Department of Immunology and Biochemistry – Novickij et al. Research Group

Lithuanian State Research Institute, Centre for Innovative Medicine

The Centre for Innovative Medicine (IMC) is a Lithuanian State Research Institute dedicated to advancing biomedical research and developing innovative therapeutic and diagnostic solutions. Its research focuses on translating fundamental scientific discoveries into practical medical applications in the areas of stem cell biology, regenerative medicine, immunology and bioelectrochemistry, personalised medicine, and pre-clinical research. IMC is licensed to perform research in vitro, in vivo, preclinical, and clinical trials.



The Novickij et al. research group specializes in high-power electronics, electromagnetic radiation and its effects on biological objects, with a high focus on electroporation in the context of drug and gene delivery. The group has developed 10+ various high-power generators for biomedical applications. The applied electroporation research is performed on all pre-clinical levels (*in silico, in vitro, in vivo*) with a wide array of national and international partners. The accessible infrastructure involves state-of-art electroporation facilities, incl. pulsed magnetic field generators, flow cytometry, spectrophotometry fluorescence and confocal microscopy incl. kinetic systems for long-term evaluation of cellular bioeffects. The group has licenses and vast experience in in vivo experiments with access to modern vivarium featuring modern visualization systems. Group members have extensive expertise in cancer immunology and cancer models.

Research profile: https://www.researchgate.net/profile/Vitalij-Novickij

Open to partnering for the following calls:

- **HORIZON-MISS-2027-02-CANCER-01** Leveraging functional genomics to reveal novel targets for cancer treatment
- **EP PerMed 101137129** Cell and Gene Therapy for Personalised Medicine
- **HORIZON-HLTH-2027-01-CARE-02** Personalised approaches to reduce risks from Adverse Drug Reactions due to administration of multiple medications
- **HORIZON-HLTH-2027-01-DISEASE-08** Development of innovative antimicrobials against pathogens resistant to antimicrobials

Possible contribution:

- Electric/magnetic field mediated molecular delivery
- Characterization of new anticancer agents, targeted delivery
- Magnetic/electric field stimulation studies
- In vivo models and experiments

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- Immune response characterization
- Bacterial inactivation using pulsed electromagnetic fields
- Tissue ablation (e.g., cancer, cardiac ablation, etc.).

Key projects and publications

Supervised projects:

- 2019 – 2022 “Development of High Frequency Dielectrophoresis and Electrosensitization Based Nanoelectroporation Technologies for Targeted Drugs and Genes Delivery”
- 2021 – 2024 “Electroporation-based manipulation of drug resistance in cancer using novel nanosecond asymmetrical pulse sequences”
- 2023 – 2026 “A novel technology for eradication of tumors via targeted drug and DNA delivery based on bursts of high magnetic field pulses”
- 2024 – 2026 “Development of Synergistic Nano-Electroporation-based Gene Delivery Methods”
- 2025 – 2026 “Defining the role of pore-stabilizing nisin in nanosecond and microsecond range electrochemotherapy”

Key publications:

- Radzevičiūtė-Valčiukė, Eivina, et al. "Improving bleomycin electrochemotherapy with gold nanoparticles: First in vivo study on intra-tumoral field amplification." *Bioelectrochemistry* 165 (2025): 108999.
- Malakauskaitė, Paulina, et al. "Effects of ultra-fast nanosecond electric pulses on mitochondria transmembrane potential and oxidation." *Scientific Reports* 15.1 (2025): 39778.
- Miklavcic, Damijan, et al. "Contactless electroporation induced by high intensity pulsed electromagnetic fields via distributed nanoelectrodes." *Bioelectrochemistry* 132 (2020): 107440.
- Novickij, Vitalij, et al. "High frequency electroporation efficiency is under control of membrane capacitive charging and voltage potential relaxation." *Bioelectrochemistry* 119 (2018): 92-97.
- Novickij, Vitalij, et al. "Membrane permeabilization of mammalian cells using bursts of high magnetic field pulses." *PeerJ* 5 (2017): e3267.

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