

## **Smart Barrier Platforms for Biotech Therapies – Partnership Proposal**

**Topic identifier and title:** [HORIZON-HLTH-2025-01-TOOL-05](#): Boosting the translation of biotech research into innovative health therapies

### **Introduction**

The **Faculty of Information Technology and Bionics** at Pázmány Péter Catholic University ([PPKE ITK](#)), is a top-tier Hungarian research hub at the intersection of IT, bionics, and life sciences. Known for its strong theoretical foundations and cutting-edge applied research, ITK is home to the [Ányos Jedlik Laboratories](#), encompassing over 30 interdisciplinary research groups driving breakthroughs in **bioinformatics, artificial intelligence, neurotechnology, nanodevices, and human-machine interfaces**.

The Faculty's researchers publish regularly in Q1 journals, contribute to major international projects (Horizon Europe, DARPA, EUREKA), and foster innovation through student-led spin-offs. Notable outcomes include **award-winning assistive technologies** like EyeRider in the [Cybathlon](#), and novel lab-on-a-chip systems for diagnostics and drug delivery.

Education at ITK is closely integrated with research, training the next generation of scientists and engineers through **hands-on, research-driven programs** in computer science, electrical engineering, and bionics. Doctoral degrees are awarded in biology, information technology, and electrical engineering, reinforcing the institution's role as a key contributor to the European Research Area.

### **Barrier Modeling and Innovative Pharmaceuticals Research Group**

In this laboratory the main research focus is on the **investigation of different physiological barriers** (e.g. epidermal/dermal barrier, nasal barrier, cornea, retina, intestinal barrier etc). We are studying the permeability, integrity and morphology of the natural and artificial barriers in normal and pathological conditions, as well as the drug delivery through the barriers.

We make **comparative and validation experiments** with different innovative drug formulations and traditional preparations. Our testing platforms include **organ-on-a-chip microfluidic devices, optical and ultrasound imaging, dermal diagnostics** (elasticity, hydration, pH, barrier function, pigmentation) **and visualization**, computational image analysis and in silico / mathematical modelling.

## **Expertise and references**

Our team possesses advanced expertise and state-of-the-art instrumentation in the **design, fabrication, and validation** of microfluidic systems for use in **pharmaceutical, dermatological, and ophthalmological** research. We conduct **pharmacokinetic** and **drug absorption** studies using **in vitro** and **ex vivo** models in **miniaturized systems**. Our work in **tissue engineering** includes the creation of **artificial epidermis** with human keratinocytes and hydrogels, along with detailed **morphological** and **functional characterization** of both artificial and human tissues. We test advanced **drug delivery systems**, including **electrospun nanofiber wound dressings** and **ophthalmic inserts**, using integrated **in vivo, ex vivo, and in vitro** methods. Our results have been published widely in **high-impact journals**, particularly on **nasal and topical drug delivery, barrier analysis, and microfluidic platform development** under healthy and pathological conditions.

## **Proposed activities and possible role in the project**

We are seeking to join a consortium under the Horizon Europe call **HORIZON-HLTH-2025-01-TOOL-05** as a **scientific and preclinical testing partner**, contributing to the translational development of innovative wound healing therapies.

Our proposed role includes the **in vitro** and **ex vivo** evaluation of **drug-loaded, electrospun nanofiber wound dressings** or other innovative formulations to support the transition from lab-scale research to clinical trial readiness. By applying our advanced testing platforms, we aim to:

1. **Accelerate access to innovative therapies** through robust preclinical datasets and in silico prediction supporting regulatory submissions and clinical entry.
2. **Facilitate clinical translation of novel biotech solutions** by validating drug release profiles, mechanical integrity, and antimicrobial activity in physiological models.
3. **Strengthen SME competitiveness** by providing scalable, eco-conscious assessment protocols that align with both **regulatory standards** and **end-user needs**.

We will carry out detailed assessments of **morphology, drug kinetics, barrier interaction, and efficacy** using **state-of-the-art imaging and microfluidic technologies**. We are committed to working closely with **SMEs and industrial partners** to ensure that the developed therapeutic platforms are **scalable, sustainable, and tailored to real-world clinical application**—ultimately enhancing **patient compliance and outcomes**.

## **Contact**

### **Franciska Erdő, PhD**

Professor, Head of laboratory, Faculty of Information Technology and Bionics at Pázmány Péter Catholic University, Budapest, Hungary,

E-mail: [erdo.franciska@itk.ppke.hu](mailto:erdo.franciska@itk.ppke.hu)