ioana-Georgeta Grosu obtained her Ph.D. in Chemistry in 2011 through a joint doctoral program between Babeș-Bolyai University, Cluj-Napoca, Romania and Leipzig University, Germany. She is currently a Scientific Researcher II at the National Institute for Research and Development of Isotopic and Molecular Technologies (INCDTIM), Cluj-Napoca. Her research interests include the synthesis and characterization of functional polymeric materials, supramolecular assemblies and polydopamine-based systems for biomedical applications. Her recent studies focus on hyaluronic acid-dopamine conjugates, polydopamine-mediated hydrogel formation and multifunctional biomaterials for biomedical and regenerative medicine applications. She employs complementary structural and physicochemical characterization techniques, including solid-state NMR, thermal analysis and electron microscopy, to investigate the relationship between molecular organization, supramolecular interactions and material performance.

A CASE OF REPORT LATE-ONSET BIOTINIDASE DEFICIENCY PRESENTING AS NEUROMYELITIS OPTICA SPECTRUM DISORDER

Tamara Kuptsova[1], GO Bronin[2,3], NV Bronina[1] and VS Lobanova[1]

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[2]International Academic Hub for Childhood Cancer, Uzbekistan
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Abstract

Biotinidase deficiency (BD) is a metabolic disorder characterized by decreased activity of the biotinidase enzyme. Individuals with untreated profound BD may develop diverse symptoms at any age, including refractory epilepsy, developmental delay, ataxia, dermatological manifestations, optic atrophy, hearing loss and myelopathy, among others.

We report a 12-year-old boy with late-onset BD, who presented with limb weakness and optic atrophy. Neuroimaging initially revealed transverse myelitis of the cervical and lumbar spinal cord, leading to a misdiagnosis of neuromyelitis optica spectrum disorder (NMOSD). Following pulse steroid therapy, plasma exchange and immunoglobulin administration, the patient showed partial clinical improvement.

However, the patient's condition subsequently deteriorated, progressing to tetraparesis and respiratory failure. Subsequent neuroimaging revealed new structural changes in the brain, characterized by FLAIR hyperintensities in the posterior medulla, pons, tectum, bilateral medial thalami, periventricular and parahippocampal regions and optic chiasm/tracts. These lesions demonstrated diffusion restriction (high DWI, low ADC) and no post-contrast enhancement.

Despite aggressive immunomodulatory therapy, including rituximab, cyclophosphamide, hematopoietic stem cell transplantation and satralizumab, the patient's condition progressively worsened.

Due to therapeutic resistance, whole exome sequencing (WES) was performed, revealing three pathogenic variants in the BTD gene: c.1270G > C (p.Asp424His); c.38_44delinsTCC (p.Cys13Phefs*36); and c.571C > T (p.Arg191Cys). Sanger sequencing confirmed the mother as a carrier of the c.38_44delinsTCC (p.Cys13Phefs*36) variant. The other two variants were found in *cis* configuration and inherited from the father. The older sibling, who was asymptomatic, carried the same three variants as the proband. Enzyme activity in the proband's blood sample was profoundly decreased, approaching zero.

Biotin supplementation led to a significant improvement in the patient's condition. Family screening identified an asymptomatic member, who is also currently receiving treatment.

Conclusion: Biotinidase deficiency should be considered in the differential diagnosis of neuromyelitis optica spectrum disorder and multiple sclerosis. Early diagnosis is crucial for reducing or preventing the severity of symptoms.

Biography

Tamara Kuptsova graduated from the Russian Medical Academy of Continuing Professional Education in 2021 with a degree in medical genetics. She completed her recidency training at the Research Centre for Medical Genetics in Moscow. Her scientific interests include hereditary metabolic diseases, syndromic hereditary pathology, clinical phenotyping of genetic syndromes. She currently works as a clinical geneticist in Morozov Children's City Clinical Hospital. Also she teaches residents at theirs clinical training programs to gain experience diagnosing and treating patients with the full spectrum of genetic diseases. She presents at conferences on medical genetics, neonatology and neurology. She actively attends continuing education courses in various areas of medical genetics, including hereditary diseases involving liver pathology, neonatal screening and disorders of sex development.

THANATOPHORIC DYSPLASIA TYPE I: PRENATAL ULTRASOUND FINDINGS *vs* POSTNATAL GENETIC VERIFICATION

Vera A Larionova and V S Lobanova
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Abstract

Thanatophoric dysplasia type I (TD) is the most common lethal skeletal dysplasia caused by de novo FGFR3 mutations. The prevalence is 0.24-0.69 per 10,000 births. TD-I accounts for approximately 80% of cases and is characterized by a "telephone receiver" deformity of the femurs, frontal bossing and midface hypoplasia. Lethality is primarily attributed to pulmonary hypoplasia, a constricted thoracic cage and brainstem compression. Survival beyond the neonatal period is extremely rare.

We present a case of a male newborn born to a 35-year-old mother from non-consanguineous marriage. Prenatal ultrasound at 24 weeks revealed shortening of the tubular bones below the 3rd percentile, curved hips and shoulders, narrow chest, macrocephaly. Amniocyte whole-genome sequencing (WGS) was performed, however, no pathogenic variants were found. The family decided to keep the pregnancy. A live male infant was delivered at 38 weeks of gestation. The APGAR score were 5/7. Birth weight was 3000 g, body length was 37 cm, head circumference was 36.5 cm. Clinical examination at birth revealed Macrocephaly, a cloverleaf skull, a depressed nasal bridge, a narrow thoracic cage, micromelia and curvature of the legs. Postnatal whole-exome sequencing (WES) identified a heterozygous pathogenic de novo variant in the FGFR3 gene: c.742C>T (p. Arg248Cys), confirming the diagnosis of TD-I.

The patient's neonatal course was severe and unstable, characterized by pronounced neurological irritability and desynchronization with mechanical ventilation. The clinical severity was driven by respiratory failure and moderate heart failure secondary to thoracic organ compression (thoracic circumference was below the 3rd percentile, corresponding to a gestational age of 34 weeks). Following a multidisciplinary consensus, the infant was transitioned to palliative care.

Conclusion: TD-I is a lethal skeletal dysplasia associated with extremely high neonatal mortality. Prenatal ultrasonography is a highly effective tool for identifying characteristic phenotypic features. Pathognomonic sonographic findings (long bone shortening <3rd percentile, "telephone receiver" femoral deformity and a narrow thorax) are quite specific for TD-I, enabling a presumptive diagnosis even in the absence of initial genetic confirmation. A negative prenatal WGS result does not rule out the diagnosis when a pathognomonic clinical phenotype is present, highlighting the necessity of postnatal genetic re-evaluation.

Biography

Vera Larionova graduated from Medicine of the Future faculty of I. M. Sechenov First Moscow State Medical University in 2022. She completed her residency at Research Centre for Medical Genetics (RCMG) in 2025 with a degree in Medical Genetics. Her scientific area of interest includes hereditary syndromes, hereditary pathology and neuromuscular diseases. She is working as a genetic consultant in Morozov Children's City Clinical Hospital, Moscow and its Neonatal Screening Center. She performs at conferences on medical genetics, neonatology and neurology.

Day 2

Video Presentations

THEORETICAL BASIS OF PRIMARY AND SECONDARY HEALING IN PERIPHERAL NERVE INJURY: BASED ON SCHWANN CELL PHENOTYPIC SWITCHING

Bo He and Zhaowei Zhu

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Abstract

Background: Peripheral nerve regeneration is a complex, highly regulated biological process in which Schwann cells (SCs) serve as the principal facilitators of repair. While previous studies have described a single "Büngner cell" phenotype representing repair-type SCs, our prior work revealed that reprogrammed SCs actually comprise at least two distinct subtypes, He SCs and Zhu SCs. However, the precise relationships and lineage connections among these SC populations remain unclear.

Objective: This study aims to establish a modified classification system for repair SCs and to delineate their phenotypic transformation trajectories during peripheral nerve regeneration.

Methods: Single-cell RNA-sequencing datasets (GSE216665, GSE280857 and GSE153762) were obtained from the Gene Expression Omnibus (GEO). After quality control, preprocessing and reannotation, SCs were subdivided into distinct subclusters. Dynamic changes during dedifferentiation were analyzed using Slingshot, Monocle and RNA velocity to infer cellular trajectories, transformation dynamics and lineage relationships.

Results: Runx2 was identified as a pivotal transcriptional regulator initiating SC phenotypic conversion and differentiating Zhu SCs from, He SCs. Trajectory analyses revealed two distinct reprogramming modes: a proliferative transformation pathway and a direct transformation pathway. Furthermore, aging-induced Wallerian-like degeneration produced a subset of xrSCs-like cells characterized by low *Jun* and *Egr2* expression but high *Runx2* expression.

Conclusion: During Wallerian degeneration, Zhu1 SCs represent a central dedifferentiated phenotype in an energetically unstable state. Once activated, these cells contribute to nerve repair through either primary or secondary healing processes. This refined classification of repair SCs provides new insight into the cellular heterogeneity and dynamic transitions underlying peripheral nerve regeneration.

Biography

Bo He, M.D. is currently an Associate Professor in Microsurgery and Traumatic Orthopedics. He previously conducted postdoctoral research at Stanford University. Since 2005, he started peripheral nerve clinic and related basic research. His clinical expertise covers the repair and reconstruction of peripheral nerve injuries, the treatment of pelvic and limb fractures and various corrective surgeries for bone and soft tissue deformities. He holds clinical research certification from the U.S. National Institutes of Health (NIH) and initiated the first multicenter clinical trial on acellular allogeneic nerves in CHINA, confirming their safety and efficacy. He also developed the first clinical guideline for the cryopreservation of vascularized composite tissues, with the related study featured as a cover article in the *Journal of Tissue Engineering and Regenerative Medicine*. Additionally, he served as the editor of a special issue entitled "The Function of Schwann Cells in the Peripheral Nervous System" (ISSN: 1664-8714) and has published dozens of papers in high-level journals such as *Cellular & Molecular Biology Letters, Biomaterials, Molecular Medicine, Plastic and Reconstructive Surgery, Annals of Biomedical Engineering, Neural Regeneration Research* and *Frontiers in Cellular Neuroscience*. He currently serves as an editorial board member of the *Chinese Journal of Microsurgery* and is also a reviewer for The *British Medical Journal(The BMJ), Biomedical Materials* and *the European Journal of Neuroscience.*

REFRAMING ACCESS TO ADVANCED THERAPY MEDICINAL PRODUCTS (ATMPs) IN EUROPE: A PATIENT-CENTERED CALL TO ACTION FOR POLICY AND SYSTEMIC REFORM

Mariano Votta[1,2]

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Abstract

Advanced Therapy Medicinal Products (ATMPs) offer groundbreaking potential to cure or transform the clinical trajectory of rare and severe diseases. Despite their promise, access to these one-shot, high-cost therapies remains uneven across Europe, often hindered by budget constraints, regulatory fragmentation and inadequate health literacy. This article builds upon a multi-stakeholder "Call to Action" led by Active Citizenship Network (ACN) and its partners, advocating for a systemic shift in how ATMPs are regulated, financed and accessed. We present the methodology underpinning this civic initiative, discuss the ethical and economic imperatives it addresses and explore its proposed paradigm shift: from viewing ATMP-related spending as current expenditure to classifying it as capital investment. Through comparative policy analysis and stakeholder engagement, this work aims to inform a sustainable, equitable framework for ATMP integration in European healthcare systems.

Biography

Mariano Votta is responsible for EU Affairs at the Italian NGO Cittadinanzattiva and Director of its EU branch "Active Citizenship Network". Passionate about health & consumer issues, Mariano has 25 years of experience in advocacy, stakeholder engagement, communication, European Public Affairs & EU funded-projects. Mariano holds a Degree in Political Science and two post-graduate master's degrees in European Public Relations and Corporate Social Responsibility. He is also a journalist with more than 50 publications in international peer-reviewed journals. He led the political initiative to launch in 2015 at the EU Parliament the Interest Group "EU Patients' Rights & Cross-Border Healthcare," - now at its third mandate - endorsed by more than 100 organisations across Europe and dozens of Members of the European Parliament. In 2016 Mariano won the Efhre International University Excellence Awards on patients' rights.

QUANTITATIVE ASSESSMENT OF MYOCARDIAL PERFUSION USING DYNAMIC COMPUTED TOMOGRAPHY IMAGING AND MACHINE LEARNING

Mohammed Owahidur Rahman[1,3], Piotr Augustyniak[1] and Elzbieta Olejarczyk[2,3]

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Abstract

Myocardial ischemia can be assessed using invasive and noninvasive imaging techniques, each with varying sensitivity and utility. Dynamic myocardial computed tomography perfusion (CTP) imaging has emerged as a promising noninvasive approach, enabling quantitative assessment of myocardial blood flow (CT-MBF). However, the reliability and optimal analysis strategies of CTP-derived parameters remain unvalidated.

This study evaluated machine learning for classifying normal, ischemic and infarcted myocardial conditions using CT-MBF from dynamic CTP at different temporal sampling rates (1RR, 2RR, 3RR and 4RR), with emphasis on assessing myocardial ischemia from a clinical perspective.

Global CT-MBF data for normal, ischemic and infarcted conditions corresponding to 1RR, 2RR, 3RR and 4RR sampling were obtained from a publicly available dataset. An ensemble RUSBoosted Tree classifier, combining random under-sampling with AdaBoost, labeled class imbalance and improved minority class detection. A 5-fold cross-validation strategy ensured model robustness and avoided overfitting. Performance was evaluated using ROC analysis and contingency table metrics, including sensitivity, specificity, PPV and NPV.

The optimized RUSBoost model demonstrated strong classification performance across all sampling strategies. ROC analysis indicated good discriminative ability among normal, ischemic and infarcted groups. Infarcted myocardium was identified with a sensitivity of 68.5%, while ischemic cases achieved a PPV of 55.9%. Abnormal cases showed a TPR of 73% and PPV of 79%. Performance metrics varied across sampling intervals, with higher temporal resolutions improving diagnostic accuracy.

Machine learning-based analysis of CT-MBF from dynamic CTP imaging shows significant potential for quantitative assessment of myocardial perfusion. The RUSBoosted ensemble method effectively handles class imbalance and enhances diagnostic performance. These findings support integrating machine learning into clinical workflows for improved detection of myocardial ischemia and infarction.

Biography

Mohammed Owahidur Rahman currently pursuing his Ph.D. in Biomedical Engineering at AGH University of Krakow, Krakow, Poland. His research interests include cardiac signal processing, optics and microwave application in medicine and machine learning applications in cardiovascular diagnostics.

SILENT CNS NEOPLASMS REVEALED AT AUTOPSY: NEUROIMAGING AND CLINICOPATHOLOGICAL LESSONS FROM INCIDENTAL MENINGIOMA AND EXTRAMEDULLARY MULTIPLE MYELOMA

Jayeshkumar Kanani
Surat Municipal Institute of Medical Education and Research, India

Abstract

Background: Clinically occult central nervous system (CNS) neoplasms may present with nonspecific symptoms or remain undiagnosed until advanced disease or death. Autopsy provides an opportunity to identify unexpected pathology and evaluate clinicoradiological-pathological correlations.

Case-based Presentation: We describe two unrelated autopsy cases illustrating different challenges in the recognition of CNS neoplastic disease. The first involved a young woman with chronic headache who died following complications of malaria and septicemia. No focal neurological deficits were documented during life; however, autopsy revealed an undiagnosed intracranial meningioma. The second involved a middle-aged immunocompromised male with pathological fractures and progressive neurological symptoms. Clinical and radiological evaluation suggested advanced malignancy, while autopsy demonstrated extensive extramedullary multiple myeloma with CNS involvement, including lytic skull lesions and dural-based masses producing cerebral compression.

Discussion: These cases demonstrate how CNS neoplasms may remain clinically occult and highlight the complementary value of clinical assessment, neuroimaging and postmortem examination in establishing the full extent of disease. The findings emphasize the importance of appropriate neuroimaging in persistent or unexplained neurological symptoms and careful evaluation of CNS involvement in patients with systemic malignancy.

Conclusion: Autopsy-based clinicopathological correlation can reveal otherwise unrecognized CNS pathology and provide important lessons for earlier diagnosis, imaging assessment and multidisciplinary neurological care.

Biography

Jayeshkumar Kanani has over 14 years of experience including 8 years of experience in the field of forensic medicine and Toxicology. Appointed in 2016 as an autopsy medical officer, he has conducted over 4,000 autopsies, providing invaluable medico-legal expertise in death investigations. His expertise extends to histopathological studies, scientific writing, court testimonies and mentoring students in forensic medicine. Kanani has published many peer-reviewed papers in international journals such as Elsevier, BMC and SpringerNature, with most as the first author. He has demonstrated exceptional skill in managing the publication process and successfully publishing articles with tight deadlines. His research interests include general medicine, forensic medicine, Toxicology, Surgery, Cardiology, Pathology, Oncology and Neurology. He is passionate about contributing to the academic and professional community and welcomes opportunities to collaborate on research and editorial endeavours.

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