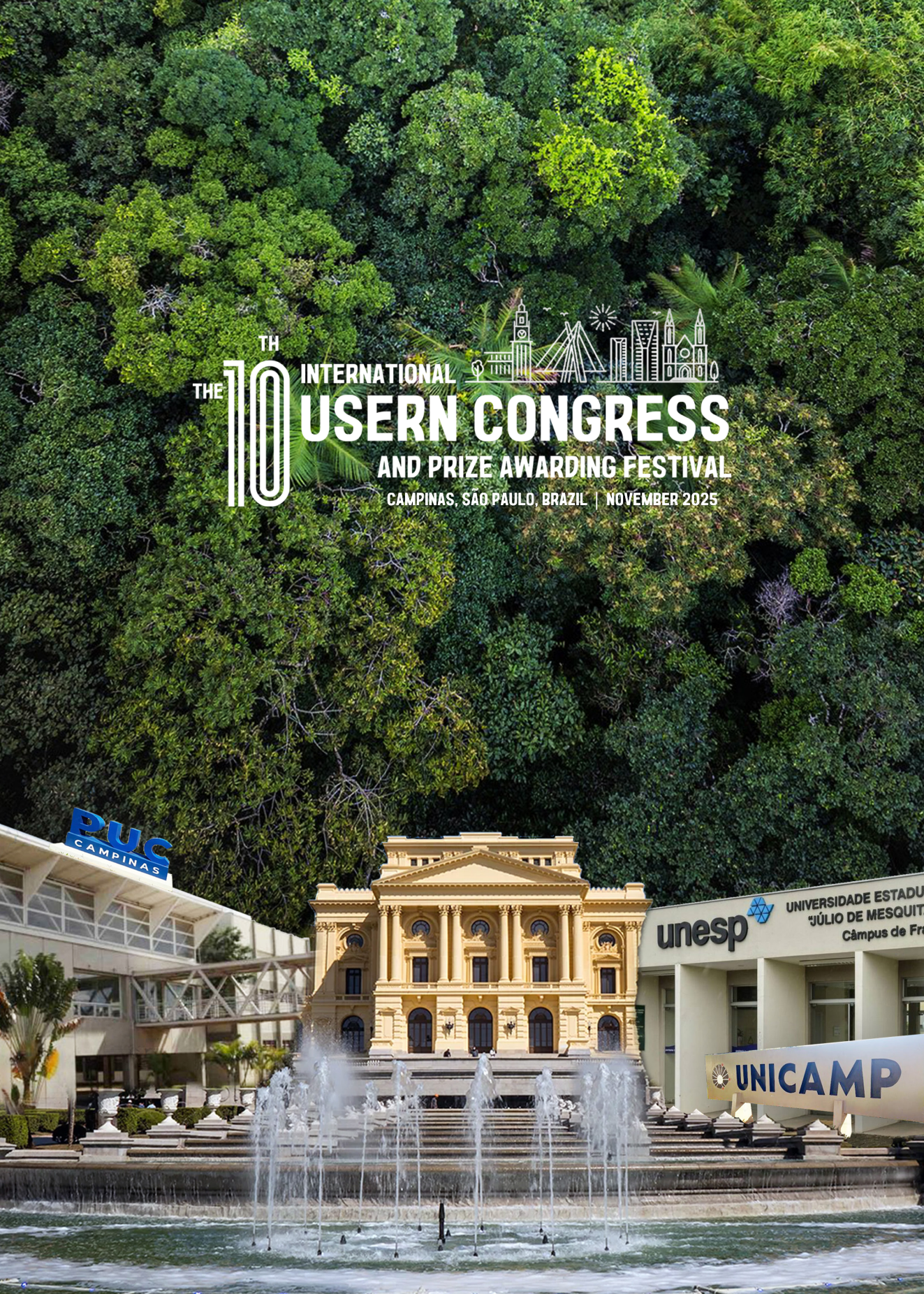
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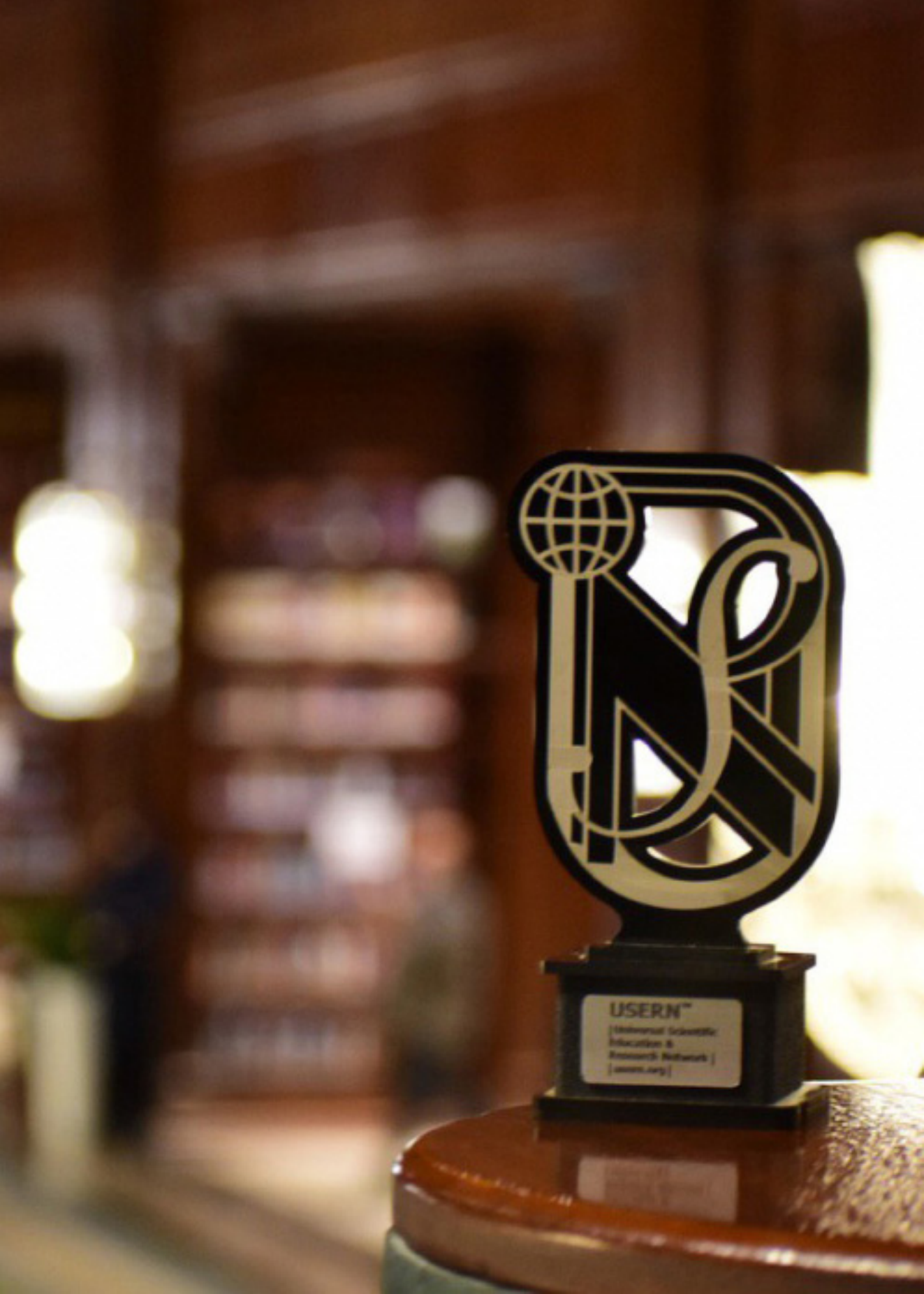
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November 8th - 10th, 2025
Campinas, São Paulo, Brazil

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Mahmoud Yaghoubi (Iran)
Masayoshi Yamaguchi (USA)
Muhhwa Yang (Taiwan)
Otto Orlean Yang (USA)
Peidong Yang (USA)
Guihua Yu (USA)
Jiaguo Yu (China)
Salim Yusuf (Canada)
Jeffrey M. Zacks (USA)
Hassan Ali Zamani (Iran)
Mostafa Zandieh (Iran)
Hamid Reza Zare (Iran)
Mohammad Reza Zarrindast (Iran)
Witold A. Zaton´ski (Poland)
Jianhua Zhang (China)
Chaohui Zhang (China)
Xudong Zhao (China)
Andrey Ustyuzhanin
Martino Margoni
Patrizia Azzi
Julien Noce Donini
Alberto Ruiz
Andrea Giammanco
Calin Alexa

Support and Resource Development

Alireza Bagheri
Arash Esmaeili
Helia Sharif
Kosar Zolfaghari
Maryam Tonekaboni
Mohammad Pourashoury
Niloufar Yazdanpanah
Sara Asl Motaleb Nejad
Tara Shahmoradi

USERN Junior Ambassadors

Hassan Alipanahzadeh, Afghanistan
Amine Harbi, Algeria
Luis Alejandro Boccalatte, Argentina
Araks Ulikhanyan, Armenia
Naveed Akhtar, Australia
Samaneh Zoghi, Austria
Fareeda Sayed Jaber Hashem, Bahrain
Md. Shahidul Islam, Bangladesh
Svetlana O. Sharapova, Belarus
Mohammad Hossein Khosravi, Belgium
Otavio Cabral Marques, Brazil
Mariya Vlado Ivanovska, Bulgaria
Mickael Essouma, Cameroon
Sina Harsini, Canada
Chunfeng Xiao, China
Amanuel Godana Arero, Ethiopia
Hongbo Zhang, Finland
Lamin Ndow, Gambia
Aram Pascal Abu Hejleh, Germany
Aliyu Tijani Jibril, Ghana
Orsolya Cseprekal, Hungary
Mujtaba Shaw, India
Laila Rahmah, Indonesia
Sila Kaya, Ireland
Ahang Abdullah Kareem, Iraq
Sila Kaya, Ireland
Giulia Grancini, Italy
Shadrack Oriama, Kenya
Lindelwa Mmema, Kingdom of Eswatini
Kawthar Mohamed, Kuwait
Ayesha Mushtaq, Kyrgyzstan
Rossella Castagna, Latvia
Sara A. Makka, Lebanon
Harris Tokpah, Liberia
Dalia Sabaliauskiene, Lithuania
Irene Ling, Malaysia
Sarah Cuschieri, Malta
Juan Carlos Bustamante Ogando, Mexico
Dharmagat Bhattarai, Nepal
Chagajeg Soloukey Tbalvandany, Netherlands
Sunny Okechukwu Abarikwu, Nigeria
Abdullah Mohamed Al-Lawati, Oman
Amjad Khan, Pakistan
Adeeb Mohammed Saber Naser Eddin, Palestine
Magaly Alison Cavalcanti Castillo, Perú
Leander Marquez, Philippines
Piotr Rzymski, Poland
Tiago Ribeiro, Portugal
Sheema Hashem, Qatar
Maria-Bianca Gegea, Romania
Nataliya Iakovchenko, Russia
Matjaz Perc, Slovenia
Annabelle Robyn Graeme Armstrong, South Africa
Jahan Hara Mohammed Nazeer, Sri Lanka
Rayan Goda, Sudan
Sergii Yakunin, Switzerland
Isfandiyor Muhsinjonovich Usmonov, Tajikistan
Faten Attig Bahar, Tunisia
Esra Hazar, Turkey
Frank Kiwanuka, Uganda
Kseniia Alexandrovna Minakova, Ukraine
Fiona Morrison, United Kingdom
Swaumu Idrisa Kishari, United Republic of Tanzania
Ajeet K Kaushik, United States
Eduardo Rodriguez-Roman, Venezuela
Faiz Alnusairi, Yemen
Rangarirai Makuku, Zimbabwe

USERN Interest Groups

Animal Models Integrated Network (AMIN)
Antimicrobials Research Group (ARG)
Applications of Cochrane Evidence in Everyday's Life Group (ACEELG)
Association of Nuclear Medicine and Molecular Imaging (ANMMI)
AstraBionics Research Network (ARN)

BioMedical Visualization Association (BMVA)
Brain Cancer research Core (BCRC)
Cancer Artificial Intelligence Collaborative Group (CAICG)
Cancer Biology Signaling Pathway Interest Group (CBSPIG)
Cancer Immunology Project (CIP)
Clinical Psychology and Psychotherapy Studies (CPPS)
Committee of Climate Change and Health (CCCH)

Digital Innovation And Lifestyle Interventions Network (DIAL_IN)
Early Childhood Education, Development, and Intervention research group (ECEDI)
Food Science and Nutrition Group (FSANG)
Fuzzy Logic Lab Interest Group (FLLIG)
Gastrointestinal Pharmacology Interest Group (GPIG)
G-Quadruplexes as INnovative ThERApeutiC Targets (G4_INTERACT)
Handicapped and Elderly Life Promotion Network (HELP)
Health and Art (HEART)
History of Medicine Network (HiMedNet)
Immunology Board for Transplantation And Cell-based Therapeutics (Immuno_TACT)
ImmunologyToday, Immunology (ImmunologyToday)
Integrated Science Association (ISA)
Interest Group of CoronaVirus 2019 (IGCV_19)
International Hematology/Oncology of Pediatrics Experts (IHOPE)
International Network for Photo Medicine and Photo Dynamic Therapy (INPMPDT)
International Network of Stem Cell (INSC)
International Neurosurgery Group (ING)
International Surgical Research Association (ISRA)
Iranian Association of Magnetic Resonance in Medicine (IAMRM)
Medical Biotechnology and Bioinformatics Research Group (MBBRG)
Medical Genetics Network (MeGeNe)
MetaCognition Interest Group (MCIG)
Microbial Toxin's Physiology Group (MTPG)
Multiple Sclerosis research group (MSRG)
Nanomedicine Research Association (NRA)
Network of Dermatology Research (NDR)
Network of Empirical, Gustatory and Olfactory Aesthetics (NEGOA)
Network of Immunity in Infection, Malignancy and Autoimmunity (NIIMA)
Network of Interdisciplinarity in Neonates and Infants (NINI)
Network of Neurosurgery and Artificial Intelligence (NONAI)
Neurosurgical Research Network (NRN)
One Health Association (OHA)
Orthopedic Trans-disciplinary Applied Research (OTAR)
Persian Medicine Network (PMN)
PhytoPharmacology Interest Group (PPIG)
Primary Immunodeficiency Diseases Network (PIDNet)
Primordial Prevention of Non Communicable Disease Group (PPNCDG)
Regenerative Medicine Group (REMED)
Scientific Union of Community Health (SUCH)
Space Biology and Astrobiology Research Team (SBART)
Systematic Review and Meta-analysis Expert Group (SRMEG)
Systems Artificial Intelligence Network (SAIN)
Tissue Engineering Hub (TEHUB)
Tissues and Biomaterial Research Group (TBRG)
Universal Council of Epidemiology (UCE)
Universal Council of Ophthalmology (UCO)

USERN Anthem Vocals

Ali Sani
Arash Barzkar
Ariana Rezaei
Arnika Rezaei
Ghazal Mahdavi
Helia Mojtabavi
Melina Sharbati
Pejman Mansouri
Saina Ahmadi Moghaddam
Shayan Shekarabi
Zahra Rahimi Pirkoohi

Message from Congress Chairs


Leonardo Oliveira Reis


Tommaso Dorigo


Nima Rezaei

As one dives deep into his own scientific field, interacting with colleagues, and joining educational and research groups, we realize how high we have built the walls around ourselves, and those who share the same interests as us. We learn not to resist invaders into our territories and to think and behave as affiliates of a certain virtue.

Art, medicine, plants, mathematics, and astronomy, are all parts of the heritage of ancient, true pioneers of knowledge. The enormity of this prodigious legacy can only reach its true potential when these segments, reunite as a whole and into knowledge without borders. It is undeniable that science today, is unintentionally mistaken for a line to draw boundaries with, a weapon to display power, or a rule to rank orders. We believe that the golden key to this reconciliation is by the hands of the scientist themselves, by the hands of artists, mathematicians, and by the hands of anyone who has an ability to share what they know, for the greater good.

USERN has been established with the main purpose of the peaceful and humanitarian promotion of education and research, universally. It comprises of top 1% of scientists in all scientific fields as the advisory board members who would manage and supervise the educational and research programs in their field of specialty. There are more than 600 top scientists, including Nobel/Abel Laureates, among the advisory board members of USERN.

The gathering of senior and junior scientists in the context of the USERN Congress would be a forward step in eliminating the age and level borders of science. Not only the senior scientists but also junior students/scientists would get the chance to present their experiences in science within USERN Congress in the context of "Junior Talks/Posters". The concept of USERN has been supported by a hundred scientific centers and universities.

Importantly and beyond the noble goal of USERN Congress in scientific promotions, USERN Prize has been established in order to identify the most talented qualified junior scientists in all areas of science, who have devoted their time to science promotion and performed outstanding scientific projects so far! The bests of bests in each field will be awarded each year to be distinguished to the scientific world and to be acknowledged for their humanitarian efforts. The USERN Prize Awarding Festival will be held annually on November 10th, the Global Day of Science for Peace and Development.

Respecting the USERN slogan of "Science without Borders" and in order to eliminate the geographical borders of science, the USERN Congress and Prize Awarding Festival is to be held annually hosted by a scientific center worldwide. Proudly, to date, we have organized the previous USERN Congresses and Festival in Iran (Tehran), Ukraine (Kharkiv), Italy (Reggio Calabria), Hungary (Budapest), Iran (Tehran), Turkey (Istanbul), Muscat (Oman) Yerevan (Armenia), and Plovdiv (Bulgaria), respectively; all highly welcomed by the international academic community.

The next edition of the USERN congress will be held in PUC Campinas, Sao Paulo, Brazil. The scientific theme of this year's congress is "**ONEHealth: From Formal to PsychoMedical Sciences**". We hope to gather all scientists who wish to contribute to our goals of a strong interdisciplinary community of researchers united in the conviction that together we can make a difference for the benefit of humanity.

In-Person Scientific Program
Campinas, São Paulo, Brazil

November 8, 2025 | Morning
Auditório do Campus I

09:00 - 09:45	**Opening Session	Welcome Messages** Rectors of the Host Universities Local Chair of the Congress, Leonardo Oliveira Reis Founder of USERN, Nima Rezaei President of USERN, Tommaso Dorigo
09:45 - 10:30	**IFPPP Festival Presentation**
10:30 - 11:00	**Coffee Break**

November 8, 2025 | Morning
Auditório do Campus I

11:00 - 13:00	**Keynote Lectures** **Chairs:** *Timothy Lyons, Alberto Ruiz, Matthias von Herrath, Steven Hayes, Bahram Mobasher*

Keynote Lecture 1 | Timothy Lyons, US
Newly Emerging Threats at the Intersection Between Climate Change and Human Health

Keynote Lecture 2 | Alberto Ruiz, Spain
Exploring the Mysteries of the Universe: Projects for Future Higgs Factories

Keynote Lecture 3 | Matthias von Herrath, US
Optimizing the Scientific Dialogue in Times of Division

Keynote Lecture 4 | Steven Hayes, US
The Ergodic Illusion: How Normative Statistics Mislead the Life Sciences

Keynote Lecture 5 | Bahram Mobasher, US
Latest Results from the James Webb Space Telescope: The First Billion Years

13:00 - 14:00	**Break**

November 8, 2025 | Afternoon
Auditório do Campus I

14:00 - 16:00	**Symposium 1 – One Health: An Integrated Approach to Health** **Moderator:** *Leonardo Reis, Caio V. Suartz*
	Mario Saad Metainflammation and the Obesity Epidemic
	Reinaldo Salomão The infectious Diseases Lessons to the One Health
	Eduardo Pessoa Radiomica em Câncer de Mama
	Jorge Toro The Role of Data Cloud Federation in the One Health
	Licio Velloso The One Health Perspective of Obesity
	Roger Chammas One Health for Precision Oncology
	Leonardo Reis A Model for Translational Science and Health Equity: INCT UroGen

November 8, 2025 | Afternoon
Prédio H02 - Sala 900

14:00 - 16:00	**Workshop 1 | Alexander Leemans, the Netherlands** Mapping Brain Connectivity with Diffusion MRI Fiber Tractography

November 8, 2025 | Afternoon
Mescla Piso Superior - Salas 1 e 3 (round table)

14:00 - 16:00	**Meet the Expert Session 1 | Steven Hayes, US**

November 8, 2025 | Afternoon
Foyer do Auditório do Campus I

14:00 - 16:00	**Poster Session** **Juries:** *Nima Rezaei, Leonardo Oliveira Reis, Tiziana Cappello, Maziar Moradi-Lakeh, Anton Tkachenko, Dong Keon Yon, Yunlu Dai, Maria Maisano*

November 9, 2025 | Morning
Auditório do Campus I

09:00 - 11:00	**Symposium 2 – Interdisciplinary Neuroscience Research: From Neurobiology to Neuroimaging** **Chairs:** *George Perry, Alexander Leemans, Bahram Mobasher*
	Keynote Lecture 6 | George Perry, US Oxidative Stress in the Origin of Alzheimer's Disease
	Keynote Lecture 7 | Alexander Leemans, the Netherlands From Diffusing Water Molecules to the Blueprint of Brain Connections
	Oral Presentation Session 1 **Juries:** *Alberto Ruiz, Timothy Lyons, Nima Rezaei, Leonardo Oliveira Reis, Dong Keon Yon, Yunlu Dai, Maria Maisano, Tiziana Cappello, Maziar Moradi-Lakeh, Anton Tkachenko*

November 9, 2025 | Morning
Mescla Piso Superior - Salas 1 e 3 (round table)

09:00 - 11:00	**Meet the Expert Session 2 | Matthias von Herrath, US**

November 9, 2025 | Morning
Foyer do Auditório do Campus I

09:00 - 11:00	**International Festival of Paintings for Pediatric Patients (IFPPP)**
11:00 - 11:30	**Coffee Break**

November 9, 2025 | Morning
Auditório do Campus I

11:30 - 13:00	**Symposium 3 – Interdisciplinary Environmental and Biomedical Research: From Etiology to Clinical Practice** **Chairs:** *Maziar Moradi-Lakeh, Tiziana Cappello, Anton Tkachenko*

Keynote Lecture 8 | Maziar Moradi-Lakeh, US
The Impacts of Climate Change on Health

Keynote Lecture 9 | Tiziana Cappello, Italy
Effects of Microplastics and Associated Contaminants on the Embryo-larval Development and Reproductive Health of Different Aquatic Species

Keynote Lecture 10 | Anton Tkachenko, Czech Republic
How do Red blood Cells Fie? Novel Insights into Eryptosis, A Suicidal Cell Death of Erythrocytes: It is Machinery, Role in Health and Disease, Druggability

Oral Presentation Session 2
Juries: *Timothy Lyons, Bahram Mobasher, Alberto Ruiz, Matthias von Herrath, Carolina Sanchez Aranda, Alexander Leemans, George Perry, Dong Keon Yon, Yunlu Dai, Alberto Ruiz, Maria Maisano*

November 9, 2025 | Morning
Foyer do Auditório do Campus I

11:30 - 13:00	**International Festival of Paintings for Pediatric Patients (IFPPP)**
13:00 - 14:000	**Break**

November 9, 2025 | Afternoon
Auditório do Campus I

14:00 - 16:00	**Symposium 4 – Interdisciplinary Immune Research: From Bench to Bedside in Immune-Related Diseases** **Chairs:** *Nima Rezaei, Carolina Sanchez Aranda, Antonio Condino-Neto*

Keynote Lecture 12 | Nima Rezaei, Iran
Memorial Talk: The JMF Warning Signs for Diagnosis of Inborn Errors of Immunity

Keynote Lecture 13 | Carolina Sanchez Aranda, Brazil
Immunologist and Secondary Immunodeficiency

Keynote Lecture 14 | Antonio Condino-Neto, Brazil
Implementation of Newborn Screening for Inborn Errors of Immunity in Brazil

Keynote Lecture 15 | Niloufar Yazdanpanah, Austria
Allergy in Inborn Errors of Immunity: Translation of Advances in Allergy Treatment to Inborn Errors of Immunity

Keynote Lecture 16 | Marcelo Bendhack, Brazil
Cancer de Prostata e Longevidade: Qualidade de Vida e Teste Epigenético

Keynote Lecture 17 | Carla M Salgado, Brazil
Avaliação e Aconselhamento Genético do Paciente com Diagnóstico de Câncer

Oral Presentation Session 3
Juries: *Leonardo Oliveira Reis, Matthias von Herrath, Anton Tkachenko, Maziar Moradi-Lakeh, Maria Maisano, Tiziana Cappello, Timothy Lyons, Alexander Leemans, George Perry, Alberto Ruiz, Bahram Mobasher, Dong Keon Yon, Yunlu Dai, Marcelo Bendhack*

November 9, 2025 | Afternoon
Mescla Piso Superior - Salas 1 e 3 (round table)

14:00 - 16:00	**Meet the Expert Session 3 | Timothy Lyons, US**

November 9, 2025 | Morning
Foyer do Auditório do Campus I

14:00 - 16:00	**International Festival of Paintings for Pediatric Patients (IFPPP)**

November 10, 2025 | Morning
Auditório do Campus I

09:00 - 10:00	**USERN Festival** USERN Awarding Festival 2025 Announcing the Host of USERN 2026 **Chairs:** *Nima Rezaei, Leonardo Oliveira Reis*
10:00 - 12:00	**USERN Laureates Talks** **Closing Session**

Virtual Programs

November 8, 2025 | Afternoon, 14:00 - 16:00

Virtual Session 1: Translational Medicine: Global Efforts to Overcome Challenges

Virtual Lecture 1 | Tommaso Dorigo, Italy
Random Tips for Aspiring Researchers

Virtual Lecture 2 | Ute Romling, Sweden
Single Amino Acid Substitutions - Small Alterations with Big Effects

Virtual Lecture 3 | Paulo R. Bueno, Brazil
Quantum Electroanalysis and its Applications in Diagnostics and Drug Discovery

Virtual Presentation Session 1
Juries: *Tommaso Dorigo, Ute Romling, Paulo R. Bueno*

Shayan Boozarjomehri
Equine Models in Translational Medicine: One Health Perspective

Sara Asl Motaleb Nejad
Organoid Chips in Pediatric Precision Medicine: Translational Potential, Challenges, and Future Directions

Shaghayegh Mohammadioun
From Data to Cure: The Role of the Targeted Therapy Through the Future Approaches

Kiarash Saleki
Isoform-Selective PI3Kδ Inhibitors for Activated PI3Kδ Syndrome — A Structure-Guided, Fragment- and Peptide-Based

Shaghayegh Mousavi
Mucosal and Memory Immunity in Chronic Rhinosinusitis: From Pathogenesis to Therapeutics

Mohammadreza Saleh
Early-Onset Familial Mediterranean Fever with Severe GI and Immune Features

November 9, 2025 | Morning, 09:00 - 11:00

Virtual Session 2: Translational Formal and Chemical Sciences: From Artificial Intelligence to the Molecules

Virtual Lecture 5 | Fabien Lotte, France
Artificial Intelligence for Neurotechnologies: opportunities and biases

Virtual Lecture 6 | Artemi Cerda, Spain
Soil Erosion as a Consequence of Forest Fires

Virtual Lecture 7 | Artem Oganov, Russia
Chemical Reactivity of the Elements: Simple Model and Non-trivial Implications

Virtual Lecture 8 | Pablo Artal, Spain
Vision with Infrared Two-photon Vision

Virtual Presentation Session 2
Juries: *Tommaso Dorigo, Fabien Lotte, Artemi Cerda, Artem Oganov, Pablo Artal*

Kosar Zolfaghari
Spectroscopic Signatures of Carbon Cluster Cations: Clues to Prebiotic Chemistry in Space

Mohammad Pourashory
Revolutionizing Diagnostics: The Role of Explainable AI in Enhancing Clinical Decision-Making

Arta Ghalehbaghi
AI›s Role in Diagnosis and Care of Fibromyalgia Syndrome; A Narrative Review Over Future and Challenges

Neda Harirforoush
Artificial Intelligence in Prognostic Prediction of Heart Failure: A Narrative Review of Algorithms, and Future Directions

Roya HajiMalek
Improving Diagnostic Accuracy of Heart Disease with Attention-Augmented Deep Neural Networks

November 9, 2025 | Morning, 11:30 - 13:00

Virtual Session 3: Translational Medical and Public Health: The Progress and the Challenges

Virtual Lecture 9 | Christopher Wlezien, US
Public Updating of (Economic) Perceptions: How History Matters

Virtual Lecture 10 | Filip Dochy, the Netherlands
The Future of Learning in Universities of Tomorrow

Virtual Lecture 11 | Reza Malekzadeh, Iran
Updates on Prevention of Premature Death

Virtual Presentation Session 3
Juries: *Tommaso Dorigo, Christopher Wlezien, Filip Dochy, Reza Malekzadeh*

Mahsa Zargaran
Relationship Between Apolipoprotein B to apolipoprotein A1 ratio and Metabolic Dysfunction-associated Steatotic Liver Disease in Patients with Type 2 Diabetes

Mahsa Hosseini Kakroudi
The Role of Macrophage Polarization in Myocardial Infarction and Cardiac Repair

Alireza Maboudi
Electrospun Hyaluronic Acid–PVA Mats Loaded with Probiotics for Wound Dressing: Preparation and In Vitro Evaluation

Azin Dokht Arafi
The Approach of CRISPR-Cas9 in Gene Editing for Thalassemia Therapy: A Narrative Review

Parham Farzam
Emotional Intelligence and Pain Management in Dentistry: An Umbrella Review of Current Evidence

November 9, 2025 | Afternoon, 14:00 - 16:00

Virtual Session 4: Translational Immunology and Cancer: Updates and Challenges

Virtual Lecture 12 | Sara De Biasi, Italy
Immunometabolic Signature of Antigen-Specific T Cells After Vaccination

Virtual Lecture 13 | Fabiana Corsi-Zuelli, UK
Immunopsychiatry and Psychosis: Connecting Inflammation, Immunity, and the Brain

Virtual Lecture 14 | Moein Moghimi, UK
Overcoming acute complement responses to nanomedicines

Virtual Lecture 15 | Domenico Pratico, US
Role of miRNAs in tauopathy and related dementias

Virtual Presentation Session 4
Juries: *Tommaso Dorigo, Sara De Biasi, Fabiana Corsi-Zuelli, Moein Moghimi, Domenico Pratico*

Pardis Zamani
Targeting T-cell Exhaustion in Colorectal Cancer: Emerging Roles of LAG3-, TIM3-, TIGIT, and Their Signaling in Overcoming Immunotherapy Resistance

Mahshid Shahmoradi
Targeting the NKG2D Axis in Head and Neck Squamous Cell Carcinoma: From Molecular Insights to Clinical Applications

Ali Rezvanimehr
In Silico Evaluation of FDA-Approved Multi-Inhibitors for MMP-14Associated Proteins in Glioblastoma: Docking, Pharmacokinetic, and Dynamics Insights

Reyhaneh Abdi Andarabi
LncRNA RMRP and mTOR: Promising Biomarkers in Triple-Negative Breast Cancer

Pegah Khodaee
Immune Multi-Omics Integration with Machine Learning Methods to Create HNSCC Prognostic Models

November 10, 2025 | Afternoon, 14:00 - 16:00
Virtual Session 5: Translational Neuroscience and Neurology: Mental Health and Neurological Diseases

Virtual Lecture 16 | Sophia Moskalenko, US
Breaking Boundaries: The Psychological Science of Extreme Thought and Behavior

Virtual Lecture 17 | Umberto Crisanti, UK
Heal Yourself: Visualisation, Inner Intelligence, and the Neuroscience of Healing

Virtual Lecture 18 | Vivette Glover, UK
For the Sake of the Child, Perinatal Mental Health Care Needs to Help with More than Diagnosed Disorders. Stress is Important Too.

Virtual Lecture 19 | Amedeo Amedei, Italy
The Epoch of Intratumoral Microbiome: Focus on Colorectal and Breast Cancer

Virtual Presentation Session 5
Juries: *Tommaso Dorigo, Sophia Moskalenko, Umberto Cristini, Vivette Glover, Amedeo Amedei*

Parsa Alijanzadeh
TLR-4 Mediating Multiepitope Chimeric Vaccine Utilizing Bacterial Infections Associated with Alzheimer›s Disease, Cognitive Impairment, and Dementia via Advanced Immunoinformatics Approaches

Fatemeh KefayatManesh
tACS: A Novel Therapeutic Approach to Alzheimer's Disease

Melika Abrishami
MicroRNAs in Mediating Stress Vulnerability and Resilience in Multiple Sclerosis

Fatemeh Gharib
Topographical Mapping of Multiple Sclerosis Lesions on Brain MRI and Their Clinical Correlates

Kimia Kazemzadeh
Crocus Sativus (Saffron) Adjunct to Risperidone for Negative Symptoms of Schizophrenia: A Randomized, Double-blind, Placebo-Controlled Trial

Junior Oral Presentation

November 9, 2025 | Morning, 09:00 - 11:00 | Auditório do Campus I

Oral Presentation Session 1

Juries: *Alberto Ruiz, Timothy Lyons, Nima Rezaei, Leonardo Oliveira Reis, Dong Keon Yon, Yunlu Dai, Maria Maisano, Tiziana Cappello, Maziar Moradi-Lakeh, Anton Tkachenko*

Chiman Daneshyar
Ocular Gateway to Peace: A Comprehensive Review of Visual-Affective Dysfunctions in Medical and Neuropsychiatric Disorders, and the Modulatory Roles of Environmental Factors and Intelligence

Arash Esmaeili
Immunomodulatory, Diagnostic, Prognostic and Therapeutic Dimensions of Exosomal MicroRNAs in Glioblastoma Multiforme

Tara Shahmoradi
GPTSD: The Role of Conversational AI in Managing Post-Traumatic Stress

Nazanin Zahra Keshvari
AI-Driven Perspectives on Gut Dysbiosis in Major Depressive Disorder

Azin Dokht Afifi
Neurotherapy and Cognitive Enhancement: Can We Boost Intelligence for Better Health?

November 9, 2025 | Morning, 11:30 - 13:00 | Auditório do Campus I

Oral Presentation Session 2

Juries: *Timothy Lyons, Bahram Mobasher, Alberto Ruiz, Matthias von Herrath, Carolina Sanchez Aranda, Alexander Leemans, George Perry, Dong Keon Yon, Yunlu Dai, Alberto Ruiz, Maria Maisano*

Mohammadreza MirzaeeGoodarzi
The Role of Entrepreneurial Education in Shaping the Future of the Health Industry

Maryam Sadat Tonekaboni
Organic Chemistry Meets Machine Learning: Revolutionizing Bioremediation

Mahta Bahri
The Role of Artificial Intelligence in Dental Diagnosis and Treatment Plan Outcomes: Special Focus on Orthodontics and High-Quality Facial Profile

Marjan Ahmadirad
Digital Pathways: Emerging Career Opportunities for Medical Students in the Evolving Landscape of Health Technology

Parvaneh Hamian Roumiani
Three Decades of Atrial Fibrillation and Flutter in the MENA Region: Trends, Risk Factors, and Health Implications

November 9, 2025 | Afternoon, 14:00 - 16:00 | Auditório do Campus I

Oral Presentation Session 3

Juries: *Leonardo Oliveira Reis, Matthias von Herrath, Alberto Ruiz, George Perry, Anton Tkachenko, Maziar Moradi-Lakeh, Maria Maisano, Tiziana Cappello, Timothy Lyons, Alexander Leemans, George Perry, Alberto Ruiz, Bahram Mobasher, Dong Keon Yon, Yunlu Dai, Marcelo Bendhack*

AmirMohammad Amouzadeh Samakoush
Chimeric Antigen Receptor (CAR) Therapies in Retinoblastome

Alma Naseri
Next Generation Therapeutics: Drug Delivery Applications Bioactive Compounds from Superfoods

Hamoon Baghaei
Stem Cell Therapy for Urethra and Ureter Tissue Engineering: A Systematic Literature Review on Animal Studies

Sara Fattahi
The Role of Emotion-Regulation Difficulties, Distress Tolerance, and Perceived Stress in Predicting Treatment Adherence among Patients with Type 2 Diabetes

Junior Poster Presentation

November 8, 2025 | Afternoon, 14:00 - 16:00 | Foyer do Auditório do Campus I

Poster Session

Juries: N*ima Rezaei, Leonardo Oliveira Reis, Tiziana Cappello, Maziar Moradi-Lakeh, Anton Tkachenko, Dong Keon Yon, Yunlu Dai, Maria Maisano*

Maria Maisano
Gadolinium A Rare Earth Element (REE): A Smart Resource or a Danger to the Reproductive Health of Non-Target Aquatic Organisms?

Fatemeh Abouzari
The Role of Psychological Flexibility, Difficulty in Emotion Regulation, and Intolerance of Uncertainty in Predicting Psychological Distress and Obsessive-Compulsive Symptoms in Patients with Type 2 Diabetes During the COVID19- Pandemic

Teodora Kalfova
Development of an Algorithm for the Automated Analysis of Multi-Parameter Flow Cytometric Data on Sub-Population of B-Lymphocytes

Steliyan Petrov
Immunophenotyping and Functional Characterization of NK Cells in SARS-CoV2- Infection

Martina Bozhkova
Humoral and Memory B Cell Responses Following SARS-CoV2- Infection and mRNA Vaccination

Rozhin Bakhshi
Comparison of PET/CT and PET/MRI in Central Nervous System Tumors

USERN Congress In-Person and Virtual Keynote Speakers

Timothy Lyons

Newly Emerging Threats at the Intersection Between Climate Change and Human Health

Department of Earth and Planetary Sciences and the Alternative Earths Astrobiology Center, University of California, Riverside, CA USA

Alberto Ruiz

Exploring the Mysteries of the Universe: Projects for future Higgs Factories

Instituto de Física de Cantabria, University of Cantabria, Santander, Spain

Matthias von Herrath

Optimizing the Scientific Dialogue in Times of Division

Type 1 Diabetes Research Center, Novo Nordisk, Seattle, WA, USA; Type 1 Diabetes Center, La Jolla Institute for Allergy and Immunology, La Jolla, CA 92014, USA

Steven Hayes

The Ergodic Illusion: How Normative Statistics Mislead the Life Sciences

University of Nevada, Reno, NV, USA

Bahram Mobasher

Latest Results from the James Webb Space Telescope: The First Billion Years

Department of Physics and Astronomy, University of California, Riverside, CA, USA

Mario Saad

Metainflammation and the Obesity Epidemic

Department of Internal Medicine, School of Medical Science, State University of Campinas, Campinas 13083-887, SP, Brazil

Reinaldo Salomão

The Infectious Diseases Lessons to the One Health

Instituto Latino Americano de Sepse - São Paulo (SP), Brazil

Eduardo Pessoa

Radiomica em Câncer de Mama

Universidade Estadual Paulista Júlio Mesquita Filho, Botucatu, SP, Brazil

Jorge Toro

The Role of Data Cloud Federation in the One Health

President, CEO and Founder for Medinexo, Saint Louis, Missouri, USA

Licio Velloso

The One Health Perspective of Obesity

Laboratory of Cell Signaling-Obesity and Comorbidities Research Center, University of Campinas, Campinas, Brazil

Roger Chammas

One Health for Precision Oncology

Center for Translational Research in Oncology, Instituto do Câncer do Estado de São Paulo, Hospital das Clinicas da Faculdade de Medicina da Universidade de São Paulo, São Paulo, Brazil

Leonardo Reis

A Model for Translational Science and Health Equity: INCT UroGen

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Oxidative Stress in the Origin of Alzheimer's Disease

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Alexander Leemans

From Diffusing Water Molecules to the Blueprint of Brain Connections

PROVIDI Lab, UMC Utrecht, the Netherlands

Maziar Moradi-Lakeh

The Impacts of Climate Change on Health

Optimax Access, USA

Tiziana Cappello

Effects of Microplastics and Associated Contaminants on the Embryo-larval Development and Reproductive Health of Different Aquatic Species

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Paulo R. Bueno

Quantum Electroanalysis and its Applications in Diagnostics and Drug Discovery

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Anton Tkachenko

How do Red Blood Cells Die? Novel Insights into Eryptosis, A Suicidal Cell Death of Erythrocytes: It is Machinery, Role in Health and Disease, Druggability

First Faculty of Medicine, BIOCEV, Charles University, Vestec, Czech Republic

Nima Rezaei

Memorial Talk: The JMF Warning Signs for Diagnosis of Inborn Errors of Immunity

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Carolina Sanchez Aranda

Immunologist and Secondary Immunodeficiency

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Antonio Condino-Neto

Implementation of Newborn Screening for Inborn Errors of Immunity in Brazil

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Cancer de Prostata e Longevidade: Qualidade de Vida e Teste Epigenético

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Avaliação e Aconselhamento Genético do Paciente com Diagnóstico de Câncer

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Tommaso Dorigo

Random tips for Aspiring Researchers

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Ute Romling

Single Amino Acid Substitutions - Small Alterations with Big Effects

Department of Microbiology, Tumor and Cell Biology, Biomedicum, Karolinska Institutet, Stockholm, Sweden

Jean-Marc Cavaillon

Sepsis: Still a Worldwide Medical and Scientific Challenge

Institut Pasteur, Paris, France

Diana Boraschi

Advocating Mucosal Vaccination in the Global Cooperation for Preparedness to Old and New Infections

Institute of Biomolecular Chemistry, National Research Council, Pozzuoli, Italy

Fabien Lotte

Artificial Intelligence for Neurotechnologies: Opportunities and Biases

Inria Center at the University of Bordeaux / LaBRI, Talence, France

Artemi Cerda

Soil Erosion as a Consequence of Forest Fires

Soil Erosion and Degradation Research Group, Department of Geography, Valencia University, Blasco Ibàñez, Valencia, Spain

Artem Oganov

Chemical Reactivity of the Rlements: Simple Model and Non-trivial Implications

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Pablo Artal

Vision with Infrared Two-photon Vision

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Christopher Wlezien

Public Updating of (Economic) Perceptions: How History Matters

College of Liberal Arts, University of Texas at Austin, Austin, USA

Filip Dochy

The Future of Learning in Universities of Tomorrow

University of Regensburg & Maastricht University, The Netherlands

Reza Malekzadeh

Updates on Prevention of Premature Death

Professor of Medicine Digestive Disease Research Institute, Tehran University of Medical Science, Tehran ,Iran

Sara De Biasi

Immunometabolic Signature of Antigen-Specific T Cells After Vaccination

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Fabiana Corsi-Zuelli

Immunopsychiatry and Psychosis: Connecting Inflammation, Immunity, and the Brain

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Moein Moghimi

Overcoming Acute Complement Responses to Nanomedicines

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Domenico Pratico

Role of miRNAs in Tauopathy and Related Dementias

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Sophia Moskalenko

Breaking Boundaries: The Psychological Science of Extreme Thought and Behavior

Georgia State University, Atlanta, GA 30302, United States

Umberto Crisanti

Heal Yourself: Visualisation, Inner Intelligence, and the Neuroscience of Healing

Psychotherapist in Private Practice, Canterbury, Kent England

Vivette Glover

For the Sake of the Child, Perinatal Mental Health Care Needs to Help with More than Diagnosed Disorders. Stress is Important Too.

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Simon Robson

Targeting of Defined ENTPD/CD39 Ectonucleotidases to Inflame Tumors

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USERN Congress Keynote Speakers

Alberto Ruiz

Exploring the Mysteries of the Universe: Projects for future Higgs Factories

Instituto de Física de Cantabria, University of Cantabria, Santander, Spain

The standard model of Particle Physics is a field theory with gauge symmetry of the type SU(3) C x (SU(2)L x (U(1)Y)eW which describes the elementary structure of "ordinary" matter, made up of fermions (quarks and leptons) and the basic electroweak and strong nuclear forces mediated, respectively, by photons and weak bosons W+, W-, Z, and by gluons. In addition, it helps us theorize about the origin and evolution of the Universe in its first moments, approximately 10-10 sec after the Big Bang.

The model, developed during the second half of the last century, was completed with the model of spontaneous electroweak symmetry breaking, through the Brout-Englert-Higgs mechanism, which gives mass to fermions and bosons through interaction with the Higgs field, whose quantum, the scalar Higgs boson, was discovered in 2012 in the ATLAS and CMS experiments at the LHC accelerator at CERN.

The search for the Higgs boson has lasted 50 years since its proposal by Peter Higgs, in 1964, and requires a deeper understanding of its role in the standard model of particle physics, which has led the international community to develop projects for future Higgs factories as a first priority. Such factories will allow the precise measurement of the properties of the Higgs and its couplings to fermions and bosons, as well as its self-coupling. In addition, they will be completed with measurements of electroweak parameters, particularly with precise measurements of the properties of the top quark and the bosons of the weak nuclear interaction.

These fundamental studies, which include, among others, the origin of mass, flavour, spontaneous symmetry breaking, baryogenesis, etc., together with the search for new exotic particles, will allow us to discard or maintain theories beyond the standard model, to delve deeper into the current anomalies currently under discussion and to delve deeper into the mysteries surrounding the Universe, in particular its own stability, the existence of dark matter, matter-antimatter asymmetry, This talk shows, in addition to the previsions of advances in fundamental physics, the various existing technologies, the viability of possible future colliders and the corresponding challenges, as well as strategies to minimize environmental impact and the status of discussions regarding possible projects in the international, global context.

Alexander Leemans

From Diffusing Water Molecules to the Blueprint of Brain Connections

PROVIDI Lab, UMC Utrecht, the Netherlands

The brain's complex network of fiber pathways is essential for understanding how it functions. Diffusion magnetic resonance imaging (MRI) offers a powerful, non-invasive method for studying the microstructure of brain tissue in vivo. Using diffusion MRI tractography, researchers can reconstruct white matter pathways – much like cartographers mapping the landscape of the brain. Yet, the intricate, multi-scale organization of these connections and the subtle features that define regional boundaries pose major challenges. This presentation will introduce key principles of diffusion MRI and tractography, highlighting the main difficulties faced in this field. Participants will gain an appreciation for how diffusion MRI is advancing our knowledge of brain connectivity.

Anton Tkachenko

How do Red Blood Cells Die? Novel Insights into Eryptosis, A Suicidal Cell Death of Erythrocytes: It is Machinery, Role in Health and Disease, Druggability

First Faculty of Medicine, BIOCEV, Charles University, Vestec, Czech Republic

Recent advances in erythrocyte cell biology have demonstrated that mature red blood cells (RBCs) have a network of interconnected signaling pathways and molecular mechanisms involved in cell death regulation. For instance, experimental evidence shows that there are at least three autonomous and orderly regulated cell death (RCD) pathways in mature erythrocytes: eryptosis, erythronecroptosis, and spectosis. Importantly, although these pathways bear certain resemblance to their counterparts in nucleated cells (apoptosis, necroptosis, and pyroptosis, respectively), nowadays there is mounting evidence that these phenomena are restricted to mature erythrocytes only.

Eryptosis is a specific form of erythrocyte RCD initiated primarily by Ca2+ overload and culminated in scramblase activation-associated phosphatidylserine (PS) externalization. In physiological and pathological scenarios, eryptosis rapidly removes injured erythrocytes from the bloodstream, which is mediated by PS-dependent erythrophagocytosis performed by macrophages. In striking contrast with eryptosis, erythrophagocytosis and recently discovered spectosis are lytic lethal subroutines, suggesting that they may demonstrate signs of immunogenic cell death. Erythronecroptosis is initiated in erythrocytes in response to pore-forming bacterial toxins and is driven by the RIPK1/RIPK3/MLKL signaling axis, while spectosis is triggered by the complement membrane attack complex and is mediated by the NLRP3/ASC/caspase-8/β-spectrin axis culminating in β-spectrin proteolysis by caspase-8.

Among the erythrocyte-associated RCD pathways outlined above, eryptosis is the most studied. Briefly, eryptotic signaling leads to PS externalization and further immunologically silent clearance of eryptotic RBCs. A wide spectrum of signaling pathways terminate in PS externalization. Thus, several forms of eryptosis have been identified based on the recruited PS externalization-inducing signaling mechanisms: cation channel-driven, ROS-mediated, lipid-driven, caspase-dependent, and extrinsic. Its physiological importance as a mechanism aimed at rapid removal of dysfunctional RBCs is well-recognized. At the same time, eryptosis reportedly contributes to a variety of disorders as a driving force for anemia, endothelial dysfunction, hypercoagulation, or inflammatory responses. A compelling body of evidence shows that the effects mentioned above are primarily linked to PS externalization, suggesting that PS externalization-targeting eryptosis inhibitors can be beneficial to reverse eryptosis-associated pathological alterations.

Bahram Mobasher

Latest Results from the James Webb Space Telescope: The First Billion Years

Department of Physics and Astronomy, University of California, Riverside, CA, USA

We are living in a unique time in the history of the humankind. Over the last few years, rapid developments in science and technology have allowed us to address the most fundamental questions that had occupied the greatest minds for centuries. The Hubble Space Telescope has taken the deepest images of the Universe ever seen by the humankind. Through this, we have discovered the first generation of galaxies in the Universe. With the launch of the James Webb Space Telescope on December 25, 2021, we are now able push our horizon even deeper into the Universe, searching for galaxies formed after ~200 million years from the beginning of the Universe.
This talk presents the latest results from the James Webb Space Telescope regarding the first generation of galaxies using the deepest images of the Universe going back over 13 billion light years. The talk will elevate you to a new understanding of the nature and answers questions (or create new ones) about our very existence. This could potentially change your views about the Universe and life and the world around you.

Christopher Wlezien

Public Updating of (Economic) Perceptions: How History Matters

College of Liberal Arts, University of Texas at Austin, Austin, USA

How do people respond to new information about social conditions? Does an improvement always lead people to say things are "better," and to what degree? We develop a theory of context-dependent updating which posits that people update their perceptions based on historical context – whether pre-existing perceptions are positive or negative. Consequently, we expect that equivalent changes in conditions elicit different reactions from the public depending on when they take place. To test this possibility, we update a classic model of aggregate public responsiveness to changes in economic conditions to include a moderator variable that captures public perceptions in the recent past. This small adjustment reveals a massive source of heterogeneity: changes in the economy matter either a great deal for public perceptions or not at all depending on levels of existing perceptions. The results imply that public updating is a highly relative process.

Dong Keon Yon

Global Health Foundation Model: Building an AI Platform for Predicting Non-Communicable Disease Trajectories

Center for Digital Health, Medical Science Research Institute, Kyung Hee University, Medical Center, Kyung Hee University, College of Medicine, Seoul, South Korea

This project aims to develop a foundation model in medicine that incorporates multinational, multimodal health data—including structured EMRs, imaging, omics, environmental exposures, and social determinants of health (such as social-economic status). Inspired by limitations in generalizability of current clinical AI models, this work began with a national-scale effort to harmonize real-world data from 15 hospitals in South Korea.

We already began by integrating large-scale, real-world datasets from South Korea, Japan, and the United Kingdom. These studies demonstrated the feasibility and scientific value of international medical data harmonization and large-scale predictive modeling. Building on this foundation, we are now developing a Korean-origin foundation model capable of learning from diverse modalities, including fundus images and clinical records.

A key innovation of this project is the integration of these predictive models with disease burden metrics, particularly disability-adjusted life years (DALYs), to forecast future global health trajectories and inform national and international policy. We aim to build an intuitive, DALY-driven prediction platform that enables policymakers to act proactively and allocate resources efficiently.

Leveraging advanced architectures (transformers, GNNs, diffusion models), the foundation model will be trained to predict disease onset, progression, adverse drug reactions, and response to interventions. Ultimately, this model will support precision medicine, policymaking, and future-ready clinical decision tools across regions.

This project will lead to the development of a unified, DALY-based forecasting platform capable of simulating future disease burdens across regions, populations, and disease categories. By providing reliable, timely predictions of health trends, it will enable policymakers to allocate resources and implement interventions at the right time and place. Such a platform can reduce avoidable deaths and disabilities by supporting proactive, data-driven public health decisions. Ultimately, it can help narrow global health disparities and enhance health equity on a planetary scale.

George Perry

Oxidative Stress in the Origin of Alzheimer's Disease

Department of Neuroscience Development and Regenerative Biology, The University of Texas at San Antonio, San Antonio, Texas, USA

For over 40 years, our research has focused on dissecting the cytopathology of Alzheimer's disease (AD) with the goal of developing a cure. We have used oxidative stress as a window to view and understand AD. Oxidative damage to sugars, proteins, lipids, and nucleic acids increases in neuronal cytoplasm. The same neuronal compartment has increased redox active iron and copper, which can catalyze oxidative damage, and likely derive from mitochondrial debris (in and outside lysosomes) including cytochromes, mitochondria-specific prosthetic groups, and mtDNA. Mitochondria show altered axonal transport, size distribution, energetics, fusion/fission, and degradation in AD that correlate with the extent of oxidative damage suggesting they are the origin. Synaptic mitochondria abnormalities correlate with synaptic vesicular changes. Surprisingly, amyloidβ and tau are quantitatively associated with reduced neuronal oxidative damage. Copper sequestration by amyloidβ blocks copper-mediated oxidation of lipids and vitamin C indicating amyloidβ can be a protective response rather than the initiator of AD. Instead of being bound to amyloidβ, iron is present as 10nm magnetite crystals with super-paramagnetic properties as well as abundant metallic iron, along with metallic copper. This is the first report of metallic iron and copper in humans. Not just amyloidβ, but also tau, may be protective responses induced in AD to maintain neurons with altered balance for decades. While these studies put oxidative stress at the center of AD, they also highlight a complexity of multifaceted alterations that is homeostatic and requires a deeper level of understanding before an effective cure.

Maziar Moradi-Lakeh

The Impacts of Climate Change on Health

1. Optimax Access, USA
2. Lancet Countdown on Health and Climate Change
3. Gastrointestinal and Liver Disease Research Center, Iran University of Medical Sciences
4. Univiersiti Malaysia Terengganu

The Lancet Countdown on Health and Climate Change is a global, multidisciplinary collaboration that monitors the evolving links between climate change and health, as well as the world's response. The 2025 report, representing the ninth iteration of its indicators, coincides with COP30 in Brazil, to affect global, regional and national policies through negotiations and collaborations.
This international collaboration brings together 128 scientists from 71 leading academic institutions and UN agencies, with expertise from climate science, public health, engineering, economics, and social sciences. The 2025 report tracks 57 indicators across five interconnected domains:
1. Health Impacts of Climate Change (17 indicators): Examines direct and indirect health risks associated with rising temperatures, extreme weather events, infectious disease transmission, and food insecurity. It also tracks exposure to wildfires (and smoke) and droughts.
2. Adaptation, Planning, and Resilience for Health (11 indicators): Assesses national capacities to protect populations from increasing climate hazards and to enhance the resilience of health systems.
3. Mitigation Actions and Health Co-benefits (9 indicators): Evaluates the intersection between climate mitigation efforts and health benefits, including transitions in energy, transport, and food systems.
4. Economics and Finance (13 indicators): Investigates the economic implications of climate change and the transition toward net-zero economies, including shifts in investments and lending from fossil fuels to clean energy.
5. Public and Political Engagement (7 indicators): Monitors global awareness, policy commitments, and civil society actions linking climate change and health.
Over successive reports, the Lancet Countdown has documented unprecedented changes and breaking records in climate-related health impacts along with encouraging responses by some of the countries working to reverse these trends. Although the risk of reaching irreversible thresholds remains a concern, the accelerating actions of governments and the growing engagement of global citizens continue to foster hope for a healthier, more sustainable future.
[The findings of this study are under embargo at the time of publishing the conference proceedings but will be presented during the Congress.]

Moein Moghimi

Overcoming Acute Complement Responses to Nanomedicines

School of Pharmacy, Newcastle University, Newcastle upon Tyne, NE1 7RU, UK

The complement system is an important arm of the innate immune system playing multifaceted roles in nanomedicine performance in the body, resulting in both beneficial and adverse responses. This presentation will discuss: 1) our recent work on the role of complement system and complement regulation in the performance of intravenously injected preclinical and clinically approved nanomedicines and strategies for the design of complement-evading nanoparticles, and 2) examines orthogonal effects of regulatory-approved complement pathway inhibitors on complement-related adverse reactions to nanomedicines.

Simon Robson

Targeting of Defined ENTPD/CD39 Ectonucleotidases to Inflame Tumors

Brigham and Women's Hospital, and Department of Anesthesia, Critical Care and Pain Medicine, Center for Inflammation Research, Beth Israel Deaconess Medical Center (S.C.R.), Harvard Medical School, Boston, MA

Background & Aims: Ectonucleotidases of the CD39 family, e.g., ENTPD1 (CD39), ENTPD3 (CD39L3), and others, convert the danger molecule, extracellular ATP released by immune and cancer cells, to immunosuppressive adenosine, potentially causing tumor immune evasion. Emerging evidence also implicates both ENTPD1 and ENTPD3 activity in metabolic dysregulation, linking these ectoenzymes to insulin resistance, metabolic syndrome, and potentially to the development of cachexia. Colorectal cancer (CRC) is a major public health burden, where tumor progression and systemic cachexia increasingly pose critical challenges in large numbers of patients. We have explored the functionality of ENTPD1 and ENTPD3 in both modulating the tumor microenvironment (TME) and immunometabolism in experimental models of CRC and in clinical cohort studies.
Methods: The syngeneic MCA38 colorectal cancer model was tested in wild-type and global Entpd1 and Entpd3 knockout mice to evaluate tumor growth kinetics and delineate immune cell infiltration patterns through flow cytometry (CD45+CD11b+F4/80+ TAMs, Foxp3+ Treg, CD8+ T cells) and immunofluorescence (ENTPD3/CD206/CD86). Immune and extensive metabolic characterization was performed using Entpd1 null, Entpd3 null, as well as humanized ENTPD1 and ENTPD3 knock-in mice. All experiments included littermate controls with ≥6 independent replicates, analyzed by two-tailed Student's t-test. Analyses of human single-cell sequencing data in the "Single Cell Portal database" and mouse transcriptome studies were completed.
Results: Genetic ablation of Entpd1 or Entpd3 in mice significantly inhibited MCA38 tumor growth in vivo. Spatial analysis of these tumor microenvironments confirmed Entpd1 expression in regulatory T cells (Treg), tumor-associated macrophages (TAM), and endothelial cells. Depletion of such suppressive cells, TAM, and the targeting of tumor vasculature was achieved by administration of afucosylated anti-CD39 antibodies, resulting in activation of antibody-dependent cellular cytotoxicity. In contrast, ENTPD3 expression was noted in CD206+ M2-polarized macrophages at the invasive tumor margins, being absent in M1 macrophages (CD86+) and normal colonic tissues. ENTPD3 expression was also seen on CD45-CD31-CD34+CD38+ preadipocyte populations and on plasmacytoid dendritic cells. Human single-cell data revealed that human adipocytes and adipose tissue macrophages both express ENTPD3. Such ENTPD3 enrichment was also noted in orexin-producing hypothalamic neurons, with RNA-FISH confirming precise co-localization with hypocretin.
Conclusions: ENTPD1 and ENTPD3 are multifaceted immune and metabolic regulatory factors in CRC that contribute to immune evasion and metabolic dysfunction. ENTPD1 and/or ENTPD3 inhibition might effectively target these critical aspects of pathogenesis. Evolving data support further development of novel therapeutic strategies to target ENTPD1 and/or ENTPD3 in advanced CRC, with potential benefits for both tumor control and improved metabolic homeostasis in these disease settings.

Steven Hayes

The Ergodic Illusion: How Normative Statistics Mislead the Life Sciences

University of Nevada, Reno, NV, USA

The life sciences have long relied on normative statistics, assuming that aggregate-level averages reliably represent processes in particular organisms—a premise rooted in the ergodic theorem, which equates ensemble statistics (averaged across units of targeted complexity) with time-averaged trajectories (within these units over time). In some areas of physical science this is a plausible assumption, but not in the life sciences. The resulting "ergodic illusion" has profoundly misled fields from psychology to biology by masking idiosyncratic heterogeneity and path-dependent dynamics. In this talk, I will introduce idionomics, a paradigm that prioritizes modeling processes longitudinally at lower levels of complexity and basing nomothetic generalizations on those data provided they do not distort the idiographic information. Idionomics uses tools such meta-analytic heterogeneity indices (e.g., I^2) to quantify non-ergodic variance.

In psychology, idionomics reveals that processes such as mindfulness and psychological flexibility unfold uniquely over time, with traditional assessments failing to predict outcomes due to violated ergodicity assumptions. For instance, intensive longitudinal data show high interpersonal variability in experiential avoidance, challenges one-size-fits-all interventions. Thus process-based therapies need to be tailored to personal networks.

By dismantling the ergodic illusion, idionomics bridges these disciplines, fostering personalized approaches in psychology, psychiatry, medicine, and public policy. This talk proposes empirical pathways that can promote a shift toward heterogeneity-aware statistics for more accurate, impactful work in the life sciences.

Timothy Lyons

Newly Emerging Threats at the Intersection Between Climate Change and Human Health

Department of Earth and Planetary Sciences and the Alternative Earths Astrobiology Center, University of California, Riverside, CA USA

I am a geochemist interested in the history of microbial life and its surroundings. My journey has taken me full circle from today's oceans, to our distant past and planets far away, back to modern Earth and its crushing human footprint. I work within the complementary research spheres of astrobiology, geobiology, and biogeochemistry. Genomic, geologic, and geochemical tools are used to define temporal slices, or 'alternative Earths,' that track across the beginnings and subsequent expansion of microbial innovations and ecosystems over billions of years. The related drivers and consequences of first-order environmental change are revealed, most notably, in the oxygenation histories of our oceans and atmosphere. This work is now providing an important framework in the search for life on extrasolar planets light-years away and the pathways to life on early Earth.
This experience has led me in recent years to the topic of this presentation: our rapidly changing planet. I will highlight challenges to ecological and human health linked specifically to shrinking terminal lakes throughout the world and permafrost thaw in the Arctic. Lakes in arid and semi-arid regions around the world are facing rapidly declining water availability and quality, leading to devastating shifts that include toxic waters and receding shorelines releasing harmful dust and airborne pathogens to surrounding regions. At higher latitudes, permafrost thaw over the past several years is a large-scale driver of degrading water quality in previously pristine rivers. This unexpected consequence of global warming is threatening fish populations and the well-being of first-peoples communities living along these rivers.

Tiziana Cappello

Effects of Microplastics and Associated Contaminants on the Embryo-larval Development and Reproductive Health of Different Aquatic Species

Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, Messina 98166, Italy

The extensive use of predominantly non-degradable plastic-made materials has inevitably led to their accumulation in landfills, resulting in the spread in the environment of new toxic compounds. Once released, plastic is fragmented into smaller particles that can reach the micro scale size, known as microplastics (MPs, <5 mm), posing an increasing threat to the health of aquatic organisms due to their tiny size and role as carriers for other pollutants ("Trojan-Horse effect"), being able to affect organisms at different stages of their life cycle. In the context of the funded project PRIN 2020 (20204YRYS5_003), EMBRYOMICS aims to unveil the reprotoxicity of MPs, alone or combined with bisphenol A (BPA), on the reproductive function of aquatic biota: from gametogenesis to embryo/larval development with a focus on the metabolic pathways related to reproduction. In detail, within EMBRYOMICS, organisms from different evolutionary level have been selected as model species, such as sea urchins, mussels, zebrafish and frogs. In these study cases, the adverse effects of polystyrene MPs (PS MPs, 1 and 5 µm; 10 µg/mL) and bisphenol A (BPA; 5 and 25 µM), alone and conjugated, were assessed on the early life stages of the selected animal models by a multi-biomarker approach, integrating embryotoxicity assays, morphological evaluation, metabolomics, and enzymatic biomarkers of oxidative stress and neurotoxicity. Overall, size-dependent accumulation of PS MPs was observed. The two doses of BPA significantly altered the normal larval development, inducing skeletogenic defects at 5 µM and development arrest at 25 µM, whereas when adsorbed onto MPs exhibited mitigated toxicity, even with a higher internalization of particles. The high-throughput protonic Nuclear Magnetic Resonance (1H NMR)-based metabolomics revealed significant alterations in neuromodulatory, energetic, and osmoregulatory pathways in all treatments. Similarly, enzymatic assays indicated redox imbalance and inhibited acetylcholinesterase activity. While both PS MPs and BPA, alone and conjugated, induced impaired embryogenesis, surprisingly no synergistic effect between the toxicants was observed in seawater, likely due to the low sorption capacity of BPA on PS MPs. The absence of a synergistic effect between PS MPs and BPA suggests that, under the tested acute exposure conditions, MPs may modulate rather than exacerbate BPA toxicity. Nonetheless, their co-occurrence can influence exposure routes and developmental processes, with relevant ecological implications for invertebrate early life stages. Therefore, even weak and transient particle-pollutant interactions can modulate contaminant behaviour and toxicity, reinforcing the need to incorporate adsorption/desorption dynamics rather than mixture scenarios into environmental hazard assessments of emerging pollutants.

Umberto Crisanti

Heal Yourself: Visualisation, Inner Intelligence, and the Neuroscience of Healing

Psychotherapist in Private Practice, Canterbury, Kent England

This presentation bridges neuroscience with ancient contemplative practices to explore how guided visualisation can activate the body's natural capacity for healing. During the presentation, you will be introduced to simple, science-informed tools—and practise them with me—to create a felt sense of safety and repair, helping the nervous system shift from survival to restoration. Research shows that these practices can reduce amygdala activity (linked to fear and hypervigilance) and engage the prefrontal cortex, supporting emotional regulation, meaning-making, and long-term resilience. In this state of coherence, the body becomes more open to emotional and physiological healing.

Yunlu Dai

Metal coordination biomaterials for anticancer immunotherapy

University of Macau

Metal coordination biomaterials are an emerging class of functional platforms for drug encapsulation and targeted delivery. We engineered a library of coordination derived building blocks (e.g. PEGylated polyphenol derivatives, hyaluronic acid polyphenol conjugates) and layered double hydroxides (LDH) to address critical limitations of conventional anticancer agents. These limitations included poor stability, does-limiting toxicities, and short systemic circulation. These components were assembled into multifunctional metal coordination systems. These systems enable tumor microenvironment responsive drug release. Our platform capitalizes on the innate immunomodulatory properties of metal ions to actively regulate antitumor immunity. It integrates conventional therapies (surgery, radiotherapy) with cancer immunotherapy with a unified biomaterials framework. This synergistic approach improves therapeutic efficacy and facilitates mechanistic investigations into the underlying biological processes. This presentation showcases our recent breakthroughs via using coordination biomaterials for next generation cancer immunotherapies.

USERN Junior Talks (in-person & virtual) and Poster Presentations

Ali Rezvanimehr

In Silico Evaluation of FDA-Approved Multi-Inhibitors for MMP14-Associated Proteins in Glioblastoma: Docking, Pharmacokinetic, and Dynamics Insights

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Glioblastoma multiforme (GBM) is a highly invasive brain tumor with dismal prognosis and limited therapeutic options. Targeting extracellular matrix (ECM) interactions, particularly those involving matrix metalloproteinase-14 (MMP14), represents a promising therapeutic strategy. This study aimed to identify FDA-approved multi-target inhibitors capable of disrupting the MMP14-associated interactome.

An MMP14-centered protein–protein interaction (PPI) network was constructed, and proteins with interaction scores greater than 0.5 were evaluated for co-upregulation with MMP14 using TCGA datasets ($r > 0.5$). Transcriptomic analysis further identified genes highly expressed in GBM samples. High-throughput docking of 1,615 FDA-approved drugs from the ZINC15 library was then performed against prioritized ECM proteins, followed by assessment of drug-likeness, ADMET properties, and blood–brain barrier (BBB) permeability. Structural dynamics simulations were conducted to validate the stability of drug–MMP14 complexes.

Six overlapping proteins—HSPG2, ADAM9/10/12, Furin, ITGA5, BMP1, and TGFB3—were identified as highly expressed and suitable for inhibitor design. Docking analyses revealed several FDA-approved compounds with favorable multi-target binding profiles across MMP14 and its interactome partners. Top candidates demonstrated stable interaction dynamics and acceptable pharmacokinetic features, including predicted BBB penetration.

This computational drug repurposing study highlights FDA-approved compounds with potential to achieve multi-inhibition of the MMP14-associated ECM interactome in GBM. These findings provide a rationale for ECM-targeted therapeutic strategies and establish a foundation for subsequent preclinical validation.

Keywords: Glioblastoma, MMP14, extracellular matrix, drug repurposing, molecular docking, pharmacokinetics.

Alireza Maboudi

Electrospun Hyaluronic Acid–PVA Mats Loaded with Probiotics for Wound Dressing: Preparation and In Vitro Evaluation

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Infectious wounds pose significant challenges, especially with the growing issue of antibiotic resistance, which makes traditional antibiotic treatment less effective. For this reason, recent research has been seeking alternative types of treatment using probiotics. This research aim to was to fabricate and assess electrospun hyaluronic acid/polyvinyl alcohol (PVA) fibers incorporating Micrococcus luteus for wound management. The PVA/hyaluronic acid fibers were fabricated with electrospinning and crosslinked by dry heat treatment. Fiber morphology before and following crosslinking was also investigated using scanning electron microscopy (SEM). Further tests, such as Fourier-transform infrared spectroscopy (FTIR) and mechanical strength analysis, were conducted on the optimized crosslinked sample. Water vapor transmission rate (WVTR) was also measured to evaluate suitability for wound dressing applications. Micrococcus luteus in polyethylene oxide (PEO) was electrosprayed on the fibrous mat, and probiotic viability was tracked for 28 days. Antibacterial activity against Staphylococcus aureus and Pseudomonas aeruginosa were evaluated. Biocompatibility and wound healing potential were evaluated through MTT and scratch closure tests at 0, 4, and 24 hours. The fibers produced were 202 ± 23 nm, with a decrease in diameter following crosslinking. FTIR verified the esterification of the polymers. Mechanical testing showed appropriate ability for wound application, while WVTR results demonstrated the material's capability to maintain a moist environment. The probiotic remained viable and also inhibited both pathogens successfully. MTT results showed over 80% cell viability, demonstrating high biocompatibility. The scratch assay also demonstrated full wound closure within 24 hours, confirming the wound dressing's strong healing potential.

Keywords: Electrospinning, Probiotic, Micrococcus luteus, Poly vinyl alcohol, Hyaluronic acid

Alma Naseri

Next Generation Therapeutics: Drug Delivery Applications Bioactive Compounds from Superfoods

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The growing intersection between nutrition, immunology, and pharmaceutical sciences is driving a new era of next-generation therapeutics. Among the most promising developments is the application of bioactive compounds derived from superfoods in targeted drug delivery, which leads to the modulation of immune function, particularly through the enhancement of peripheral immune tolerance. Superfoods such as berries, oats, turmeric, mushrooms, green tea, and marine algae are rich in bioactive molecules, including polyphenols, flavonoids, alkaloids, omega-3 fatty acids, peptides, and prebiotic fibers. These compounds have demonstrated a wide range of biological effects, such as antioxidant, anti-inflammatory, antimicrobial, and immunomodulatory actions. Recent advances in nanocarrier-based drug delivery systems have led to targeted and controlled release of compounds, enhancing their stability, bioavailability, and tissue-specific efficacy.

Recent evidence highlights the essential role of specific bioactive compounds in promoting peripheral immune tolerance, which is crucial for preventing autoimmune disorders and allergic reactions. Loss of this tolerance is a hallmark of many chronic conditions, including allergies, type 1 diabetes, multiple sclerosis, and inflammatory bowel diseases. β-glucans, butyrate, and anthocyanins play significant roles in activating regulatory T cells (Treg), enhancing the tolerogenic properties of dendritic cells, and influencing the gut microbiota-immune system interaction. Liposome-derived molecules, hydrogels, and microemulsions precisely deliver superfood-derived molecules to immune tissues and mucosal surfaces, minimizing their degradation and enhancing their immunomodulatory effects. Superfoods that are rich in probiotics and functional nutraceuticals help induce oral tolerance and reduce chronic inflammation. Furthermore, these findings are redefining the concept of food as medicine, as functional diets enriched with immune-regulating compounds are increasingly seen as viable adjuncts or alternatives to conventional pharmacological interventions.

Combining bioactive compounds from food with immune modulation presents a promising approach to precision dietary therapy. Superfoods can serve both as nutritional components and as a delivery system for immunoregulatory agents. The integration of omics, nanoformulations, and immunoengineering is creating a positive outlook for future treatments of autoimmune disorders, allergy prevention, and maintaining gut-immune balance.

AmirMohammad Amouzadeh Samakoush

Chimeric Antigen Receptor (CAR) Therapies in Retinoblastome

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Retinoblastoma is the most common type of intraocular cancer found in children, and it presents significant challenges in the field of pediatric ophthalmology. Therapeutic interventions in retinoblastoma primarily aim to preserve life, surviving ocular, and preserving vision. The second goal is the quality of the patient's life. Although conventional treatments like chemotherapy, radiotherapy, and enucleation increase survival rates, they often result in vision loss, secondary malignancies, and long-term complications. As pediatric oncology advances, the development of targeted therapies that ensure survival while preserving ocular integrity and optimizing quality of life has become increasingly important. A decade ago, immunotherapy was considered an exciting treatment method for advanced cancers. Today, it contains the core of cancer therapy.

CAR T cell therapies are a form of immunotherapy with tremendous effects on advanced cancers, with some patients experiencing extended periods of disease eradication. Engineering T cells from retinoblastoma patients to express synthetic receptors that recognize tumor-specific antigens is known as CAR therapy, which can effectively attack cancer cells while preserving healthy cells. Preclinical studies have shown the feasibility of targeting these tumor-specific antigens, such as GD2, B7H3, and CD171. The fourth generation of CAR constructs, also known as armored CAR, has advanced by incorporating multiple co-stimulatory domains, which enhance T-cell persistence, proliferation, and anti-tumor activity.

One of the most important challenges in applying CAR T-cell therapy to ocular tumors is the eye's immune-privileged environment. This unique environment, which prevents inflammation and preserves visual function, also presents a barrier to effective immune cell infiltration and activation. CircRNA-engineered CAR-T cells and the use of immune-stimulatory oncolytic viruses are innovative strategies designed to overcome the eye' s special environment.

Although clinical stages require more evidence, preclinical models show promising results, establishing CAR therapy as a next-generation treatment for retinoblastoma. Further research is needed to enhance this approach's effectiveness in young patients.

Arash Esmaeili

Immunomodulatory, Diagnostic, Prognostic and Therapeutic Dimensions of Exosomal MicroRNAs in Glioblastoma Multiforme

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Glioblastoma multiforme (GBM) is a complex and aggressive Central Nervous System (CNS) tumor that has a poor prognosis, and restricted therapeutic options are available despite the increasing research conducted. Moreover, the cells in our body package microRNAs, ubiquitous modulators of numerous biological processes, into exosomes for cell-to-cell signaling. Indeed, exosomal miRNAs contribute to several aspects of glioma, such as development, occurrence, metastasis, and immune evasion. Additionally, exosomal miRNAs play a key role in cellular functions and glioma pathogenesis by regulating numerous pathways, including the Wnt/β-Catenin, PTEN/PI3K/Akt, EGFR/MAPK, Notch Signaling, and NF-κB. Notably, exosomal miRNAs are recognized to have promising potential in clinical applications; in fact, exosomal miRNAs are emerging biomarkers for glioma diagnosis and prognosis, and are additionally considered as putative therapeutic candidates by inhibiting tumor progression, occurrence, and metastasis. This review presents the current knowledge regarding clinical potential and application of exosomal miRNAs in glioma, as well as the miRNA-mediated regulatory network underlying glioma immunopathogenesis.

Keywords: Glioma, Astrocytoma, miRNA, Extracellular Vesicles, Non-invasive diagnosis, Immunosuppression.

Arta Ghalehbaghi

AI's Role in Diagnosis and Care of Fibromyalgia Syndrome; A Narrative Review Over Future and Challenges

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Fibromyalgia (FM) syndrome is a common complex clinical condition due to its multifactorial symptoms, subjective nature, and lack of definitive diagnostic tests, making it hard for many doctors to distinguish FM patients from Chronic Fatigue Syndrome (CSF), Rheumatoid Arthritis, Lupus, etc. patients. Recent advances in Artificial Intelligence (AI) have built new pathways into more efficient ways of diagnosis and care of many diseases. FM is not excluded either. With many new machine learning models being structured for pattern recognition, diagnostic support, patient stratification and personalized treatment planning AI has shown growing achievements in diagnosing and care of FM syndrome. However, many notable challenges or also springing up with machine learnings when used in care process such as data variability, ethical concerns, and the integration of AI into routine clinical practice. In this narrative review we discuss how machine learning models are being used for diagnosis and treatment of fibromyalgia. By analyzing current literature and future directions, this review also examines the potential of AI to transform FM syndrome care while addressing main limitations and challenges in the way and some recommended solutions and ideas for them.

Keywords: Fibromyalgia , Artifical Intelligence , Machine Learning

Azin Dokht Afifi

Neurotherapy and Cognitive Enhancement: Can We Boost Intelligence for Better Health?

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Neurotherapy refers to a range of non-invasive techniques aimed at altering brain activity to improve cognitive function. In recent years, non-invasive brain stimulation techniques such as rTMS and tDCS have gained attention for their therapeutic potential in treating mental health disorders like depression and ADHD. These techniques, along with neurofeedback, offer innovative approaches for cognitive enhancement and psychological interventions. This abstract explores the application of neurotherapy, with a focus on neurofeedback, and compares its efficacy to rTMS and tDCS in the treatment of various mental health conditions. Recent studies have indicated that these techniques not only aid in the treatment of psychological disorders such as depression and anxiety but also have the potential to enhance cognitive abilities. The question arises: Can neurotherapy be used to boost intelligence and improve mental health? This presentation aims to explore the effects of neurotherapy on cognitive enhancement and mental health. It will examine the foundational principles of neurotherapy, various techniques used, and the existing evidence supporting their impact on cognitive function and quality of life. Additionally, the presentation will discuss the potential for neurotherapy to enhance cognitive performance in healthy individuals and reduce the negative effects of stress and trauma.

This presentation will review existing research on neurotherapy and its role in cognitive enhancement. Empirical findings regarding various techniques, such as rTMS and neurofeedback, particularly in relation to memory, attention, and problem-solving, will be discussed. Moreover, the psychological benefits of these interventions, including increased cognitive flexibility and reduced symptoms of anxiety and depression, will be analyzed.

It is anticipated that neurotherapy, especially techniques like rTMS and neurofeedback, can significantly improve cognitive performance and boost intelligence. Furthermore, these interventions may alleviate symptoms of anxiety and depression, ultimately contributing to improved mental health and quality of life.

Neurotherapy holds promise as an effective tool for enhancing cognitive function and mental health. Given the growing body of evidence supporting these interventions, further research could lead to the development of new, effective treatments for cognitive and psychological disorders. This research suggests that neurotherapy may offer an innovative solution for enhancing cognitive abilities and improving life quality across diverse populations."

Keywords: Neurotherapy, Neurofeedback, rTMS, tDCS, Brain Stimulation,, Mental Health Disorders, Cognitive Enhancement, Depression Treatment, ADHD Treatment, Non-invasive Brain Stimulation, Cognitive Neuroscience, Psychological Interventions, Neuroscience of Mental Health

Azin Arafi

The Approach of CRISPR-Cas9 in Gene Editing for beta-Thalassemia Therapy: A Narrative Review

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Thalassemia is the most prevalent autosomal recessive single-gene disorder globally and one of the most important hemoglobinopathies. According to evidence It is expected that the number of thalassemia cases increase significantly in the future. Traditional supportive treatment has significant challenges for patients, public health systems and economies. After years of depending on blood transfusions to manage anemia and suppress ineffective erythropoiesis in beta-thalassemia recently new treatment methods have been developed. Gene editing encompasses a range of techniques. Among them, CRISPR/Cas9 offers greater precision, higher efficiency, and faster operation. This technology enables the correction of genetic defects, creating two primary therapeutic strategies for treating thalassemia: First, by restoring functional beta-globin synthesis and normalizing its levels alongside a reduction in alpha-globin expression, thereby reducing ineffective erythropoiesis through a balanced chain ratio. Second, it can reactivate fetal hemoglobin (HbF) production. This reactivation is achieved by inhibiting B-Cell Lymphoma/Leukemia 11A)BCL11A(. By increasing levels of HbF, which is normally produced only during fetal development, complications of beta-thalassemia can be reduced, thereby decreasing patients; reliance on regular blood transfusions. The suppression of γ-globin expression, a vital step in hemoglobin switching, is largely carried out by the regulatory protein BCL11A in mature erythroid cells.
CRISPR/Cas9-mediated disruption of the BCL11A gene leads to a rise in HbF. Despite all CRISPR benefits, the clinical translation of CRISPR faces technical hurdles such as off-target effects, inefficient delivery systems, and scalability challenges for widespread use. Future research findings will dictate whether CRISPR capacity to modulate hemoglobin expression can yield a spectrum of definitive therapeutic strategies for thalassemia.

Keywords: Beta-thalassemia, Gene editing, CRISPR-Cas9, Fetal hemoglobin, BCL11A

Chiman Daneshyar

Ocular Gateway to Peace: A Comprehensive Review of Visual-Affective Dysfunctions in Medical and Neuropsychiatric Disorders, and the Modulatory Roles of Environmental Factors and Intelligence

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The human eye is not only a primary sensory organ but also a fundamental gateway for emotional and social communication. Visual-affective processing, including gaze interpretation and facial emotion recognition, plays a crucial role in fostering empathy, trust, and conflict prevention. Disruptions in this process—whether due to medical and neuropsychiatric disorders or environmental factors—can lead to emotional misinterpretation, reduced empathy, and heightened tension.

This comprehensive review aims to examine the impact of visual-affective dysfunctions in systemic, neurological, metabolic, structural, psychiatric, and immunological disorders, and to analyze the modulatory roles of intelligence and environmental factors (including microgravity and atmospheric changes) in this process. Potential applications in clinical rehabilitation, psychiatric care, intercultural communication, space medicine, and technology-based empathy training are also discussed.

A comprehensive review was conducted using PubMed, Scopus, and Web of Science databases up to 2025. Keywords included "visual-affective," "empathy," "neuropsychiatric disorders," "ocular," "intelligence," and "environmental factors." Studies were selected based on relevance to the vision–emotion interface and scientific quality.

A wide range of conditions—including multiple sclerosis, Parkinson's disease, epilepsy, diabetes, traumatic brain injury, PTSD, autism, and schizophrenia—can disrupt the neural pathways responsible for integrating visual input with emotional responses. In many patients, this leads to diminished empathy and an increased tendency to perceive visual cues as threatening. Evidence also suggests that microgravity and environmental factors can influence intracranial pressure and visual pathways.

Preserving the integrity of visual-affective systems and leveraging the modulatory role of intelligence may be key in preventing emotional misinterpretations and promoting both interpersonal and global peace. These findings highlight the importance of interdisciplinary approaches in medicine, psychiatry, and aerospace health.

Keywords: Intelligence, neuropsychiatric disorder, visual-affective, empathy, aerospace

Fatemeh Abouzari

The Role of Psychological Flexibility, Difficulty in Emotion Regulation, and Intolerance of Uncertainty in Predicting Psychological Distress and Obsessive-Compulsive Symptoms in Patients with Type 2 Diabetes During the COVID-19 Pandemic

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Improving patients' adherence to therapeutic recommendations consistently remained a key focus for healthcare providers. The present study, therefore, examined whether emotion-regulation difficulties, distress tolerance, and perceived stress can predict meaningful levels of treatment adherence in individuals with type 2 diabetes.
Employing a descriptive-correlational design, all patients with diabetes who visited health centers in Sanandaj during 2022 formed the study population. Using convenience sampling, 230 patients were selected and completed the Difficulties in Emotion Regulation Scale, the Distress Tolerance Scale, the Perceived Stress Scale, and the Treatment Adherence Scale. Data were analyzed with Pearson correlation coefficients and multiple regression.
Emotion-regulation difficulties and perceived stress were both negatively and significantly associated with treatment adherence ($P < 0.01$), whereas distress tolerance showed a positive, significant association with adherence ($P < 0.01$). Collectively, the three psychological variables accounted for 69.6 % of the variance in treatment adherence.
These findings underline the importance of incorporating mindfulness-based stress reduction programs and emotion-focused therapies into standard care in clinics and hospitals. These methods can help people with type 2 diabetes to take their medication better, lead healthier lives, and better control their blood glucose levels.

Keywords: Emotion regulation, distress tolerance, perceived stress, treatment adherence, type 2 diabetes

Fatemeh Gharib

Topographical Mapping of Multiple Sclerosis Lesions and Their Clinical Correlates

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Multiple sclerosis (MS) can have widely varying symptoms in different patients because lesions are located in various regions of the central nervous system. Understanding the relationship between lesion location and symptoms can help to explain this diversity and potentially improve patient care.
This review updates the latest evidence on MS lesion locations and their clinical outcomes.
A narrative review of nine peer-reviewed articles from 2010 to 2024 was conducted. Articles were searched in PubMed and Scopus using keywords "multiple sclerosis," "MRI," "lesion mapping," and "clinical correlates." Studies were included if they examined lesion location and its relation to neurological or neuropsychiatric symptoms.
Lesions in frontal and parietal pathways were frequently linked to fatigue and cognitive problems. Cortical and subpial hotspots of lesions were associated with long-term disability. Frontal and parietal white matter involvement was related to depression, and spinal cord lesions to sexual dysfunction. Lesion mapping was also shown to be useful for predicting disease progression years after a clinically isolated syndrome. Ultra-high-field MRI improved differentiation of MS lesions from non-specific white matter changes, though the integration of such techniques into routine clinical practice remains challenging.
Imaging of MS lesions helps explain symptom heterogeneity across patients and can guide predictions of disease course. Integrating advanced neuroimaging into clinical practice can tailor prognosis and more directly inform individualized treatment. Further standardized studies are needed to better translate research findings into patient care.

Keywords: Multiple sclerosis, MRI, lesion mapping, clinical correlates

Fatemeh Kefayat Manesh

tACS: A Novel Therapeutic Approach to Alzheimer's Disease

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Alzheimer's disease (AD), the most prevalent cause of dementia worldwide, is characterized by progressive neurodegeneration, cognitive impairment, and the accumulation of amyloid-β and tau pathology. While pharmacological treatments provide modest symptomatic relief, non-invasive neuromodulation techniques such as transcranial alternating current stimulation (tACS) are emerging as promising therapeutic alternatives. tACS delivers low-amplitude sinusoidal currents through the scalp to modulate endogenous neural oscillations. Gamma-band tACS (~40 Hz) has attracted specific interest due to its capacity to entrain oscillatory activity involved in memory consolidation and cognitive processing, functions notably impaired in AD.

Preclinical studies have demonstrated that gamma stimulation can reduce amyloid burden and improve synaptic function. Recent human trials indicate that gamma-tACS is safe, well-tolerated, and potentially efficacious in enhancing working memory, attention, and sleep quality in patients with mild cognitive impairment (MCI) or early-stage AD. Furthermore, long-term and home-based tACS protocols are being explored to ensure feasibility and improve treatment adherence. Clinical designs increasingly emphasize individualized dosing, precision electrode targeting, and multimodal outcome measures including EEG and behavioral assessments.

Despite these advances, the mechanism of action remains incompletely understood, and long-term efficacy data are limited. Challenges include optimal stimulation parameters, individual variability in responsiveness, and the integration of tACS into comprehensive care models. Ethical and regulatory considerations also persist, particularly in vulnerable populations with cognitive decline. Nonetheless, the rapid evolution of tACS technology and its potential to modify disease progression, not just symptoms, positions it as a compelling frontier in AD therapeutics.

Keywords: Alzheimer's disease - transcranial alternating current stimulation - brain stimulation

Hamoon Baghaei

Stem Cell Therapy for Urethra and Ureter Tissue Engineering: A Systematic Literature Review on Animal Studies

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The present study investigates the optimal stem cells for using in ureter and urethra tissue engineering by systematically reviewing the literature. Scopus, PubMed, and Embase databases were searched up to December 2024 to find original studies investigating ureter and urethra tissue engineering by seeding stem cells on the scaffolds in animal models, which resulted in the identification of 1191 studies. Finally, 26 studies were included. Eighteen and eight studies tried urethra and ureter tissue regeneration, respectively. Adipose-derived stem cells were the most commonly used for tissue engineering of the ureter and urethra, with 14 studies. Bone marrow-derived stem cells were involved in 5 studies, urine-derived in 3, muscle-derived stem/precursor cells in 3, and human amniotic membrane-derived mesenchymal stem cells in 1. Bladder acellular matrix, artery extracellular matrix, and small intestinal submucosa were non-synthetic seeded scaffolds that were used in 10 studies. However, studies used biomaterial and synthetic scaffolds, including Poly (l-lactide-co-caprolactone) nano yarn, Poly-glycolic acid, nanofiber, double-modified sulfated bacterial cellulose, and silk scaffold more frequently. Data demonstrated that adipose-derived, bone marrow-derived, urine-derived, and human amniotic membrane-derived stem cells have the capability of both urothelium and smooth muscle regeneration in urethra reconstruction. Furthermore, seeding bone marrow-derived stem cells can improve collagen and vessel formation. Also, this study showed that the muscle-derived SCs or precursor cells are able to regenerate urethra smooth muscle, but data are limited. Hypoxia precondition, subcutaneous or omental pre-incubation, fibroblast growth factor receptor overexpression, and mechanical extension stimulation were employed as boosting conditions. However, data about ureter tissue engineering are limited. Adipose-derived stem cells were the most frequently employed for ureter tissue regeneration, with appropriate outcomes for both urothelium and smooth muscle regeneration however, other types of stem cells should be more investigated for ureter tissue engineering.

Keywords: Stem cell, Tissue engineering, Bioengineering, Guided tissue regeneration, Urethra, Ureter

Kiarash Saleki

Isoform-Selective PI3Kδ Inhibitors for Activated PI3Kδ Syndrome — A Structure-Guided, Fragment- and Peptide-Based Discovery Approach

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Activated PI3Kδ Syndrome (APDS) is a rare inborn error of immunity caused by gain-of-function mutations in PIK3CD or PIK3R1, resulting in chronic PI3Kδ hyperactivation with clinical manifestations ranging from recurrent infections to lymphoproliferation and increased malignancy risk. Current management is largely symptomatic; although the PI3Kδ inhibitor leniolisib demonstrates clinical benefit, limitations including off-target toxicity, variable efficacy and potential resistance motivate discovery of next-generation, highly selective PI3Kδ inhibitors.

We implemented an integrated in silico discovery pipeline combining structure-based design, fragment-based lead discovery (FBDD), and high-throughput peptide screening. The PI3Kδ–leniolisib co-crystal structure (PDB: 9NQ) was analyzed to define binding hotspots and reactive residues. Virtual libraries of small molecules and electrophilic fragments were docked (AutoDock Vina / Glide) with prioritized covalent docking against candidate cysteines; top complexes underwent 50–100 ns molecular dynamics simulations (GROMACS/AMBER) to assess stability (RMSD, RMSF, hydrogen bonds, Rg). Parallel computational screening of linear and macrocyclic peptide libraries (PEP-FOLD / Rosetta; HADDOCK docking) identified peptide binders to unique surface pockets. Leads were filtered by predicted potency and selectivity (docking energy, MD stability) and evaluated for ADMET properties (SwissADME, pkCSM, admetSAR) and isoform selectivity against PI3Kα/β/γ.

The pipeline yielded a set of prioritized leads including small molecules, covalent fragment-derived scaffolds, and cyclic peptides. Multiple candidates met pre-defined in silico benchmarks: predicted sub-nanomolar to low-nanomolar binding affinity, >100-fold selectivity versus PI3Kα/β/γ in comparative docking, and favorable ADMET profiles (oral bioavailability, low hepatotoxicity risk, acceptable permeability). MD analyses showed sustained binding modes and key interactions recapitulating hotspots from the 9NQ structure. Peptide hits targeted non-conserved surface grooves, suggesting routes to isoform selectivity.

An integrative computational strategy successfully generated candidate PI3Kδ inhibitors with predicted high potency and isoform selectivity, including small molecules, covalent fragment derivatives, and engineered peptides. These in silico leads warrant biochemical validation and cellular assays in APDS-derived models. The platform provides a scalable framework for rapid discovery of safer, more selective kinase modulators for precision treatment of APDS and related immune disorders.

Keywords: Porphyromonas gingivalis, Alzheimer's disease, computational structure prediction, Immunoinformatics, molecular dynamics.

Kimia Kazemzadeh

Crocus Sativus (Saffron) Adjunct to Risperidone for Negative Symptoms of Schizophrenia: A Randomized, Double-blind, Placebo-controlled Trial

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Current treatments for schizophrenia encounter resistance, limited efficacy, and limiting complications, necessitating novel approaches. The effects of saffron on negative symptoms were investigated as it has shown neuroprotective and antipsychotic properties. Fifty-six clinically stable chronic schizophrenic outpatients were equally assigned to saffron 15 mg q12hr or placebo groups while continuing risperidone. The Positive and Negative Syndrome Scale (PANSS) was used to assess schizophrenia-related symptoms in weeks 4 and 8. Also, the patients were assessed for the Hamilton depression rating scale (HDRS) and adverse effects. The baseline characteristics of the groups were comparable (P s > 0.05). There were significant time-treatment interaction effects on negative (= 0.137), general psychopathology (= 0.193), and total (= 0.113) PANSS scores. Affirmatively, their reductions were significantly greater in the saffron group until weeks 4 (Cohen's d s = 0.922, 0.898, and 0.759, respectively) and 8 (Cohen's d s = 0.850, 1.047, and 0.705, respectively). Regarding the negative symptoms, a better 25% response rate was obtained in the saffron group until the endpoint (P = 0.003). The HDRS scores, extrapyramidal symptom rating scale scores, and side effect frequencies were comparable between the groups (P s > 0.05). Saffron was beneficial for primary negative symptoms of chronic schizophrenia in a safe and tolerable manner. It also outperformed placebo in improving general psychopathology and total symptoms

Keywords: Crocus sativus, saffron, risperidone, schizophrenia

Kosar Zolfaghari

Spectroscopic Signatures of Carbon Cluster Cations: Clues to Prebiotic Chemistry in Space

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Carbon cluster cations are an important class of reactive intermediates in astrochemical settings such as protoplanetary disks, circumstellar envelopes, and interstellar molecular clouds. They could be precursors in the stepwise chemical evolution from simple carbonaceous species to complex organic molecules because of their individual stability, structural diversity, and spectral characteristics. Interpreting astronomical observations and reconstructing the processes that might have seeded early prebiotic chemistry within cosmic environments depend on an understanding of their spectroscopic signatures.

With a focus on their visible, ultraviolet, and infrared spectroscopic fingerprints derived from both theoretical and laboratory methods, this review summarizes the state of knowledge regarding carbon cluster cations. Density functional theory (DFT) and time-dependent DFT (TD-DFT) analyses supporting structural and electronic characterization are discussed along with experimental techniques like laser ablation in molecular beams, mass-selected ion spectroscopy, photodissociation, cryogenic ion trapping, and messenger-tagging methods. We identify distinctive patterns among cluster geometries, such as linear, cyclic, and fullerene-type configurations, and associate these topologies with electronic transition and vibrational characteristics that correspond to diffuse interstellar bands (DIBs) and unidentified infrared (UIR) bands.

As catalytic or templating units for the synthesis of amino acids, nucleobases, or lipid-like precursors, carbon cluster cations may be important for prebiotic molecular assembly in addition to their astrochemical significance. Their ability to participate in molecular recognition and selective charge transfer may represent early analogues of biochemical reactivity that subsequently evolved into the response and recognition mechanisms typical of modern immune systems. This review highlights how carbon cluster cations help us understand chemical complexity, molecular evolution, and the earliest chemical underpinnings of life and molecular self-recognition in the cosmos by bridging spectroscopic insights with astrobiological implications.

Keywords: Carbon cluster, Astrochemistry

Mahsa Hosseini Kakroudi

The Role of Macrophage Polarization in Myocardial Infarction and Cardiac Repair

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Myocardial infarction (MI), a major complication of coronary artery disease, remains the primary cause of mortality worldwide. Although reperfusion treatments such as thrombolytic therapy and percutaneous coronary intervention (PCI) are significantly effective, restoring blood flow can also trigger ischemia-reperfusion (I/R) injury, which leads to inflammatory damage to surviving cardiomyocytes and increases the risk of heart failure. Among the multiple molecular and cellular mechanisms underlying I/R injury, macrophages play a crucial dual role. Due to their plasticity, macrophages can transform their phenotypes in response to environmental stimuli, influencing oxidative stress, cell death pathways, angiogenesis, fibrosis, and extracellular matrix remodeling. Classically, M1 macrophages induce inflammation, whereas M2 macrophages facilitate resolution and repair; yet, this binary paradigm is highly simplistic.

Recent advances in single-cell and spatial multi-omics technologies have revealed the transcriptional and spatial heterogeneity of cardiac macrophages, uncovering complex cellular niches and dynamic interactions with fibroblasts, endothelial cells, and immune cells. These findings offer a new therapeutic approach on reprogramming macrophage function to enhance cardiac healing, reduce fibrosis, and minimize cardiomyocyte loss.

This review attempts to provide a comprehensive overview of the immunological functions of macrophages in cardiac repair, summarizes emerging omics-based insights into macrophage heterogeneity, and explores how the integration of multi-omics data with immunoengineering strategies could lead to the development of macrophage-targeted therapies for myocardial infarction.

Mahsa Zargaran

Relationship between Apolipoprotein B to apolipoprotein A1 ratio and Metabolic dysfunction-associated steatotic liver disease in patients with type 2 diabetes

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The study was conducted to examine the relation between apolipoprotein B and apolipoprotein A1 ratio and Metabolic dysfunction-associated steatotic liver disease (MASLD) in patients with type-2 diabetes (T2D).

By reviewing the Diabetes clinic's archive, we collected all demographic, anthropometric and laboratory data of diabetic patients. In our study, we recruited 1057 patients, of whom 205 (19%) had NAFLD and 852 (81%) did not have fatty liver disease. In order to estimate Odd's Ratio of having fatty liver, we used binary logistic regression analysis, and receiver operating characteristic curves (ROCs) were used to determine the diagnostic accuracy of ApoB/ApoA1. 205 patients with NAFLD and 852 patients without fatty liver were recruited from the Diabetes Clinic's archive. Among the two groups with and without fatty liver, the average age was 53.3+9.5 and 57.6+9.8 years, respectively, and there was no gender difference. A regression analysis found that the ApoB/ApoA1 ratio was independently associated with NAFLD in patients with diabetes. After adjusting the confounding variables, higher levels of ApoB/ApoA1 are significantly associated with increased odds (Odd's Ratio) of NAFLD by 1.7 times.

A significant correlation was observed between the ApoB/ApoA1 tertile ratio category and fatty liver. NAFLD was significantly associated with higher serum triglycerides, LDL cholesterol, ApoB levels, and ApoB/A1 ratios. In contrast, participants with low HDL cholesterol and ApoA1 levels had a higher prevalence of NAFLD. According to these findings, high serum ApoB levels and low serum ApoA1 levels appear to be risk factors for coronary artery disease."

Keywords: MASLD, NAFLD, ApoB, ApoA1, Diabetes mellitus type 2

Mahshid Shahmoradi

Targeting the NKG2D Axis in Head and Neck Squamous Cell Carcinoma: From Molecular Insights to Clinical Applications

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Head and neck squamous cell carcinoma (HNSCC) is an aggressive cancer that evades immune surveillance by impairing the NKG2D receptor on natural killer (NK) cells and cytotoxic T lymphocytes. NKG2D recognizes stress-induced ligands (e.g., MICA, MICB, ULBPs) on tumor cells, but HNSCC tumors counteract this by shedding soluble ligands and secreting immunosuppressive cytokines like TGF-β1, reducing NKG2D expression and function. This review explores therapeutic strategies targeting the NKG2D axis to enhance HNSCC treatment. Cytokine therapies, such as IL-2 or IL-15, boost NKG2D-dependent NK cell activation. Monoclonal antibodies targeting MICA/B or ULBPs prevent ligand shedding and induce antibody-dependent cellular cytotoxicity (ADCC). Engineered cell therapies, including NKG2D-based chimeric antigen receptor (CAR)-T and CAR-NK cells, show potent preclinical efficacy against HNSCC. Combining these approaches with EGFR-targeted antibodies (e.g., cetuximab) or checkpoint inhibitors enhances NKG2D-mediated immunity. Despite promising results, challenges persist, including heterogeneous ligand expression, persistent shedding, and the immunosuppressive tumor microenvironment, which limit clinical efficacy. Future directions include multimodal strategies like bispecific NK-cell engagers and integration with chemoradiotherapy to overcome these barriers. By restoring NKG2D-driven immunity, these therapies hold potential to improve outcomes for HNSCC patients, though further research is needed to optimize their clinical translation.

Keywords: NKG2D, Head and Neck Squamous Cell Carcinoma (HNSCC), Natural Killer Cells, Immune Evasion, Immunotherapy

Mahta Bahri

Prevalence of Medication-Free Remission and its Predictive Factors in Patients with Rheumatoid Arthritis: A Real-World Longitudinal Cohort Study

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The integration of artificial intelligence (AI) into dental diagnosis and treatment planning signifies a promising development in various dental specialties. Additionally, via machine learning algorithms and deep learning techniques, AI systems may analyze extensive datasets of radiographic images, clinical records, and medical/dental histories, for the betterment of diagnosis and improvement of treatment outcomes. The large amount of the aforementioned data have been labeled to be used in such algorithms.
In addition, in periodontics, AI is used for early diagnosis of periodontal pockets, aided by image assessment. Predicting root canal morphology and establishing optimal treatment protocols, AI-driven technologies may be useful for upgrading the teaching methods in endodontics. Moreover, AI is involved in oral surgery for surgical risk assessment and preoperative planning to assist surgeons in optimizing surgical precision and increasing patient safety.
Also, AI in orthodontics allows for accurate prediction of tooth movements, custom-designed aligners, and prediction of overall treatment results. Furthermore, according to the recent study of the orthodontics department of Shahid Beheshti University of Medical Sciences, the AI model for generating high-quality facial profile images has been designed to produce realistic images that closely match real profiles, verified by quantitative metrics and a Turing test with orthodontists, surgeons, and laypeople.
In conclusion, AI technology may help clinicians create personalized treatment plans based on individual patient profiles, increasing the success rates of interventions and minimizing potential adverse events. The current presentation aims to explore the possible ways through which AI might affect clinician workflow efficiencies, lessen diagnostic errors, and enhance patient involvement through customized educational tools.

Keywords: Artificial Intelligence, Diagnosis, Orthodontics, Facial Profile

Maria Maisano

Gadolinium A Rare Earth Element (REE): A Smart Resource or a Danger to the Reproductive Health of Non-Target Aquatic Organisms?

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Gadolinium (Gd) is the most abundant rare earth element (REE) in Earth with a concentration of 6.2 mg/kg. Due to its natural ferromagnetic and paramagnetic properties, Gd is a strategic resource for today's economy, primarily in healthcare as a contrast agent for magnetic resonance imaging. Although the forms used for diagnostics appear to be non-toxic because chelated with other molecules that reduce toxicity, preserving water solubility, its widespread use has led to contamination and environmental bioaccumulation of Gd, especially in marine ecosystems. Therefore, the aim of the study was to evaluate the potential cytotoxic effects of GdCl3 and Gd2O3 isoforms on the male and female reproductive health of marine bivalve Mytilus galloprovincialis. To this end, the impact of two realistic concentrations (1 and 10 µg/L) of GdCl3 and Gd2O3 were tested in mussel gonads during a 28-day chronic exposure, evaluating the biological responses at T0, T7, T15, T28. The presence in gonads of hemocytes, as highlighted by the H/E histological staining, demonstrated the interference of GdCl3 and Gd2O3 in gonadal tissues of both sexes, while the dPAS/PAS histochemical assay allowed to understand the effect of Gd on primary energy reserves by demonstrating the presence of glycogen, an essential metabolite in the gonads for germ cell maturation. Preliminary data from 1H NMR metabolomics revealed overall metabolic disorders in male and female gonads, showing sex-related responses to the different experimental conditions. Overall, it is possible to confirm that both forms of Gd modulate energetic strategies in both sexes of mussels, and that this REE may represent a danger for the reproductive health of non-target aquatic organisms. This work was supported by PRIN PNRR 2022 - CUP B53D23024710001: "GADOlinium (Gd), an emergent contaminant, is a new threat to the living beings: a comparative study to assess its biological TOXcity in animal models (GADOTOX)"." Rare earth element; Gd; Mussels; Gonads; NMR Metabolomics.

Keywords: Rare earth element, Gd, Mussels, Gonads, NMR Metabolomics

Marjan Ahmadirad

Digital Pathways: Emerging Career Opportunities for Medical Students in the Evolving Landscape of Health Technology

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As healthcare undergoes rapid digital transformation, new career horizons are emerging for medical students that extend beyond traditional clinical roles. This narrative review explores the expanding spectrum of job opportunities at the intersection of medicine and digital innovation, ranging from telemedicine facilitation and health data analytics to artificial intelligence development and digital therapeutics. By examining current trends and real-world examples, the review highlights how medical students can leverage their clinical knowledge alongside digital skills to thrive in novel roles that improve patient outcomes and health system efficiency. Embracing these digital pathways offers not only professional growth but also a meaningful chance to shape the future of healthcare, fostering a new generation of clinician-innovators committed to compassionate, tech-enabled care.

Keywords: Digital health careers, Medical students job opportunities, Health technology roles

Martina Bozhkova

Humoral and Memory B Cell Responses Following SARS-CoV-2 Infection and mRNA Vaccination

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Understanding the duration and quality of immune memory following SARS-CoV-2 infection and vaccination is critical for informing public health strategies and vaccine development. While waning antibody levels have raised concerns about long-term protection, the persistence of memory B cells (MBCs) and T cells plays a vital role in sustaining immunity.
We conducted a longitudinal prospective study over 12 months, enrolling 142 participants in total either after natural infection or vaccination with BNT162b2 (Pfizer–BioNTech) or mRNA-1273 (Moderna). Peripheral blood samples were collected at four defined time points (baseline, 1-2 month, 6-7 months, 12-13 months after vaccination or disease onset). Immune responses were assessed through serological assays quantifying anti-RBD IgG and neutralizing antibodies, B-ELISPOT, and multiparameter flow cytometry for S1-specific memory B cells.
Both mRNA vaccines induced robust B cell and antibody responses, significantly exceeding those observed after natural infection. Memory B cell frequencies and antibody titers peaked at 6 months and declined by 12 months but remained above baseline. The mRNA-1273 vaccine elicited stronger and more durable humoral and cellular immunity compared to BNT162b2, likely influenced by its higher mRNA dose and longer prime-boost interval. Class-switched memory B cells and S1-specific B cells were significantly expanded in vaccine recipients, with more sustained responses in the Moderna cohort. Natural infection induced more heterogeneous and less durable immune memory.
mRNA vaccination, particularly with Moderna's mRNA-1273, generates stronger, more durable, and more functionally competent immune memory compared to natural SARS-CoV-2 infection or vaccination with Pfizer's BNT162b2. These findings highlight the importance of vaccination for establishing longer-term immunity and suggest that vaccine platform and dosage play critical roles in shaping durable protective responses against COVID-19.

Keywords: SARS-CoV-2, COVID-19, BNT162b2, mRNA-1273, B-cell memory, humoral immune response, antigen specific B-cells

Maryam Sadat Tonekaboni

Organic Chemistry Meets Machine Learning: Revolutionizing Bioremediation

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Bioremediation has long offered hope in tackling the complex and growing challenge of environmental pollution, but traditional methods often fall short due to their unpredictability and limited efficiency. Today, a new synergy is emerging as organic chemistry joins forces with machine learning, reshaping how we approach the cleanup of harmful organic contaminants. By leveraging advances in data science, researchers are now able to sift through vast streams of genomic and environmental information, uncovering subtle patterns in how microbes break down pollutants at the molecular level.

The integration of machine learning allows scientists to forecast the behavior of microbial communities, anticipate the fate of specific pollutants under various environmental conditions, and make smarter, faster decisions about which organisms and conditions are best suited for each cleanup task. This approach not only streamlines experimental design, saving valuable time and resources, but also opens the door to more precise, large-scale, and sustainable remediation strategies. From predicting the outcomes of bioremediation efforts in oil spills or contaminated water, to designing custom microbial blends for complex waste issues, machine learning is giving new life to the promise of organic chemistry.

Ultimately, as technology deepens our understanding of nature's processes, this partnership between fields marks a promising path forward—offering practical solutions to protect both human health and our environment with greater confidence and efficiency

Keywords: Bioremediation, Organic Chemistry, Machine Learning, Environmental Pollution, Microbial Degradation

Melika Abrishami

MicroRNAs in Mediating Stress Vulnerability and Resilience in Multiple Sclerosis

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Multiple sclerosis (MS) is an autoimmune and neurodegenerative chronic disease. MS is affecting the life quality of more than 2.8 million people around the world. It has been pinpointed that psychological stress has a meaningful influence on disease progression. Moreover, in MS patients, microRNAs (miRNAs) can reveal vulnerability and resilience to stress. In fact, miRNAs are small RNAs that do not code for proteins. However, they can regulate the expression of genes. The preclinical models, illustrate certain miRNA profiles associated with depression and resilience. Notably, miRNAs could influence stress vulnerability and disease severity by controlling the hypothalamic-pituitary-adrenal axis and immune cell function pathways. This review gathered clinical and preclinical evidence to examine under stress miRNA dysregulation and how it could worsen neuroinflammation and MS symptoms. Meanwhile, specific miRNAs promote resilience through adaptive immune modulation and neuroprotection. In addition, the medicinal benefits of miRNA-based interventions have been investigated. For instance, miRNA could mimic inhibitors to enhance resilience and reduce stress-induced MS worsening. This study aims to underline miRNAs as a novel approach for personalized MS management in psychological stress.

Keywords: Multiple sclerosis, microRNAs, Stress resilience

Mohammad Pourashory

Revolutionizing Diagnostics: The Role of Explainable AI in Enhancing Clinical Decision-Making

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Artificial Intelligence (AI) is transforming the medical landscape, with diagnostic systems emerging as one of its most impactful applications. However, the adoption of AI in clinical settings is hindered by concerns over trust, interpretability, and accountability. This presentation aims to explore the integration of Explainable AI (XAI) in medical diagnostics and bridging the gap between complex machine learning models and clinical transparency. State-of-the-art XAI frameworks that are applied to radiology, pathology, and genomics will be examined, highlighting how interpretability can improve diagnostic accuracy, clinician trust, and patient outcomes. We also try to look at the ethical and regulatory implications of deploying AI in high-stakes environments.

Keywords: Artificial Intelligence, Diagnose, Machine Learning

Mohammadreza MirzaeeGoodarzi

The Role of Entrepreneurial Education in Shaping the Future of the Health Industry

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Since the COVID-19 pandemic, the healthcare industry has undergone fundamental changes as a result of the breakthroughs that have brought healthcare services into a new era. The emergence of situations like lockdowns has proved that the conventional structures of the service provision have a long way to go to remain stable, efficient, and cost-effective enough to stay sustainable during the crisis. The first change-driven factor was the modifications of the non-emergent services, including routine visits, follow-ups, and education from the services, mostly delivered in person in the context of the private clinics, into the virtual communications between the patients and the service providers as a consequence of the restrictions following COVID-19. Gradually, a growing number of health service receivers have preferred to acquire health services or health-related information on a digital basis versus the conventional models. As the demand for health services increased on the digital marketplace, a higher number of practitioner across different fields assumed it necessary to get in touch with their target populations virtually, either through tele-visit platforms or through their personal brands on social media. Another turning point for the health service delivery was the increasing number of startup ecosystems that showed a tendency to make investments in the health marketplace. These startups introduced themselves as a distinct sector of the health system by offering smart responses to the unmet health problems. The innovative nature of the startups in creating value and the way they bring them to the suitable target markets defines them as a distinct entity in the health systems that is able to convert the former outlines of the health provision services. As the era of health services has changed, new sorts of skills are required for the health service providers to enable them to create value for their clients. The serious gap is that the educational curricula for the health service providers still merely meet the required skills to impact the health marketplace through the services that benefit the patients in a way that is smarter, more personalized, and more convenient. To well-recognise the health-related problems, answer them appropriately, and to deliver the answers conveniently, the clinical knowledge of medical service providers should be integrated with the advanced technical IT capabilities. Consequently, the new services can not be delivered without the teamwork of health specialists alongside the IT specialists. This study aims to review the soft skills that are required to enable the health specialties to act as health entrepreneurs and effectively create value in the health marketplace, in addition to addressing the importance of health entrepreneurship in shaping the future of the health industry.

Keywords: Health system-Entrepreneurship, Soft skills-Startups

Mohammadreza Saleh

Early-Onset Familial Mediterranean Fever with Severe GI and Immune Features

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Familial Mediterranean Fever (FMF) is a hereditary autoinflammatory disorder caused by MEFV gene mutations, typically presenting with episodic fever, serositis, and arthritis. Early-onset cases with gastrointestinal and immunologic abnormalities are rare and diagnostically challenging.
We report a 20-month-old girl, second child of consanguineous parents, with a complex neonatal and infantile course marked by early-onset fever, recurrent hospitalizations, and multisystem involvement. Delivered by cesarean due to breech presentation, she was admitted on day 2 for lethargy and irritability, initially treated as neonatal sepsis with negative CSF. By 48 days, she was rehospitalized with fever, vomiting, and anemia requiring transfusion. Growth failure was evident, with weight 4.4 kg at 4 months.
From 3.5 months, she had recurrent fever, seizures, persistent bloody or mucous diarrhea, and failure to thrive. History included oral candidiasis, eczema-like rashes, and suspected food protein-induced enterocolitis. Colonoscopy at 6 months showed crypt-destructive colitis with mixed eosinophilic and neutrophilic infiltration; infectious causes, including CMV, were excluded. Immunologic evaluation revealed leukocytosis (12,000/µL), neutrophilia (11,200/µL), monocytosis (5,800/µL), thrombocytosis (435,000/µL), and absent eosinophils. Flow cytometry showed T-cell predominance (CD3+: 67.4%), normal CD4/CD8 ratio (1.33), normal B-cell counts, and reduced NK cells (1.6%).
She was started on IVIG and antibiotic prophylaxis after suspected immunodeficiency; fever and diarrhea resolved. Family history of consanguinity and infant deaths prompted genetic testing. Whole exome sequencing identified a homozygous pathogenic MEFV variant (p.M694V), confirming autosomal recessive FMF. A heterozygous UBE3A variant (p.A371T) of uncertain significance was also found.
This case illustrates early-onset, gastrointestinal-predominant FMF mimicking immunodeficiency and inflammatory bowel disease. Genetic testing was key to diagnosis. Awareness of atypical FMF presentations is vital to prevent delayed treatment, especially in consanguineous populations.

Keywords: Familial Mediterranean Fever, Gastrointestinal symptoms, Immunodeficiency mimic, MEFV mutation

Nazanin Zahra Keshvari

AI-Driven Perspectives on Gut Dysbiosis in Major Depressive Disorder

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Major depressive disorder (MDD) is among the most common neuropsychiatric conditions worldwide, with its pathophysiology influenced by diverse biological and environmental factors. In recent years, increasing attention has been given to the gut–brain axis and the role of the microbiome in MDD. Metabolites such as gamma-aminobutyric acid (GABA) and quinolinate may affect excitatory–inhibitory neurotransmission balance, while compositional shifts—characterized by elevated pro-inflammatory bacteria and reduced butyrate-producing anti-inflammatory taxa—have been consistently reported.

Despite growing evidence, the causal or bidirectional nature of the microbiome–MDD relationship remains unresolved. To address this complexity, advanced artificial intelligence (AI) methods have been employed to analyze high-dimensional microbial datasets.

Currently, no definitive biomarkers exist for MDD diagnosis or prognosis. However, machine learning models—including random forests, support vector machines (SVMs), deep learning networks, and autoencoders—show promise in identifying microbial signatures, predicting treatment responses, and enabling personalized therapeutic strategies.

This review summarizes alterations in microbial composition and associated inflammatory and metabolic pathways in MDD, emphasizing the emerging role of AI-driven techniques in biomarker discovery and individualized medicine.

Keywords: Major depressive disorders, microbiome, gut-brain axis, computational neurobiology

Neda Harirforoush

Artificial Intelligence in Prognostic Prediction of Heart Failure: A Narrative Review of Algorithms, and Future Direction

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Ventricular systolic or diastolic dysfunction resulting from structural or functional heart abnormalities is known as heart failure (HF) which makes up for one-third of worldwide deaths from cardiovascular disease. Predicting mortality can assist doctors in creating appropriate treatment plans, reducing medical expenses, and enhancing quality of life. Nowadays artificial intelligence (AI) is being used more to transform the way we diagnose, predict risks and provide care to patients. Machine learning (ML) and deep learning (DL) models have been used to predict mortality, rehospitalization and disease progression in HF patients. This narrative review aims to summarize the performance and clinical relevance of these AI based prognostic tools. Articles published between 2018 and 2024 that used AI algorithms _such as Random Forest (RF), XGBoost, and deep neural networks (DNN)_ to predict outcomes in HF patients were reviewed. Inclusion criteria were English-language articles using structured clinical data with reported performance such as area under the curve (AUC), sensitivity, and specificity.

Most studies showed that AI models can outperform traditional risk scores in predicting 30-day readmission and all-cause mortality, with AUC ranging from 0.73 to 0.89. frequently used predictive variables include left ventricular ejection fraction (LVEF), renal dysfunction, blood pressure, and demographic factors. Integration of LIME and SHAP techniques has improved interpretability. However, significant limitations remain, including data imbalance, lack of external validation, and limited generalizability across populations.

AI tools offer significant potential for enhancing heart failure prognostic methods by using large-scaled clinical data and recognition patterns. Nevertheless, future research should address current methodological gaps including the need for standardized reporting and user-friendly clinical integration. Emphasis on equality and real-world testing will be crucial for usage of AI models in decision support systems in cardiology

Keywords: Heart Failure, Artificial Intelligence, Prognosis Prediction, Machine Learning, Clinical Decision Support

Niloufar Yazdanpanah

Allergy in Inborn Errors of Immunity: Can Advances in Allergy Research Help Patients with Inborn Errors of Immunity?

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Inborn errors of immunity (IEI), previously known as primary immunodeficiencies (PIDs), represent a heterogeneous group of genetic disorders characterized by impaired immune system development and function. Although recurrent infections remain the hallmark of IEI, allergic manifestations such as asthma, atopic dermatitis, food allergy, and eosinophilic disorders are increasingly recognized as to cause significant morbidity.
Recent advances in allergy research, particularly in the field of allergen-specific immunotherapy (AIT) and next-generation allergy vaccines, may offer new opportunities for patients with IEI. Molecularly defined vaccines, recombinant allergens, and peptide-based approaches are being developed to enhance safety and efficacy while minimizing the risk of adverse immune responses. Although patients with IEI are among the most vulnerable groups for vaccines administration, currently at the hypotheses level, these innovations may be relevant for IEI patients, mainly those with predominantly atopic and allergic manifestations. Although not curative, it may help in reducing symptoms.
Herein the spectrum of allergic disease in IEI is reviewed, and the immunological mechanisms that predispose to atopy in this setting is discussed. Also, the cutting-edge developments in allergy vaccines are highlighted. It is aimed to explore how precision immunotherapy—guided by molecular diagnostics and individualized risk assessment—could transform the management of allergic disease in IEI, ultimately improving quality of life and reducing disease burden.

Keywords: Inborn errors of immunity, primary immunodeficiency, allergy, allergen-specific immunotherapy, allergy vaccines, precision medicine

Pardis Zamani

Targeting T-cell Exhaustion in Colorectal Cancer: Emerging Roles of LAG-3, TIM-3, TIGIT, and Their Signaling in Overcoming Immunotherapy Resistance

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Exhaustion of T-cells, characterized by their compromised function and cytokine production, was first discovered in chronic infections and later redefined in the context of immunosuppressed tumor microenvironment (TME). Exhaustion markers include the immune checkpoints PD-1, TIM-3, LAG-3, and TIGIT. Colorectal cancer (CRC), which ranks among the highest in global prevalence, has been associated with exhaustion of T-cells. While many trials have focused on anti-PD1 therapeutics in clinical trials, results indicate suboptimal efficacy. A robust approach involved dual-blockade of other immune checkpoints together with PD-1. Interestingly, novel exhaustion markers could be used as prognostic markers for the development and progression of CRC. The present work discusses the basics of T-cell exhaustion markers and their signaling in CRC. Also, novel combination therapy approaches and challenges in the field are discussed.

Keywords: Colorectal cancer, T-cell exhaustion, immune checkpoint, immunotherapy

Parham Farzam

Emotional Intelligence and Pain Management in Dentistry: An Umbrella Review of Current Evidence

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Effective pain management in dentistry remains a critical clinical challenge, significantly impacting patient satisfaction, treatment compliance, and overall outcomes. Emotional intelligence (EI), defined as the ability to perceive, regulate, and evaluate emotions, has recently emerged as a key factor in enhancing practitioner-patient communication and reducing pain perception. This umbrella review synthesizes evidence from systematic reviews and meta-analyses on the role of EI in dental pain management.
Following PRISMA guidelines, a comprehensive search was conducted across PubMed, Scopus, Web of Science, and Cochrane Library for systematic reviews and meta-analyses examining the relationship between EI and dental pain perception, dental anxiety, or treatment outcomes. Included studies were assessed for quality using AMSTAR-2 criteria.
Among 12 eligible systematic reviews, 8 studies reported a significant positive correlation between higher dentist EI levels and reduced patient pain perception. Three studies demonstrated that EI training for dentists improved communication skills and decreased patient anxiety. However, heterogeneity in EI measurement tools and pain assessment criteria were notable limitations.
Current evidence supports the influential role of emotional intelligence in dental pain management. Incorporating EI training into dental education programs may serve as a complementary strategy alongside pharmacological and non-pharmacological pain control methods. Future studies should employ more rigorous designs and standardized assessment tools.
Clinical Recommendations:
Integrate EI training into dental curricula
Implement EI-based communication techniques to reduce pre-procedural anxiety
Consider EI assessment in dental school admission criteria

Keywords: Emotional intelligence, Pain management, Dentistry, Umbrella review, Dental anxiety

Parsa Alijanzadeh

TLR4-mediating Multiepitope Chimeric Vaccine Utilizing Bacterial Infections Associated with Alzheimer's Disease, Cognitive Impairment, and Dementia via Advanced Immunoinformatics Approaches

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Infection with critical organisms and viruses could comprise the stimulant factors for Alzheimer's disease (AD), cognitive changes, and dementia. be infected with herpes simplex virus type 1, picornavirus, Borna disease virus, Chlamydia pneumonia, and Helicobacter pylori were documented to play a part in the pathology of AD and cognitive impairment.Additionally, recent indications help the theory of the position of Cytomegalovirus (CMV) in AD neuropathology and support the connection between Hepatitis C virus (HCV) and dementia. some special bacteria could contribute to AD such as Porphyromonas gingivalis and Treponema denticola which reason for periodontitis. These organisms and viruses boost Th1 immune responses. Therefore, we utilized the bioinformatics reverse vaccinology (RV) technique to direct immunity reactions to Th2 by producing a immunogenic multi-epitope vaccine.
Conserve domain epitope from mentioned bacteria and viruses were identified. bioinformatics online servers were hired for predicting MHC-1, MHC-2, and CTL epitopes. These epitopes, TAT peptide, adjuvant, and IL-10 induce are connected with a linker. the sequence of chimeric-vaccine is prepared for the territory structure of the vaccine was created with MODELLER. The first 3D-model was refined via Ramachandran plot. The vaccine and TLR-4 were docked and used GROMACS for molecular dynamics (MD) simulation of vaccine and TLR4 complex. C-ImmSim server helped the immune stimulation of the chimeric-vaccine. it is necessary to predict of solubility, antigenicity, and allergenicity of a structure.
An enhanced ERRAT outcome of 82.54 for the developed model confirmed it is stable. Hence, Ramachandran plot indicated 97.15% of the residues in the most permitted and favorable location. MD simulations displayed the docked vaccine TLR4 got a stable formation. Finally, immune response simulations showed an encouraging reaction via innate and adaptive immune system.
Conclusion: we created an immunogenic vaccine against AD and cognitive impairment and verified its favorable effects via developed Immunoinformatics technique.

Keywords: Alzheimer's disease, cognitive impairment, chimeric vaccine, Immunoinformatics

Parvaneh Hamian Roumiani

Three Decades of Atrial Fibrillation and Flutter in the MENA Region: Trends, Risk Factors, and Health Implications (1990–2019)

Atrial fibrillation and flutter (AF/AFL) are major contributors to cardiovascular morbidity and mortality, but in the Middle East and North Africa (MENA) region, their contribution is comparatively underresearched. To plan effective prevention and control interventions, knowledge of long-term trends is necessary.

To estimate the incidence, mortality, and disability-adjusted life years (DALYs) caused by AF/AFL in 21 MENA countries between 1990 and 2019, we examined data from the Global Burden of Disease 2019 study. The results were also stratified by age and sex and were age-standardized. LOESS regression was used to assess correlations with the Socio-demographic Index (SDI) and compute percentage changes over time.

While ASMR and ASDR showed slight increases over the course of three decades, ASIR stayed largely constant in the MENA region. The burden increased significantly with age and was consistently higher in females. Qatar and Bahrain had the highest rates of mortality and disability in 2019, while Iraq, Iran, and Turkey reported the highest incidence. Conversely, the countries with the lowest mortality and DALYs were Kuwait, Libya, and Turkey. Hypertension was the leading risk factor for AF/AFL mortality, with obesity showing the greatest relative increase since 1990.

In the MENA region, AF/AFL-related mortality and disability have increased despite stable incidence, especially among women and older adults. In order to reduce the rising burden of AF/AFL, the results emphasise the critical need for region-specific strategies that target modifiable risk factors, particularly obesity and high blood pressure.

Keywords: Age-standardized rate; Atrial fibrillation/atrial flutter; Disease burden; Risk factors

Pegah Khodaee

Immune Multi-Omics Integration with Machine Learning Methods to Create HNSCC Prognostic Models

Most head and neck cancers belong to a group known as head and neck squamous cell carcinoma (HNSCC). HNSCC has been among the 10 most common worldwide in 2025, with a 30% anticipated annual increase until 2030. Immune-based multi-omic approaches, combined with novel machine learning models, have paved the way for more accurate prognosis prediction methods. This will solve challenges associated with diagnosis duration and accuracy, resulting in improved overall survival and prognosis.

We used the most recent articles that were published through advanced search in PubMed and Google Scholar. We aimed to collect data related to the immune microbiome and multi-omics and combine them with machine learning methods to develop state-of-the-art, precise prognostic models.

The integration of multi-omic data and machine learning algorithms has led us to state-of-the-art assessment models for HNSCC, including: PRG-based signature, immunological subtypes (CS and ICI), immune-related microbiome model (IRM), TRS-related signature (c-index = 0.78), and risk calculation scores. Furthermore, treatment response prediction models, such as sensitivity to cisplatin and sorafenib, as well as simvastatin and pazopanib, were included. CMPIS demonstrated a perfect c-index. Additionally, tumor classification (Hot and Cold) based on CD8+ T cell-related gene expression analysis, key gene detection (OLR1), drug sensitivity analysis, and molecular docking were performed in OSCC samples.

The multi-omics and machine learning methods combination, results in accurate prognostic models, helping surgeons and practitioners with rapid, effective targeted therapies to improve prognosis.

Reyhaneh Abdi Andarabi

LncRNA RMRP and mTOR: Promising Biomarkers in Triple-Negative Breast Cancer

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Cancer is the second leading cause of premature mortality in most countries worldwide. Among all cancer types, breast cancer exhibits the highest global incidence and mortality rates.
Triple-negative breast cancer (TNBC) is a highly heterogeneous tumor lacking estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) expression.
Although advances in drugs and therapies have been largely effective for patients, current knowledge across all stages of TNBC remains limited, and existing treatments are often ineffective for many patients.
This study was designed as a case-control study. The case group consisted of 50 newly diagnosed patients with triple-negative breast cancer, while the control group included 50 individuals without breast cancer. Laboratory samples involved paraffin-embedded tissue blocks obtained from the pathology department of Imam Hossein Hospital (Tehran). Expression assays for lncRNA and the mTOR gene were performed using Real-Time PCR.
In this study, 50 patients with breast cancer were examined. Regarding gender distribution, all patients were female. The mean age in the case group was 49.19 ± 7.51 years. Overall, this study demonstrated that the expression levels of lncRNA RMRP and mTOR genes in tumor samples. The results revealed that the expression levels of lncRNA RMRP and mTOR genes in tumor tissues were markedly higher than those observed in control samples, with statistically significant differences. Additionally, analysis of the relationship between lncRNA-RMRP and mTOR expression with patient survival showed a significant correlation; patients who died (non-survivors) exhibited increased gene expression compared to survivors.
Based on these results, lncRNA RMRP and mTOR genes appear to be promising biomarkers for the diagnosis, prognosis, and survival prediction in patients with triple-negative breast cancer.

Keywords: Triple-negative breast cancer, lncRNA RMRP, mTOR, Breast cancer.

Roya HajiMalek

Improving Diagnostic Accuracy of Heart Disease with Attention-Augmented Deep Neural Networks

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Heart disease remains a leading cause of mortality worldwide, necessitating accurate and timely diagnosis to improve patient outcomes. Recent advancements in deep learning have shown promise in medical diagnosis, yet challenges persist in capturing relevant features effectively from complex physiological data. This study proposes a novel hybrid deep learning model combining Convolutional Neural Networks (CNN) with multi-head attention mechanisms to enhance feature extraction and improve diagnostic performance.

The model architecture integrates CNN layers for hierarchical feature learning with attention modules that dynamically weigh feature importance, enabling the network to focus on the most salient aspects of the input data. This approach addresses limitations of conventional models that may overlook subtle but critical signals. Training and evaluation were conducted on a large-scale dataset consisting of 68,000 labeled cardiac records, employing stratified cross-validation to ensure robustness.

Performance was benchmarked against classical machine learning classifiers including Logistic Regression, Support Vector Machines (SVM), Random Forest, and XG Boost. Our hybrid model achieved an overall diagnostic accuracy exceeding 90%, outperforming all baseline methods by a significant margin. Additionally, the model demonstrated improved sensitivity and specificity, essential metrics for clinical applicability.

The results underscore the efficacy of attention-augmented neural networks in capturing complex patterns within cardiac data, suggesting substantial potential for deployment in real-world clinical decision support systems. Future work will focus on model interpretability and integration with electronic health records to facilitate widespread adoption.

This research contributes to bridging the gap between artificial intelligence and cardiovascular medicine by providing a scalable and accurate diagnostic tool, paving the way for enhanced patient care.

Keywords: Deep Learning, Convolutional Neural Networks (CNN), Attention Mechanism, Multi-Head Attention, Diagnostic Accuracy

Rozhin Bakhshi

Comparison of PET/CT and PET/MRI in Central Nervous System Tumors

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PET/CT and PET/MRI are two useful imaging modalities in neuro-oncology. Our aim was to review the existing literature on the benefits and drawbacks of using PET/CT and PET/MRI in the diagnosis of central nervous system (CNS) tumors. Methods: A literature search was conducted using valid databases, limited to English-language articles published between 2010 and 2023, and independently reviewed by two reviewers. A standard data extraction form was used to extract data from the included papers. The results were condensed and narratively presented, accompanied by supporting data from the included investigations. Results: The study analyzed 28 articles, mostly from Europe. The results varied, with some studies comparing PET/CT and PET/MRI, examining specific types of brain tumors, pediatric tumors, or focusing on specific PET/CT or PET/MRI modalities. The synthesis aimed to provide a comprehensive overview of PET/CT and PET/MRI use in CNS malignancies. Conclusions: PET/MRI offers promising advantages in neuro-oncology diagnosis and follow-up imaging, but its use should be prioritized in appropriate situations.

Keywords: PET/MRI, PET/CT, neuro-oncology, CNS tumors

Sara Asl Motaleb Nejad

Organoid Chips in Pediatric Precision Medicine: Translational Potential, Challenges, and Future Directions

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Organoid chips are an integration of patient-derived organoids with microfluidic platforms. This innovative technology represents a promising progress in pediatric precision medicine. This system mimics key physiological features of developing human tissues, including three-dimensional structure, perfusion, and mechanical stimulation, which enables more accurate disease modeling and personalized drug testing and discovery. Organoid chips are useful for studying congenital metabolic disorders, pediatric cancers, and neurodevelopmental diseases, where conventional models often fail to capture age-specific biological characteristics. Despite remarkable progress, translating these technologies into clinical practice remains challenging. Pediatric organoids often exhibit limited maturation, and their culture conditions lack standardization across laboratories. Moreover, many organoid chip systems lack vascular and immune components, reducing their physiological relevance. Ethical and regulatory concerns regarding pediatric tissue collection and consent are controversial and sensitive, and require careful consideration. Ongoing advances in stem cell differentiation, biomaterials engineering, and artificial intelligence–based data integration are expected to improve reproducibility and predictive accuracy. With greater collaboration and validation, organoid chip technology has the potential to significantly advance individualized pediatric therapies.

Keywords: Organoid chips, Microfluidic platforms, Pediatric precision medicine, Disease modeling, Personalized drug testing, Stem cell differentiation

Sara Fattahi

The Role of Emotion-Regulation Difficulties, Distress Tolerance, and Perceived Stress in Predicting Treatment Adherence among Patients with Type 2 Diabetes

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Improving patients' adherence to therapeutic recommendations consistently remained a key focus for healthcare providers. The present study, therefore, examined whether emotion-regulation difficulties, distress tolerance, and perceived stress can predict meaningful levels of treatment adherence in individuals with type 2 diabetes.

Employing a descriptive-correlational design, all patients with diabetes who visited health centers in Sanandaj during 2022 formed the study population. Using convenience sampling, 230 patients were selected and completed the Difficulties in Emotion Regulation Scale, the Distress Tolerance Scale, the Perceived Stress Scale, and the Treatment Adherence Scale. Data were analyzed with Pearson correlation coefficients and multiple regression.

Emotion-regulation difficulties and perceived stress were both negatively and significantly associated with treatment adherence ($P < 0.01$), whereas distress tolerance showed a positive, significant association with adherence ($P < 0.01$). Collectively, the three psychological variables accounted for 69.6 % of the variance in treatment adherence.

These findings underline the importance of incorporating mindfulness-based stress reduction programs and emotion-focused therapies into standard care in clinics and hospitals. These methods can help people with type 2 diabetes to take their medication better, lead healthier lives, and better control their blood glucose levels.

Keywords: Emotion regulation, distress tolerance, perceived stress, treatment adherence, type 2 diabetes

Shaghayegh Mohammadioun

From Data to Cure: The Role of the Targeted Therapy Through the Future Approaches

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Modern tharpeutic discovery will provide different approaches to overcome the toxicity and improve the survival rate. In the field of targeted therapies molecules have been designed based on the disease mechanisms and playing a strong emphasis on target identification and molecular signals. The generated data in biomedicine necessitates the employment of the sophisticated informatics techniques to glean novel insights, advance our understanding of disease, improve the diagnostic potentials, and designe individual therapy materials. The technology has provided tailored assays for each molecular stratum and revolutionizing biomedical investigations. Based on ML algorithms, classify diseases, enhance diagnostics, and develop personalized therapeutic strategies and overcome genetical disfunction which will impove the rate of survival and, comprehension of the pathogenic mechanisms underlying disease and biomarkers. Through this path, Omics, CRISPER-Casp, CAR, exon and exosome therapy will play a potential role. The algorithm facilitated the synthesis of the genetic variations such as mutions and refine genetic region.In conclusion, therapy based on the molecular data with the machine learning and big data analysis will play a potent role with the high efficacy in the feature.

Keywords: Targeted therapy, Biomarkers, machine learning, individual therapy, Omics, CRISPER-Casp, CAR, exon, exosome

Shaghayegh Mousavi

Mucosal and Memory Immunity in Chronic Rhinosinusitis: From Pathogenesis to Therapeutics

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Chronic rhinosinusitis (CRS) is a heterogeneous inflammatory disorder of the sinonasal mucosa that persists for more than 12 weeks and imposes a substantial global health and economic burden. Traditionally divided into CRS with (CRSwNP) and without nasal polyps (CRSsNP), the disease exhibits diverse immunopathological mechanisms, with type 2–driven inflammation being particularly prominent in CRSwNP. Recent advances have reshaped the understanding of CRS pathogenesis by highlighting the active role of the epithelial barrier, the dual functionality of eosinophil subpopulations, and the contribution of neuroimmune interactions. Emerging concepts such as epithelial inflammatory memory and single-cell transcriptomic profiling have uncovered novel cellular and molecular pathways that sustain chronicity and recurrence. These insights have paved the way for refined endotyping of CRS and the development of biologics and immunomodulatory therapies that move beyond symptom relief toward disease modification. This review synthesizes current knowledge on mucosal and memory immunity in CRS, emphasizing their translational potential for personalized and targeted therapeutic strategies.

Keywords: Chronic rhinosinusitis, Mucosal immunity, Inflammatory memory, Epithelial barrier dysfunction, Targeted therapeutics

Shayan Boozarjomehri

Equine Models in Translational Medicine: One Health Perspective

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Large-animal models are crucial for bridging the gap between fundamental discoveries and human clinical applications. Among these, the horse occupies a distinctive position due to its physiological complexity, lifespan, and spectrum of naturally occurring conditions that mirror aspects of human health and disease. Its utility extends from musculoskeletal and joint research to immunology, metabolic disorders, and exercise physiology, offering opportunities to examine both chronic and acute pathological processes in a setting that closely approximates clinical reality. Advances in molecular profiling, imaging technologies, and biomarker discovery have expanded the scope of equine-based studies, enabled refined mechanistic insights, and facilitated translational strategies. The integration of equine research into comparative medicine frameworks holds promise for accelerating therapeutic innovation and improving health outcomes across species.

Keywords: Translational medicine, One Health, Equine models

Steliyan Petrov

Immunophenotyping and Functional Characterization of NK Cells in SARS-CoV-2 Infection

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The immune response to SARS-CoV-2 infection involves significant alterations in the phenotype and function of natural killer (NK) cells. This study aimed to investigate the dynamic changes in NK cell subsets during COVID-19 by analyzing their activation and inhibitory markers [CD3, CD14, CD16, CD19, CD25, CD45, CD56, CD57, CD69, CD159a (NKG2A), CD159c (NKG2C), CD314 (NKG2D), CD335 (NKp46)], cytotoxic potential (perforin, interferon-gamma, granzyme B), and direct cytotoxicity against a newly genetically modified K562 cell line. Peripheral blood samples were collected from COVID-19 patients on days 3–5 and day 30 post-symptom onset and were compared to healthy controls. 16-color flow cytometry analysis revealed distinct shifts in NK cell subpopulations, characterized by increased expression of the inhibitory receptor NKG2A and the activating receptors NKG2D and NKG2C, particularly in the CD56 CD16 subset. Elevated IFN-γ production on day 30 suggested a recovery-phase immune response, while the persistent upregulation of NKG2A indicated an ongoing regulatory mechanism. The CD16 CD56 subpopulation exhibited increased expression of the markers CD69 and CD25 over time; however, its cytotoxic potential, assessed through granzyme B levels and direct cytotoxicity assays, remained lower than that of healthy controls. Significant correlations were observed between CD57 and CD69 ex-pression, as well as NKp46 and IFN-γ production, highlighting a coordinated balance between activation and regulatory mechanisms. These findings suggest that NK cells undergo functional adaptation during COVID-19, displaying signs of partial exhaustion while retaining antiviral potential. Understanding the interplay between NK cell activation and suppression may provide valuable insights into immune dysregulation in COVID-19 and inform potential therapeutic interventions.

Keywords: Natural killer cells, COVID-19, SARS-CoV-2, flow cytometry, immune response, immune dysregulation

Tara Shahmoradi

GPTSD: The Role of Conversational AI in Managing Post-Traumatic Stress

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Post-traumatic stress disorder (PTSD) is a psychiatric disorder arising out of extreme trauma, with a global lifetime prevalence of 3.9%. Refined percentages are reported for women and persons exposed to violent conflict or disasters. Classical diagnostic systems have relied heavily on clinical interviews and self-report questionnaires. Needless to say, these methods impose barriers to people and carry elements of subjectivity. Thus, AI has opened doors in addressing these concerns by developing systems aimed at the further improvement of PTSD care through its prevention, early diagnosis, treatment personalization, patient self-management, or drug discovery.

In fact, there remain concerns to be touched upon around the very creation and deployment of the algorithm, considerations of ethical distractors, and incorporation of such algorithms into clinical settings. These AI technologies, especially machine learning and deep learning models such as CNNs, have much potential to improve the diagnosis and treatment of mental health disorders.

The present study thus proposes to investigate the current use of AI in the controlling and treatment of post-traumatic stress disorder and its potential, with due consideration given to clinical relevance and integration issues within mental health systems.

Keywords: Post-Traumatic Stress Disorder (PTSD) , Artificial Intelligence, Machine Learning, Psychiatry AI-Based

Teodora Kalfova

Development of an Algorithm for the Automated Analysis of Multi-Parameter Flow Cytometric Data on Sub-Population of B-Lymphocytes

Steliyan Petrov, Martina Bozhkova, Aleksandra Baldzhieva, Dobrina Dudova, Katya Vaseva, Hristo Taskov, Michael M. Petrov

1. Project of Medical University Plovdiv: ∂n/∂n-01/23 Development of an algorithm for automated analysis of multiparameter flow cytometric data on B-lymphocyte subpopulations.
2. STRATEGIC RESEARCH AND INNOVATION PROGRAMME FOR THE DEVELOPMENT OF MEDICAL UNIVERSITY – PLOVDIV (SRIPD-MUP)", CONTRACT № BG-RRP-2.004-0007-C03

To develop and validate an automated algorithm for the analysis of multiparameter flow cytometric data, enabling accurate identification and classification of B-cell subpopulations across various pathological conditions, including hematological malignancies and viral infections.
This study analyzed .fcs files obtained from flow cytometry samples of three groups: pediatric patients diagnosed with acute B-cell lymphoblastic leukemia (B-ALL) (n = 120), individuals infected with SARS-CoV-2 (COVID-19) (n = 60), and healthy controls (n = 23). Data preprocessing, quality control, dimensionality reduction, and unsupervised clustering were performed using FlowJo software and integrated analytical plugins, including FlowAI, FlowClean, tSNE, UMAP, PhenoGraph, Xshift, FlowSOM, and ClusterExplorer.
An automated algorithm was developed and implemented for the analysis of multiparameter flow cytometric data, focusing on B-cell subpopulations in children with B-ALL and SARS-CoV-2 infected persons. Using FlowJo software with integrated plugins (including FlowAI, FlowClean, tSNE, UMAP, FlowSOM, Xshift, PhenoGraph, and ClusterExplorer), a standardized analytical workflow was established. The pipeline includes automatic artifact removal, gating of CD19
B cells, dimensionality reduction, clustering of subpopulations, and subsequent phenotypic characterization.
The methodology enabled precise differentiation between blast cells and hematogones in B-ALL patients over time—from diagnosis to day 33. The algorithm demonstrated increased sensitivity in detecting minimal residual disease compared to conventional analysis using FACSDiva.
In patients recovering from COVID-19, memory B-cell subpopulations were analyzed across three post-infection intervals (1–3, 4–8, and 9–12 months). The FlowJo-based analysis provided more accurate identification of both non-class-switched and class-switched memory B cells compared to standard methods.
Automated flow cytometry analysis improves the accuracy and speed of identifying B-cell subpopulations. It outperforms conventional methods in detecting minimal residual disease in B-ALL and provides detailed memory B-cell profiling after COVID-19.

Keywords: flow cytometry, FlowJo, B-cells