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Research Interests:

The context of this thesis is the regeneration of bone defects which can appear as a consequence of trauma, infection or cancer. It is hard to cure these loss of bone substitutes by conventional methods (autogref, implantation of biomaterials), especially in the case of large volume bone defects. Le contexte de ce projet est la régénération des défauts osseux de la sphère orale et maxillo-faciale qui peuvent survenir dans un contexte traumatique, infectieux ou tumoral. So it seems necessary to use tissue engineering techniques in some difficult clinical situations. It introduces specific methods which can provide all the necessary elements for the bone tissue regeneration, providing an osteoconducting support (scaffold), an osteogenic contingent (mesenchimal stem cells) and osteoconducting elements (growth factors).

The conventional tissue engineering is called “top-down” approach and it is based on seeding of a scaffold on its surface. The main limitation of this approach is poor cell viability inside the scaffold due to the difficulty to mimic bone microarchitecture and microenvironmental conditions, and it leads to an insufficient diffusion of oxygen and nutrients and insufficient elimination of waste products. Another approach, the “bottom-up” approach is based on assemblies of small seeded blocks. Layer-by-Layer Bioassembly is based on this approach.

The final goal of this project is to fabricate custom-made prevascularized bone substitutes, using layer-by-layer (LBL) approach to assemble cellularized poly(lactic acid) (PLA) porous membranes fabricated by Fused Deposition Modeling, which is an additive rapid prototyping method and characterized *in vitro* and *in vivo* after subcutaneous implantations in nude mice.

Porous PLA membranes fabrications realizes in three different collaborations: Institut for Bioengineering of Catalonia (Barcelona, Spain), Laboratory for Rapid Prototyping and Virtual Technologies (Faculty of Technical Sciences, University of Novi Sad, Serbia) and IUT de Bordeaux (France). Two last collaborations provide us different stabilization systems for seeding of cells onto PLA membranes and for stabilization of LBL constructs.

Two different types of human primary cells are used in this project: human bone marrow stromal cells (HBMSCs) isolated from diaphysis bone marrow, in aim to regenerate bone tissue, and endothelial progenitor cells (EPCs) isolated from cord blood, in aim to form a vascularization network in final constructs. On single seeded PLA membranes, we test cell viability, cell morphology, cell proliferation and differentiation. Evaluation of 3D LBL assemblies performs by tracking and quantifying the cell proliferation, by testing the repartition of cells in three dimensions and by histological analyses.

Keywords/expertise:

- 3D printing
- Fused Deposition Modeling
- Bone tissue-engineering
- Bioengineering
- Regenerative Medicine
- Cell culture

Education:

Academic Background

Since November 2014 PhD Student in Cellular Biology and University of Bordeaux –
Physiopathology BORDEAUX, France

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|-----------|--|---|
| 2011-2013 | Master`s degree in Engineering of Technical Sciences, Speciality Advanced Engineering Technologies | Faculty of Technical Sciences, University of Novi Sad, Serbia |
| 2011-2013 | Master`s degree in Chemistry – Speciality Molecular Chemistry | Pierre and Marie Curie University - PARIS 6, France |
| 2011 | Degree in Chemistry – Specialty Biochemistry | Faculty of Sciences, University of Novi Sad, Serbia |
| 2004 | Dental Technician | Medical school “7. April”, Novi Sad, Serbia |

Laboratory Internships & Professional Experiences

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| February-November 2013 | Internship “Study case of the rapid prototyping of the geometrical prototype of a human mandible | Laboratory for rapid prototyping and virtual technologies, Faculty of Technical Sciences, University of Novi Sad, Serbia |
| January - June 2012 | Internship “High resolution mass spectrometry for the characterization of phycotoxins in algae” | Laboratory for Structural, Organic and Biological Chemistry, IPCM, UMR-CNRS 7201, UPMC, Paris 6, France |
| April - May 2010 | Internship “Phytochemical and Biochemical Characterization of <i>Allium carinatum</i> L. and | Department of Chemistry, Biochemistry and Environment, |

Academic Background

Allium oleraceum L. extracts”

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