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TITLE OF HIS PRESENTATION

Soft microrobots for single cell manipulation

RESULTS FOR THE TALENTUM PRIZE 2024 NOMINATION

We fabricated polymer microdevices that enable the investigation of individual cells in microfluidic environment and demonstrated their efficient applicability with three very different cell manipulation tasks.

RESEARCH AREA

In our research group, we design and apply polymer microtools that allow us to approach primarily biological problems in a more efficient and sometimes in a completely different way as before. The microtools prepared in a task-specific geometry have already been used to study hydrodynamic coupling, a phenomena that significantly affects motions in the size range of bacteria, also to improve the resolution of 3D microscopic imaging of single cells as well as to measure the adhesion force between the targeting ligands of medicine carrying nanospheres and the surface of cells that form the walls of blood vessels.

TECHNIQUES AVAILABLE IN THE LAB

Design and preparation of microfluidic devices using mask lithography, preparation of polymer microtools with laser-based microfabrication, laser tweezers to study biological and physical problems, culturing bacterium strains, design and building of optical systems, fluorescent microscopy, electron microscopy, image analysis.

SELECTED PUBLICATIONS

Vizsnyiczai, G.; Búzás, A.; Aekbote, B. L.; Fekete, T.; Grexa, I.; Ormos, P.; **Kelemen, L.** (2020) Multiview microscopy of single cells through microstructure-based indirect optical manipulation. **Biomedical Optics Express 11:** 945-962.

Grexa, I.; Fekete, T.; Molnar, J.; Molnar, K.; Vizsnyiczai, G.; Ormos, P.; **Kelemen, L.** (2020) Single-Cell Elasticity Measurement with an Optically Actuated Microrobot. **Micromachines 11:** 882.

Fekete, T.; Mészáros, M.; Szegletes, Zs.; Vizsnyiczai, G.; Zimányi, L.; Deli, M. A.; Veszelka, Sz.; **Kelemen, L.** (2021) Optically Manipulated Microtools to Measure Adhesion of the Nanoparticle-Targeting Ligand Glutathione to Brain Endothelial Cells. **ACS Applied Materials and Interfaces 13:** 39018-39029.

Iványi, G. T. ; Nemes, B.; Gróf, I.; Fekete, T.; Kubacková, J.; Tomori, Z.; Bánó, G.; Vizsnyiczai, G.; **Kelemen, L.** (2024) Optically Actuated Soft Microrobot Family for Single-Cell Manipulation. **Advanced Materials 36:** 2401115 .

Vizsnyiczai, G.; Kubacková, J.; Iványi, G. T.; Slabý, C.; Horváth, D.; Hovan, A.; Strejčková, A.; Tomori, Z.; **Kelemen, L.**; Bánó, G. (2024) 3D-printed ultra-small Brownian viscometers. **Scientific Reports 14:** 13964.