

# Cell and tissue engineering research group

*Keywords: stem cells, biomaterials, tissue engineering, biocompatibility, differentiation, signal transduction*



## Research group activities

Development of artificial tissues as a part of regenerative medicine is an interdisciplinary area of science, linking biomedical, technological sciences and engineering. It is one of the most exciting and rapidly growing areas in biomedical engineering, whose goal is to assemble scaffolds, cells and growth stimulating factors – generally referred to as the tissue engineering triad - into functionally active constructs that can replace or restore damaged tissue and organs. However, tissue engineering is related not only to tissue and organ replacement, but these systems in addition to biomedical applications might be used for non-therapeutic applications, i.e. as model systems to study cell behaviour, as biosensors to detect biological or chemical threat agents, as tissue chips that can be used to test the toxicity of an experimental medication.

We seek to develop the „hard“ and the „soft“ artificial tissues based on microstructured polymeric scaffolds and autologic adult stem cells.

**As the properties of different tissues and the needs vary, the tasks of our group are:**

- to choose relevant material for tissue fabrication;
- to develop techniques for its microstructurization and/or chemical modification;
- to evaluate the biocompatibility of the developed scaffolds;
- to elucidate the properties of cells grown on these scaffolds;
- to examine functionality of artificial tissue constructs in vivo.



## Proposal

- Screening of biomaterials/novel chemical compounds;
- Cell cytotoxicity studies;
- Development of methods for cell isolation;
- Cellular microenvironment modelling in vitro;
- Construction and testing of scaffolds designed for regenerative medicine;
- Fabrication of artificial tissues.



## Meet our team

### Lead researcher

Dr. Daiva Baltriukienė

### Research Group

Assoc. Prof. Dr. Virginija Bukelskienė

### PhD students

PhD student **Milda Alksnė**

PhD student **Evaldas Balčiūnas**

PhD student **Egidijus Šimoliūnas**

### Technician

**Dalia Kulbienė**



## Research outcomes

In order to create and develop technologies for biomedical application our group collaborates with Laser Research Center (Faculty of Physics, VU), Institute of Odontology (Faculty of Medicine, VU), Faculty of Chemistry (VU), Vilnius Gediminas

Technical University, Vilnius University Hospital Santariskiu Klinikos, State research institute Centre for Innovative Medicine, Center for Physical Sciences and Technology, Prodentum Ltd, Valentis Ltd, Femtika Ltd

### Most important publications

- **Assessment of human gingival fibroblast interaction with dental implant abutment materials.** Rutkunas, V., Bukelskiene, V., Sabaliauskas, V., Balciunas, E., Malinauskas, M., Baltriukiene D., Journal of Materials Science in Medicine. 2015, 26(4):169. doi: 10.1007/s10856-015-5481-8.
- **The effect of laser-treated titanium surface on human gingival fibroblast behavior.** Baltriukienė D, Sabaliauskas V, Balčiūnas E, Melninkaitis A, Liutkevičius E, Bukelskienė V, Rutkūnas V. Journal of Biomedical Materials Research Part A. 2014, 102(3):713-20. doi: 10.1002/jbm.a.34739.
- **3D Microporous Scaffolds Manufactured via Combination of Fused Filament Fabrication and Direct Laser Writing Ablation.** Malinauskas, M., S. Rekštytė, L. Lukoševičius, S. Butkus, E. Balčiūnas, M. Pečiukaityė, D. Baltriukienė, V. Bukelskienė, A. Butkevičius, P. Kucevičius, V. Rutkūnas, S. Juodkazis. Micromachines. 2014, 5(4), 839-858.
- **Long-term muscle-derived cell culture: multipotency and susceptibility to cell death stimuli.** Kalvelyte A, Krestnikova N, Stulpinas A, Bukelskiene V, Bironaite D, Baltriukiene D, Imbrasaitė A. Cell Biology International. 2013, 37(4): 292-304.
- **In vitro and in vivo biocompatibility study on laser 3D microstructurable polymers.** Malinauskas M., Baltriukiene D., Kraniauskas A., Danilevicius P., Jarašienė, R., Širmenis R., Žukauskas A., Balčiūnas, E., Purlys V., Gadonas R., Bukelskiene V., Sirvydis V. and Piskarskas A. Applied Physics A – Materials Science & Processing 2012, 108(3): 751-759.
- **Assessment of human gingival fibroblast interaction with dental implant abutment materials.** Rutkunas, V., Bukelskiene, V., Sabaliauskas, V., Balciunas, E., Malinauskas, M., Baltriukiene, D. Journal of Materials Science in Medicine. 2015, 26(4):169. doi: 10.1007/s10856-015-5481-8.
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