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Consortium for Tissue Engineering (BxCRM).

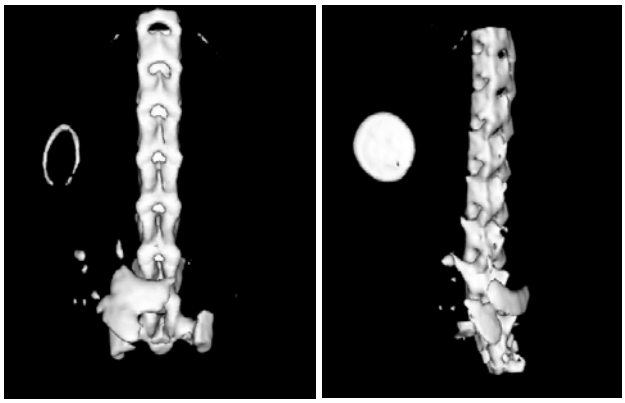
Research Interests:

Bone tissue engineering

My interests have always been focused on the use of natural products used for bone tissue engineering. My translational research has always aimed to develop innovative strategies for bone regeneration based on tissue engineering products, membranes used as periosteal substitutes, and the development of preclinical models.

My early research led me to study the resorption and bone integration of different materials used as a bone substitute: calcium phosphate, calcium carbonate and cellulose. This work helped to better understand the resorption and integration of these bone substitutes. This work led to a clinical trial that demonstrated for the first time the interest of biphasic implants (Hydroxyapatite / TCP) to repair the nasal septum.
Later, I had the opportunity to Develop polymeric materials based on pullulan and dextran doped with micrometric hydroxyapatite. These osteoinductive materials are in the process of industrial development by SILTiss society.
My current research focuses on the use of 3D printers to create custom personalized materials. A section of this research is devoted to 3D *in situ* bioimpression which allowed us to demonstrate that we were able to print mesenchymal stem cells in calvaria defect. The calvaria defect healing depended on the printed pattern.

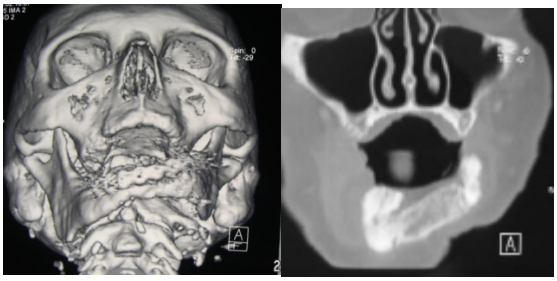
Materials



Pullulan and dextran doped with micrometric hydroxyapatite induce biomineralization in ectopic site. *Biomaterials ,2013, 34:2947-2959*

Membranes

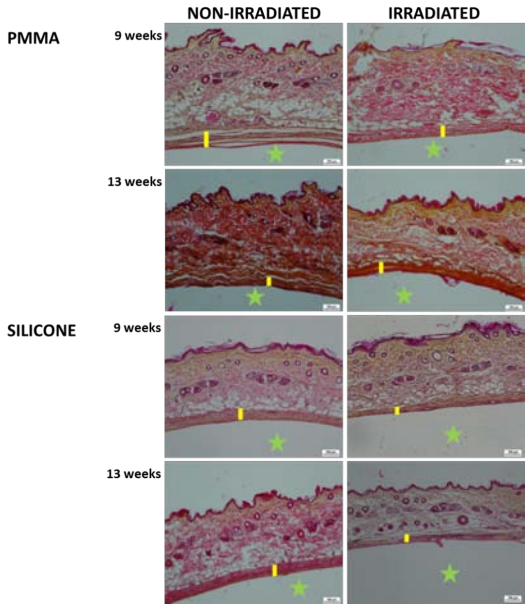
For many years my research focuses on the realization of periosteal substitutes according to the technique of induced membranes. We have demonstrated the value and feasibility of this technique in human mandible to treat osteoradionecrosis. Today this technique is used by many orthopedists and maxillofacial surgeons. In continuation of this work, we now focus our research on the use of human amniotic membrane in place of the induced membrane to cancel one operating time.



Mandibular reconstruction using induced membranes with autologous bone graft or HA-BTCP : animal model study and preliminary results in patients Int J Oral Maxillofac Surg. 2009 Dec;38(12):1289-97.

Preclinical models

Due to my surgical bakground, I developed in the laboratory many preclinical models to study bone regeneration in the presence of bone substitutes or induced membranes. These models are devoted to analyze biocompatibility in small animals models or to evaluate the efficacy in more complex models in large animals, that mimics clinical situations of oral and maxillo-facial surgery (sinus lift, regeneration of the nasal septum, bone regeneration around dental implant, segmental mandibulectomy with or without radiation). Today, our research in the field of 3D printing, aims at developing models to reduce the proportion of animal used for biocompatibility studies.



Comparative study of membranes induced by pmma or silicone and influence of external radiotherapy. *Acta Biomater. 2015 iun:19:119-27.*

Keywords/expertise:

- Preclinical model
- Bioprinting
- Biofabrication
- Bone substitute
- Oral surgery
- Oral medicine
- Induced membrane
- Tissue-engineering
- Bioengineering
- Regenerative Medicine
- Cell-based therapies
- Cell-free strategy
- Calcium phosphate
- Pre-clinical studies
- Stem cells
- Osteoinduction
- osteoconduction
- Translational medicine
- Patents
- Technology transfer

Selected publications since 2009:

- *Mandibular reconstruction using induced membranes with autologous bone graft or HA-BTCP : animal model study and preliminary results in patients* N. ZWETYENGA – S. CATROS – C. DEMINIERE – F. SIBERCHICOT – **J.C. FRICAIN.**. Int J Oral Maxillofac Surg. 2009 Dec;38(12):1289-97.

- *Subcutaneous-induced membranes have no osteoinductive effect on macroporous HA-TCP in vivo* CATROS S, ZWETYENGA N, BAREILLE R, BROUILLAUD B, RENARD M, AMEDEE J, **FRICAIN JC..** J Orthop Res. 2009;27(2):155-61.

- *Biphasic calcium phosphate to repair nasal septum: the first in vitro and in vivo study* DE GABORY L, BAREILLE R, STOLL D, BORDENAVE L, **FRICAIN JC**. Acta Biomater 2010;6(3):909-19. .

- Laser-Assisted Bioprinting for creating on-demand patterns of human osteoprogenitor cells and nano-hydroxyapatite S CATROS, **JC FRICAIN**, B GUILLOTIN, B PIPPENGER, R BAREILLE, E LAPLAUD, B DESBATS, J AMEDEE, F GUILLEMOT *Biofabrication,* 3; 2011: 025001

- *Magnetic resonance imaging tracking of human adipose derived stromal cells within three-dimensional scaffolds for bone tissue engineering* LALANDE C, MIRAUX S, DERKAOUI SM, MORNET S, BAREILLE R, **FRICAIN** JC, FRANCONI JM, LE VISAGE C, LETOURNEUR D, AMEDEE J, BOUZIER-SORE AK.Eur Cell Mater. 2011 Apr 11;21:341-54

- *Assessment of biphasic calcium phosphate to repair nasal septum defects in sheep*. DE GABORY L, DELMOND S, DEMINIERE C, STOLL D, BORDENAVE L, **FRICAIN JC.** Plast Reconstr Surg. 2011;127(1):107-16.

- *Layer-by-layer tissue microfabrication supports cell proliferation in vitro and in vivo.* CATROS S, GUILLEMOT F, NANDAKUMAR A, ZIANE S, MORONI L, HABIBOVIC P, VAN BLITTERSWIJK C, ROUSSEAU B, CHASSANDE O, AMEDEE J, **FRICAIN JC**. Tissue Eng Part C Methods. 2012, 18(1):62-70.

- *A nano-hydroxyapatite - Pullulan/dextran polysaccharide composite macroporous material for bone tissue engineering.* **FRICAIN JC**, SCHLAUBITZ S, LE VISAGE C, ARNAULT I, DERKAOUI SM, SIADOUS R, CATROS S, LALANDE C, BAREILLE R, RENARD M, FABRE T, CORNET S, DURAND M, LEONARD A, SAHRAOUI N, LETOURNEUR D, AMEDEE J. Biomaterials. 2013, 34(12): 2947-59.

- *pullulan/dextran/nha macroporous composite beads for bone repair in a femoral condyle defect in rats.* SCHLAUBITZ S, DERKAOUI SM, MAROSA L, MIRAUX S, RENARD M, CATROS S, LE VISAGE C, LETOURNEUR D, AMEDEE J, **FRICAIN JC**. plos one. 2014 oct 20;9(10):e110251.

- *statins and alveolar bone resorption: a narrative review of preclinical and clinical studies.* DE MONES E, SCHLAUBITZ S, CATROS S, **FRICAIN JC.** oral surg oral med oral pathol oral radiol. 2015 jan;119(1):65-73.

- *comparative study of membranes induced by pmma or silicone in rats, and influence of external radiotherapy.* DE MONES E, SCHLAUBITZ S, OLIVEIRA H, D'ELBEE JM, BAREILLE R, BOURGET C, COURAUD L, **FRICAIN** JC. acta biomater. 2015 jun;19:119-27.

Patents:

- Process to extract organic matrix from coral. Y. Lepetitcorps, JC Fricain, V. Souillac, A. Largeteau, R. Schmitthaeusler.. PCT : FR2004/03126, 2004.
- Bioprinting station, assembly comprising such Bioprinting station and Bioprinting method. F Guillemot, V Keriquel, S Catros, JC Fricain. EP10305224.7
- Porous polysaccharide scaffold comprising nano-hydroxyapatite and use for bone formation C Le Visage, M Derkawi, D Letourneur, S Catros, JC Fricain, J Amédée Inserm patent PCT/EP2012/064924 **licencing by SilTiss** (Member of the Administration Committee of the Company)

Teaching Activities:

- Deputy director of Bordeaux dental university
- Member of National University Council for oral surgery
- Member of scientific Council for internship in odontology
- Member of scientific council (OGDPC) for training in odontology
- Teaching at dental university oral surgery and oral medicine, Biomaterials and Medical devices at the University of Bordeaux;
- Training of 8 PhD students, 15 master students from 1997.

Clinical Activities:

- In charge of oral bone and soft tissue pathology diagnostic and treatment , in the Department of oral health and odontology at Bordeaux University Hospital, since 1997.
- Coordinator of oral surgery resident for Aquitaine area
- Chief redactor of oral surgery, oral medicine (MBCB) review
- Member of the editorial committee of Information Dentaire review
- Member of the national commission for oral surgery qualification

Funding:

- **National funds** from: GBM Aquitaine, Conseil Régional d'Aquitaine, Fondation des gueules cassées, Fondation de l'Avenir, Fondation pour la Recherche Médicale, ANR PNANO, ANR Blanc, ANR Emergence, ANR TECSAN.
- **Partner to several Concerted Actions or European Programmes**: Euronanomed FP7 NANGIOFRAC (2012-2015)-. FP7 NAMBIO COST (2012-2014). Programme de Recherche Avancée (PRA) with China,Funds from Inserm/DHOS (2010-2011)
- **Main collaborations with companies**: TEKNIMED, MERCK BIOMATERIALS (Darmstadt, Germany, CIFRE, PhD), Poietis, Straumann, SilTiss.

Memberships:

- Member of Executive Committee of Societe Francophone de Médecine Buccale et Chirurgie Buccale
- Member of European Society for Biomaterials
- Member of Executive Committee Biomat
- Member of Société Française de Biologie des Tissus Minéralisés
- Member of the interface committee INSEM – Odontology

Education:

- Doctor Dental surgery 1992, specialist of oral surgery (2012)
- PhD in Biology and Health, 1997
- Authorization for PhD training (2004)

Links:

- ESB: European Society for Biomaterials: *http//www.esbiomaterials.eu. Member of the European Society for Biomaterials (ESB) Council Committee from 2011 and Vice-President of ESB from 2015.* www.esbiomaterials.eu
- BxCRM: Bordeaux Consortium for Regenerative Medicine: https://bcrm.u-bordeaux.fr
- BIOMAT : The French association for the development of biomaterials, Tissue Engineering and Regenerative Medicine: http://www.biomat.fr
- SFCO: French Society of Oral Surgery: http://societechirorale.com