Baltic Biomaterials Centre of Excellence

RTU Rīgas Tehniskā universitāte

RSU Rīgas Stradiņa Universitāte

NRI Nacionālais pētniecības un inovāciju institūts

RSU Stomatoloģijas institūts

AO Research Institute Davos

FAU Friedrich-Alexander Universität Erlangen-Nürnberg

BBCE

New knowledge and experience

More qualified scientists and experts

Modern infrastructure

- Increased number of scientific projects
- Increased ratio of highly cited publications
- Patient-centred approach
- More scientific services for industry
- Individual approach in treatment
- New products for industry
- Attracting enterprises in healthcare for the Baltic Region
- Attracting more international scientists and students
- New startups
- Modern study programmes
- Attracting competitive funding and contract research funds



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Research Directions

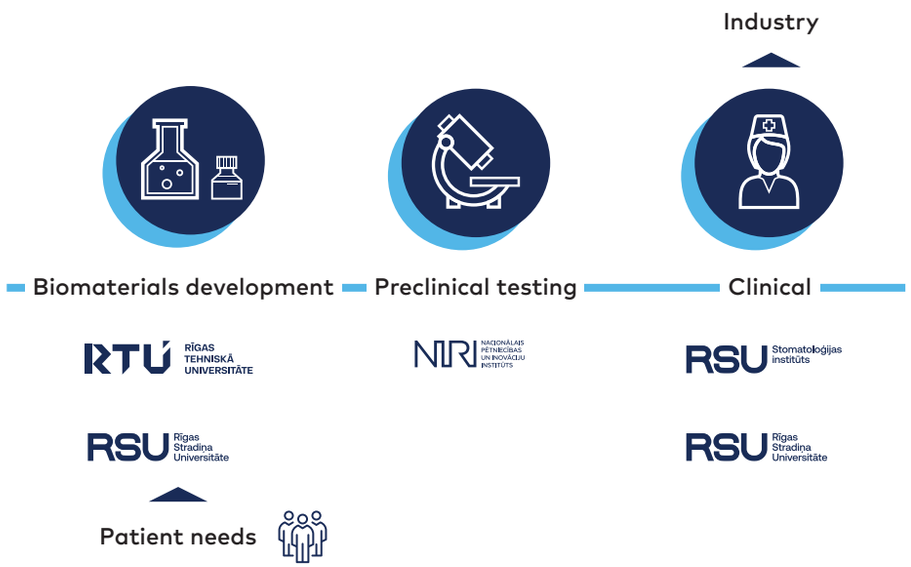
Strategic research direction of Baltic Biomaterials Centre of Excellence (BBCE) is development of patient specific personalized solutions for bone regeneration in 3 levels: biomaterial composition, geometry and bioactive compound delivery.

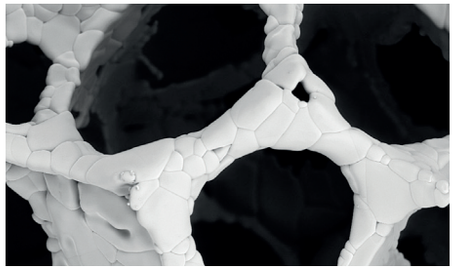
Full cycle of biomaterials for bone regeneration development consists of continuous steps:

1. Development of biodegradable, osteoconductive and osteoinductive materials, composites and drug delivery systems.
2. Preclinical in vitro/in vivo investigations.
3. Clinical trials.

BBCE long-term goal

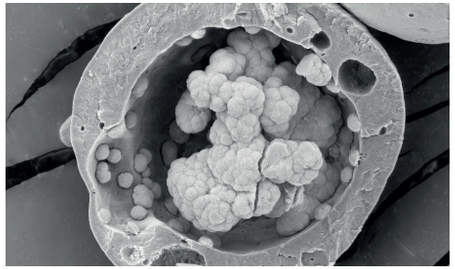
A joint Baltic Biomaterials Centre of Excellence for advanced biomaterials development based on the long-term strategic cooperation within consortium



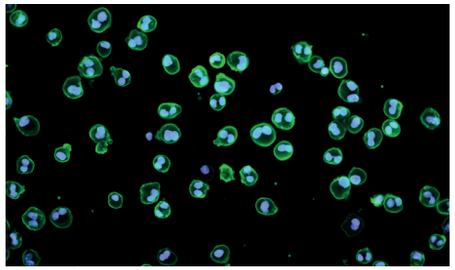
Group 1 – Calcium phosphates and composites

- Calcium phosphate (CaP) nanoparticles, nanosuspensions, granules, bone cements, CaP/biodegradable polymer (e.g. Polylactic acid, polycaprolactone, polyvinyl alcohol, hyaluronic acid) composites.
- Gradient materials, composites and hydrogels (CaP/polymer).

Group 2 – Drug/ion/cell delivery

- Local drug, biopharmaceutics and functional ion, cell delivery systems (antimicrobials, bisphosphonates, growth factors, anti-inflammatory agents, functional ions and combinations of drugs/ions).

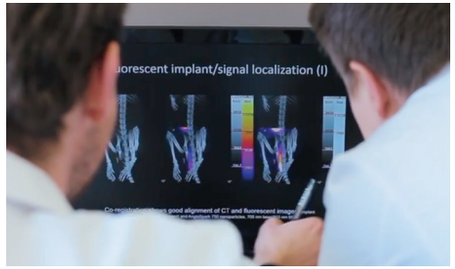
Group 3 – Materials *in vitro*

- Cellular responses, fundamental mechanisms that govern cell-biomaterial and cell-cell interactions.




Group 4 – Kinetics and stability of drug delivery systems

- Pharmaceutical technology from oral solid dosage forms to biomaterials as drug delivery systems.
- Active molecules and carrier particles - release kinetics and stability.

Group 5 – Preclinical evaluation of biomaterials

- *In vitro* and *in vivo* biocompatibility/cytotoxicity assays
- Kinetics of active substance release *in vitro,* bioavailability/pharmacokinetics *in vivo.*




Group 6 - Clinical evaluation of materials and personalized implant development.

- Clinical studies on biomaterials for bone regeneration, using 3D planning and printing technologies. Main fields - maxillofacial surgery and periodontology.