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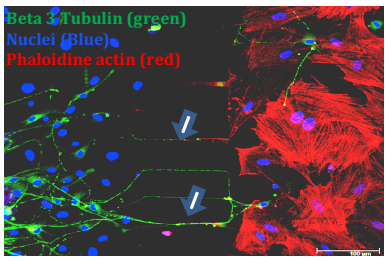
Research Interests:

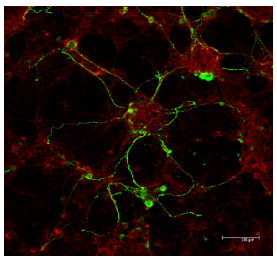
Bone tissue regeneration

My interests have from more than 20 years been centered on the translational aspects for bone tissue engineering. My experience has been focused on the stem cell biology and the different actors that control their osteogenic differentiation of human mesenchymal stem cells from bone marrow. Among them, I have worked on the role of the cellular environment and the cellular communication between angiogenesis and osteogenesis [1-4]. This has been extensively studied *in vitro* using two dimensional (2D) co-cultures models as well in three dimensional (3D) matrices able to activate blood vessels invasion [5-8].

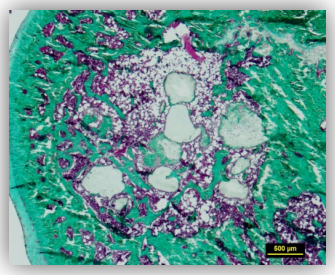
More recently, we investigate the impact of innervation on angiogenesis and osteogenesis using coculture models between mesenchymal stem cells or endothelial cells with sensory neurons isolated from Dorsal Root Ganglia of rats [9,10] or from human IPSCs differentiated to sensory neurons lineage. This basic knowledge on the bone neuro-vascular coupling was then apply for designing and developing innovative three-dimensional composites matrices for bone repair [11-16], taking into account the role of innervation for bone tissue regeneration [17]. Composite polymers [16], mainly composed of natural polysaccharides or recombinant polypeptides [17] were then developed, physico-chemically characterized and then evaluated for their



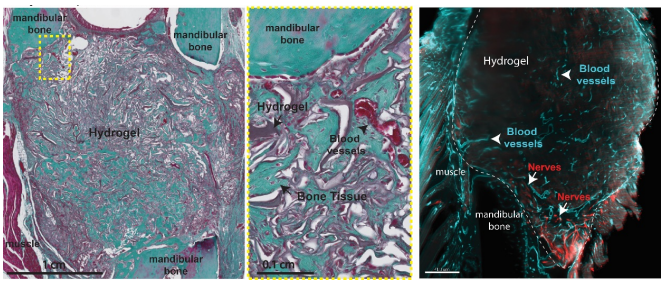
2D co-culture of sensory neurons (SN) and mesenchymal stem cells (MSCs) in microfluidic devices. Neurites outgrowth towards the extracellular matrix produced by MSCs. (*Da Silva PhD 's work).*



2D co-culture of sensory neurons (SN) and endothelial cells (ECs) in direct contact. SN and neurites remain close and around the ECs clusters. (*Leroux PhD's work).*



Microbeads of composite polysaccharides-based matrices implanted in a condyle femoral bone defect in rats (*In collaboration with Laboratory for Vascular Translational Science (Université Paris Cité), SILTISS (Saint Viance*). (*Ehret PhD 's work*)



Composite hydrogel designed for promoting bone formation, blood vessels, and

ability to promote bone formation, vessels invasion as well as innervation. Preclinical models of complex bone defects were then developed in small and large animals [11, 12, 14, 18]. One of these composite polymers, i.e polysaccharide-based materials supplemented with hydroxyapaptite [15, 16] is on clinical process investigation.

Keywords/expertise:

- Bone biology
- Human cell culture
- Osteoblast
- Mesenchymal stem cells
- Endothelial cells
- Sensory neurons
- 3D matrices
- Tissue-engineering
- Bioengineering
- Regenerative Medicine
- Cell-based / Cell-free therapies
- Preclinical studies
- Histology
- Immunofluorescence
- Clinical trials
- Translational medicine
- Patents
- Technology transfer

Representative publications:

1. Grellier M, Bordenave L, Amédée J. Cell-to-Cell Communication between Osteogenic and Endothelial Lineages: Implications for Tissue Engineering . *Trends in Biotechnology* 27, nº 10 (2009): 562-71. https://doi.org/10.1016/j.tibtech.2009.07.001.
2. Villars F, Bordenave L, Bareille R, Amédée J. « Effect of Human Endothelial Cells on Human Bone Marrow Stromal Cell Phenotype: Role of VEGF? » *Journal of Cellular Biochemistry* 79, nº 4 (2000): 672-85. https://doi.org/10.1002/1097-4644(20001215)79:4<672::aid-jcb150>3.0.co;2-2.
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9. Silva DI, Paiva dos Santos B, Leng J, Oliveira H, Amédée J. Dorsal Root Ganglion Neurons Regulate the Transcriptional and Translational Programs of Osteoblast Differentiation in a Microfluidic Platform. *Cell Death & Disease* 8, nº 12 (2017): 3209. https://doi.org/10.1038/s41419-017-0034-3
10. Leroux A, Paiva dos Santos B, Leng J, Oliveira H, Amédée J. Sensory Neurons from Dorsal Root Ganglia Regulate Endothelial Cell Function in Extracellular Matrix Remodelling. *Cell Communication and Signaling* 18, nº 1 (2020): 162. https://doi.org/10.1186/s12964-020-00656-0.
11. Fricain JC, Schlaubitz S, Le Visage C, Arnault I, Derkaoui SM, Siadous R, Catros S, *et al*. A Nano-Hydroxyapatite – Pullulan/Dextran Polysaccharide Composite Macroporous Material for Bone Tissue Engineering. *Biomaterials* 34,nº12(2013):2947-59. https://doi.org/10.1016/j.biomaterials.2013.01.049.
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15. Maurel DB, Fénelon M, Aid-Launais R, Bidault L, Le Nir A, Renard M, Fricain JC, Letourneur D, Amédée J, Catros S. Bone Regeneration in Both Small and Large Preclinical Bone Defect Models Using an Injectable Polymer-based Substitute Containing Hydroxyapatite and Reconstituted with Saline or Autologous Blood. *Journal of Biomedical Materials Research Part A* 109, nº 10 (2021): 1840-48. DOI: 10.1002/jbm.a.37176.
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17. Paiva Dos Santos B, Garbay N, Pasqua M, Chevron E, Chinoy ZS, Cullin C, Bathany K, *et al.* «Production, Purification and Characterization of an Elastin-like Polypeptide Containing the Ile-Lys-Val-Ala-Val (IKVAV) Peptide for Tissue Engineering Applications. *Journal of Biotechnology* 298 (2019): 35-44. https://doi.org/10.1016/j.jbiotec.2019.04.010.
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Education

1982-1985	PhD in Cell and Molecular Biology - University of Bordeaux 2, France,
1993	Authorization for PhD training - University of Bordeaux 2, France

Links:

BIOMAT: The French association for the development of biomaterials, Tissue Engineering and Regenerative Medicine. President of the association. http://www.biomat.fr

ESB (Europen Society for Biomaterials). Member (Vice-president: 2015-2019): https://www.esbiomaterials.eu/