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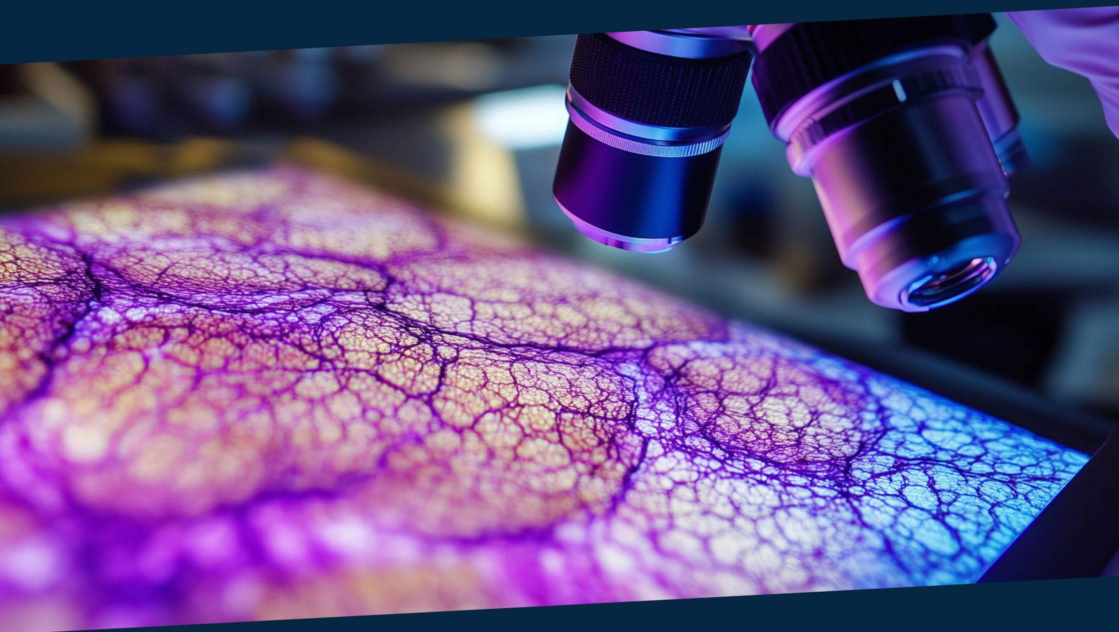
VISEGRAD+ PROJECT - 1ST EVENT
28TH JANUARY 2026
BUDAPEST, HUNGARY

DEVELOPMENT OF INNOVATIVE POLYMERS FOR WOUND HEALING AND OTHER BIOMEDICAL APPLICTIONS



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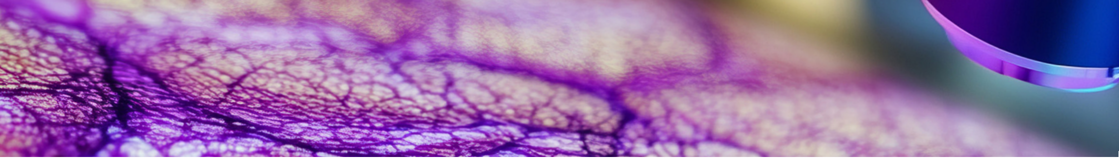

AGENDA

9:00-9:30	GET TOGETRHER
9:30-10:15	Introduction Design and development of functionalized electrospun bandages for wound therapy Prof. Franciska ERDŐ
10:15-10:45	Healing Properties of Hydrobynt No. 1 and Hydrobynt No. 2 Composites Prof. Olena Pavlenko, Prof. Vlad Neimash
10:45-11:15	Research Profile and Scientific Capabilities of the Department of Cosmetic and Pharmaceutical Chemistry, Pomeranian Medical University in Szczecin Prof. Anna Nowak
12:00-13:00	Lunch
13:00-13:30	Research Profile and Scientific Capabilities of the Department of Cosmetic and Pharmaceutical Chemistry, Pomeranian Medical University in Szczecin Prof. Paula Ossowicz- Rupniewska
13:30-14:00	Wound healing in the EpiDerm-FT full-thickness in vitro human skin model Dr. Marek Puskar, Dr. Silvia Letasiova
14:00-15:00	Labvisits
15:00-15:30	Summary-Roundtable discussion
15:30-16:00	Closing and To do
17:30-19:00	Dinner

Prof. Franciska ERDŐ

Pázmány Péter Catholic University, Budapest

Franciska Erdő, PharmD, and PhD, is a Full Professor of Drug Research and Development and Head of the Laboratory of Barrier Modelling and Innovative Pharmaceutics at Pázmány Péter Catholic University, Faculty of Information Technology and Bionics, Budapest, Hungary. She obtained her MSc in Pharmacy and PhD in Pharmacology from Semmelweis University with summa cum laude distinction and has over three decades of experience in academic, industrial, and international research environments. Her current research focuses on drug delivery, physiological barrier modelling, innovative pharmaceutics, cosmetoscience and microfluidic diffusion systems. Prof. Erdő has held senior research and leadership positions at institutions including the Max Planck Institute, Charité–Universitätsmedizin Berlin, and SOLVO Biotechnology. She is the author of over 87 peer-reviewed publications, six patents, and several book chapters, and actively serves as a grant evaluator, journal reviewer, supervisor of MSc and BSc students and mentor to doctoral and postgraduate researchers.

DESIGN AND DEVELOPMENT OF FUNCTIONALIZED ELECTROSPUN BANDAGES FOR WOUND THERAPY

Prof. Franciska ERDŐ

Faculty of Information Technology and Bionics,
Pázmány Péter Catholic University

Research focus

Development of innovative nanofiber-based drug loaded wound dressings to accelerate chronic wound healing (e.g. pressure ulcer, diabetic foot ulcer, military injuries) which currently means a serious challenge for the population and the healthcare systems of the countries of this region.

Methodologies

Multifactorial evaluation of pristine and loaded bandages. Morphology (SEM, AFM), physical properties (tensile strength, layer thickness, thermal resistance, water uptake capacity, etc), chemical properties (FT-IRS), drug release and penetration (skin-on-a-chip diffusion chambers), biological activity (in vitro assays in collaboration with Croatian partner for scratch assay and MTT assay, in vivo wounding in mice). In silico simulation and prediction methods.

Technological capabilities

Various microscopy, tensile meter, traditional diffusion chambers and skin-on-a-chip microfluidic diffusion chambers, in vivo small animal facility in collaboration with Semmelweis University.

Main interest

Making joint EU grant application for development of innovative drug delivery systems and medical devices. The main therapeutic target is wound healing and regenerative medicine, but other dermatological and cosmetic developments, ophthalmic drug containing inserts etc. are also in focus. Joint publications are very welcome. Exchange programs for researchers and students (e.g. ERASMUS+ or CEEPUS) are open for the delegates of the partners. Also our laboratory is seeking for PhD students for longer period in this research area.

Future directions

Adaptation of electrospinning technology in Budapest lab, and active participation in exchange programs and dissemination activity with the project partners.
and mentor to doctoral and postgraduate researchers.

Prof. Olena Pavlenko

Institute of Physics National
Academy of Science of Ukraine

Olena Pavlenko is a Doctor of Physical and Mathematical Sciences and Professor at the Department of Functional Materials Physics, Faculty of Physics, Taras Shevchenko National University of Kyiv, Ukraine. She obtained her PhD in solid-state physics in 2012 and her Doctor of Sciences degree in 2021, focusing on the physical properties and intermolecular interactions in π-conjugated nanosystems. Her research interests include irradiation-induced processes in nanocomposites, carbon and metal nanostructures, and their interactions with biomolecules. Prof. Pavlenko has led and contributed to multiple national and international research projects, including NATO and State Fund for Fundamental Research initiatives. She has extensive teaching experience in medical physics and supervises undergraduate, master's, and doctoral research. Her work is internationally recognized, with publications indexed in Scopus and an h-index of 9.

Prof. Vlad Neimash

Institute of Physics National
Academy of Science of Ukraine

Neymash Volodymyr, 69 years old – a graduate of the Faculty of Physics of the Taras Shevchenko Kyiv State University, Doctor of Physics, Professor, Founder and Head of the Radiation Technologies Laboratory of the Institute of Physics of the National Academy of Sciences of Ukraine.

My area of scientific interests is the study of the effect of radiation on condensed matter and the development of technologies for the controlled effect of radiation on the properties of materials, devices and functional systems.

Among my achievements: the development of means for stabilizing the operation of semiconductor electronic devices in conditions of ionizing cosmic and man-made radiation; the creation of an original technology for manufacturing film nanosilicon for cheap solar cells with high efficiency of photoelectric conversion; the creation and introducitg into production of a radiation technology for manufacturing a metal-water-polymer nanocomposite with the properties of a broad-spectrum antiseptic and the establishment of mass production of medical dressings for the treatment of burns and wounds on its basis. My colleague Olena Pavlenko will represent me and our Institute at your company. However, I am always at your service.

HEALING PROPERTIES OF HYDROBYNT NO. 1 AND HYDROBYNT NO. 2 COMPOSITES

Prof.V. B. Neimaish and Prof. Olena Pavleno

Institute of Physics, National Academy of Sciences of Ukraine,
46, Nauky Avenue, Kyiv, 03028, Ukraine

The problem of effective wound healing remains highly significant from both medical and social perspectives due to frequent infectious complications, prolonged treatment periods, and the growing resistance of microorganisms to antibiotics. Under frontline conditions, this relevance is further intensified: contaminated shrapnel and gunshot wounds, burns, and combined injuries predominate, along with limited resources and time for wound care during evacuation. This creates a demand for wound dressings that can be applied quickly, reduce pain, provide an antiseptic barrier, maintain a moist environment, and allow monitoring of the wound condition without frequent dressing changes.

The medical dressings HYDROBYNT No. 1 and HYDROBYNT No. 2, as innovative treatments for superficial injuries based on an elastomer with a gas–metal–water–polymer (GMWP) nanocomposite, possess a unique microstructure, physicochemical properties, and practical advantages for medicine. These products are manufactured using electron irradiation, which ensures crosslinking of the polymer matrix, promotes the formation of silver nanoparticles in the hydrogel environment, and simultaneously serves to sterilize the finished product. This approach makes it possible to combine structural stability of the material with antimicrobial activity without additional aggressive disinfection methods.

The materials are characterized by hydrophilicity, bactericidal activity (due to silver nanoparticles), permeability to oxygen and medicinal substances, elasticity and strength, transparency, and non-adhesiveness to the wound surface, which reduces trauma during dressing changes. The combination of these properties makes the composite promising for the treatment of burns and superficial wounds, particularly under limited care conditions.

There are two forms of the product: films and spray.

HYDROBYNT No. 1 (dressing/hydrogel for burns and wounds). This product is intended for local treatment of burns and wounds and provides cooling and analgesic effects, cleansing and disinfection, maintenance of a moist environment favorable for healing, and protection from external influences, while not adhering to the wound surface. The material consists of approximately 85% water but is capable of doubling its volume and mass by adsorbing physiological exudates. It does not cause irritation or allergic reactions. Its transparency allows visual monitoring of the wound condition without removing the dressing.

HYDROBYNT No. 2 (liquid form/aerosol). This is a liquid form of the GMWP composite designed for painless bactericidal treatment of contoured wounds and mucous membranes. In liquid or aerosol form, it ensures effective delivery of silver nanoparticles and microparticles of the elastomer gel phase to complex surfaces and exerts a soothing antiseptic effect. It does not cause irritation, even when used for eye irrigation.

Therefore, medical dressings HYDROBYNT No. 1 and No. 2 based on the GMWP nanocomposite combine antiseptic action, ease of use, and control over the healing process. The complex of properties (transparency, non-adhesiveness, exudate sorption, oxygen/drug diffusion, and bactericidal activity) makes them particularly suitable for first aid and wound treatment in field and frontline conditions.

Prof. Anna Nowak

Pomeranian Medical University
in Szczecin

Researcher at the Pomeranian Medical University in Szczecin. A graduate of the Faculty of Environmental Management and Agriculture at the West Polish University of Technology in Szczecin. She currently serves as the Head of the Department of Cosmetic and Pharmaceutical Chemistry at the Faculty of Health Sciences of the Pomeranian Medical University in Szczecin. Her main research interests include the use of plant materials and substances derived from them in cosmetology and dermatology. She focuses on the use of plant materials in cosmetology and the development of new, innovative cosmetics in line with the concept of sustainable development. Furthermore, she has been researching the permeation of active substances from plants and anti-inflammatory drugs through the skin for many years. She is the author of over 120 publications, primarily on the use of natural materials in medicine and on the permeability of active substances through natural and artificial membranes and drug accumulation within them..

Research Profile and Scientific Capabilities of the Department of Cosmetic and Pharmaceutical Chemistry, Pomeranian Medical University in Szczecin

Prof. Anna Nowak

Department of Cosmetic and Pharmaceutical Chemistry, Pomeranian Medical University in Szczecin, Powstańców Wielkopolskich Ave. 72, 70-111 Szczecin, Poland

Chronic wounds, including diabetic foot ulcers and injuries related to military conditions, represent a growing global health challenge, particularly among elderly patients and individuals with diabetes. The limited effectiveness of many currently used wound dressings highlights the need for modern, multifunctional solutions that more effectively support the healing process and reduce the risk of infection.

The Department of Cosmetic and Pharmaceutical Chemistry at the Pomeranian Medical University in Szczecin is responsible for the biological evaluation of the developed wound dressing materials and for assessing their suitability for wound care applications. The scope of research includes the analysis of antioxidant activity, cytotoxicity assessment, and studies on the penetration and accumulation of active compounds supporting the wound healing process.

Antioxidant properties will be evaluated by determining the total polyphenol content (TPC) and by measuring antioxidant activity using DPPH, ABTS, and FRAP assays. Cytotoxicity will be assessed using the MTT assay on human skin fibroblasts, while the influence of the tested materials on wound healing will be evaluated using the in vitro scratch assay to analyze fibroblast migration and wound closure.

Additionally, permeation studies will be conducted using Franz diffusion cells, along with the assessment of active compound accumulation in the skin, allowing evaluation of the efficiency of active substance delivery to deeper skin layers. The research will also include the design of natural hydrogels enriched with plant-derived extracts exhibiting anti-inflammatory properties, supporting physiological wound healing processes. The obtained results will enable a comprehensive evaluation of the safety and functional performance of the developed materials, indicating their potential as advanced wound dressings supporting wound healing and protection against infections.

Prof. Paula Ossowicz-Rupniewska

Pomeranian Medical University
in Szczecin

Paula Ossowicz-Rupniewska is a chemical engineer and a professor at the West Pomeranian University of Technology in Szczecin. She specializes in pharmaceutical technology, green chemistry, and transdermal drug delivery systems. She is the author and co-author of over 70 peer-reviewed scientific publications indexed in JCR-listed journals. Her research focuses on the synthesis and characterization of bio-based compounds, ionic liquids, and modified NSAIDs aimed at enhancing skin permeability, as well as on the development and optimization of advanced transdermal formulations.

Research Profile and Technological Capabilities of the West Pomeranian University of Technology in Szczecin in the Development of Innovative Polymeric Wound Dressing Systems

Paula Ossowicz-Rupniewska

Department of Cosmetic and Pharmaceutical Chemistry, Pomeranian Medical University in Szczecin, Powstańców Wielkopolskich Ave. 72, 70-111 Szczecin, Poland

Modern wound dressings play a crucial role in the management of acute and chronic wounds by combining protective functions with active support of the healing process. Contemporary approaches to wound dressing design increasingly rely on advanced polymeric materials, enabling precise control of mechanical properties, stability, permeability, and the incorporation of bioactive components. The development of such systems requires interdisciplinary expertise and the application of advanced material synthesis and characterization methodologies, which underpin innovative wound care solutions.

The presentation will outline the research scope, methodological approaches, and technological capabilities of the West Pomeranian University of Technology in Szczecin (WPUT), Faculty of Chemical Technology and Engineering, in the context of developing polymer-based materials for wound care applications. The focus will be on competencies in polymer science, materials engineering, and advanced chemical technologies that support the design and optimization of innovative wound dressing systems.

Key aspects to be discussed include the development of polymer matrices, hydrogels, and biodegradable materials intended for biomedical use. The presentation will address material selection strategies, polymer modification routes, and the analysis of structure–property relationships governing mechanical stability, thermal behaviour, and functional performance of polymer-based dressings.

The applied methodologies will include polymer synthesis and processing techniques, as well as comprehensive physicochemical characterization of materials. Analytical approaches such as spectroscopic analysis, thermal characterization, and mechanical testing will be presented as core tools to support material optimization and to ensure compatibility with formulation development and subsequent biological evaluation conducted by consortium partners.

The technological infrastructure available at WPUT will be presented, highlighting laboratory capabilities that support reproducibility, material stability assessment, and the development of application-oriented polymer prototypes. Particular attention will be given to the role of interdisciplinary collaboration in integrating material science with pharmaceutical and biomedical research.

The presentation will also address future research perspectives related to coordinated material development, alignment of analytical methodologies within the consortium, and joint scientific dissemination activities within the framework of the Visegrad+ project.

Dr. Marek Puskar

MatTek In Vitro Life Science
Laboratories, s.r.o.

Marek Puskar graduated with a Master's degree in Genetics from Comenius University in Bratislava. He is currently a scientist at MatTek In Vitro Life Science Laboratories, a biotech company in Bratislava specializing in the production of 3D reconstructed human tissue models. He is responsible for the production of 3D tissue models of the oral cavity and participates in various R&D projects. His primary focus is on skin wound healing and evaluating the irritation potential of medical devices used in the oral cavity, utilizing tissues from MatTek's portfolio line. Marek collaborates on developing new methods for these 3D reconstructed human tissue models, aiming for their further implementation and regulatory validation.

Wound healing in the EpiDerm-FT full-thickness in vitro human skin model

Marek Puskar, Silvia Letasiova, PhD

MatTek IVLSL, Bratislava, Slovakia

During the past three decades, great progress has been achieved in the development of in vitro reconstructed human epidermal tissue models. This technology is now available via various manufacturers of commercially available tissue models and has provided opportunities for researchers worldwide to reduce or even completely avoid in vivo testing. MatTek has developed its own full thickness in vitro human skin model (EpiDerm-FT). This model consists of normal human epidermal keratinocytes and normal human dermal fibroblasts cultured to form a multilayered model of the human dermis and epidermis. EpiDerm-FT has fully developed basement membrane, and it resembles in vivo skin in regard to both morphology and barrier function. Previous studies demonstrated that EpiDerm-FT can serve as a valuable model for studying wound healing processes, due to presence of fibroblast-keratinocyte cell interactions. A model of wound healing was created by introducing wounds in epidermis using a 3-mm biopsy punch and subsequently evaluated at multiple recovery time points. Historically, this model has been used to evaluate re-epithelization of the wound by fixing the tissues, staining with hematoxylin and eosin, and quantifying migration from the wound origin. Alternatively, wound re-epithelization can be visualized in situ by fixing and immunostaining the tissue with markers of epidermal differentiation as well as a marker of fibroblasts. This staining allows simultaneous visualization of migrating keratinocytes (keratin 14), differentiated suprabasal cells (involucrin), and dermal fibroblasts (vimentin) within the wound. Histological and immunohistochemical analysis showed keratinocyte migration at 2 days following wounding. In both methods, wounded tissues cultured without growth factors (2% human serum) had a reduced healing rate in which keratinocytes did not cover the entire wound within a 6 day timeframe. In contrast, wounded tissues cultured with growth factors demonstrated a dramatic increase in healing rate as keratinocyte migration completely covered the wounded area by day 6. In conclusion, the EpiDerm-FT model serves as a valuable tool for studying cutaneous wound healing. It is well-suited for evaluating new therapeutic compounds designed to accelerate the healing process and restoring tissue integrity and skin barrier function.

PARTICIPATING INSTITUTIONS

Pázmány Péter Catholic University, Budapest

Institute of Physics National Academy of Science of Ukraine

MatTek In Vitro Life Science Laboratories, s.r.o.

Pomeranian Medical University in Szczecin

West Pomeranian University of Technology in Szczecin