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Host own repair mechanisms in the context of tissue engineering

After a first research experience in **artificial modulation of eucaryotic gene expression** (1988-1990 in INSERM U201, Paris; 1990-2003 in INSERM U386, Bordeaux), I was interested by the **role of inflammation regulation in multiple sclerosis**, a neurodegenerative disease (2004-2013, INSERM EA 29-66 and U1049, Bordeaux). I am presently working on the **impact of innate immunity on the biointegration of an implanted material**.

When a biomaterial is implanted in the body, many host reactions may be observed: i) in the first minutes, adsorption of proteins, complement activation, provisional matrix formation, ii) during the first days, innate immunity cell extravasation, granulocytes (24h) and monocytes (48h-72h and later), in response to chemoattractants. The role of this natural cascade of events is to prevent infections by pathogens and to initiate wound healing. In a later phase, chronic inflammation, whose duration depends on the biomaterial, is associated with the presence of macrophages and lymphocytes. Implantation of biocompatible materials allows rapid resolution of acute and chronic inflammatory responses. Material remodeling takes place in part orchestrated by matrix metalloproteinases (MMP) that have been implicated in healing after injury. Increasing data demonstrate the central role of macrophages in implanted material biointegration, due to their homeostasis and wound healing properties.

The off-the-shelf strategy is based on the use of biocompatible devices, that favor the recruitment of cells able to induce regeneration of a functional tissue. During the first days after implantation, the activation phenotype of macrophages is of major importance: indeed, after recruitment in the implantation site, the monocytes undergo maturation into macrophages. Depending on the microenvironmental cues, they can adopt a large spectrum of activation phenotypes, classified in two main subsets: i) classically activated macrophages, recruited by the chemokine CCL2 due to membrane CCR2 expression, enter tissues 48h-72h after injury, clear dead cells and cell debris, release reactive oxygen species, and pro-inflammatory cytokines and promote angiogenesis; ii) in contrast, alternatively activated macrophages produce anti-inflammatory cytokines, secrete growth factors, and stimulate the remodeling of blood vessel network, and tissue. There appears to be a delicate balance, where excessive macrophage infiltration can lead to a strong foreign body reaction that induces formation of a fibrous capsule, whereas complete macrophage inhibition impedes tissue regeneration. Therefore, published results suggest that macrophages play a critical role in orchestrating tissue remodeling via a paracrine mechanism.

Keywords/expertise:

- Tissue-engineering
- Regenerative Medicine
- Inflammation
- Bone regeneration
- Vascular graft
- Neuroinflammation
- Macrophages
- Pre-clinical studies
- In vivo imaging
- Histology
- Immunofluorescence
- Molecular biology
- Technology transfer
- Safety and Hygiene
- CHSCT

Selected publications:

- Aussel A, Boiziau C, L'Azou B, Siadous R, Delmond S, Montembault A, David L, Bordenave L & Thébaud NB. Cell and tissue responses at the interface with a chitosan hydrogel intended for vascular applications: in vitro and in vivo exploration. Biomed Mater (2019), 14:025009.

- Boiziau C, Nikolski M, Mordelet E, Aussudre J, Vargas-Sanchez K & Petry KG. A Peptide Targeting Inflammatory CNS Lesions in the EAE Rat Model of Multiple Sclerosis. Inflammation (2018), 41:932-947.

- Fénelon M, Chassande O, Kalisky J, Gindraux F, Brun S, Bareille R, Ivanovic Z, Fricain JC & Boiziau C. Human amniotic membrane for guided bone regeneration of calvarial defects in mice. J Mater Sci Mater Med (2018), 29:78.

- Oliveira H, Catros S, Boiziau C, Siadous R, Marti-Munoz J, Bareille R, Rey S, Castano O, Planell J, Amédée J & Engel E. The proangiogenic potential of a novel calcium releasing biomaterial: Impact on cell recruitment. Acta Biomater (2015), 29:435-45.

- Mikita J, Dubourdieu-Cassagno N, Deloire M.S.A., Vekris A, Biran M, Raffard G, Brochet B, Canron M-H, Franconi J-M, Boiziau C & Petry K.G. Altered M1/M2 activation patterns of monocytes in severe relapsing experimental rat model of Multiple Sclerosis. Amelioration of clinical status by M2 activated monocyte administration. Mult Scler (2011), 17:2-15.

- Tourdias T, Mori N, Dragonu I, Cassagno N, Boiziau C, Aussudre J, Brochet B, Moonen C, Petry KG & Dousset V. Differential aquaporin 4 expression during edema build-up and resolution phases of brain inflammation. J Neuroinflammation (2011), 8:143 (16 pages).

- Petry KG, Brochet B, Dousset V, Vignes J-R & Boiziau C. Inflammation induced neurological handicap processes in Multiple Sclerosis: New insights from preclinical studies. Review. J Neural Transm (2010), 117:907-17.

- Tourdias T, Dragonu I, Fushimi Y, Deloire MS, Boiziau C, Brochet B, Moonen C, Petry KG & Dousset V. Aquaporin 4 correlates with apparent diffusion coefficient and hydrocephalus severity in the rat brain: a combined MRI-histological study. Neuroimage (2009), 47:659-66.

- Brochet B, Dousset V, Deloire M, Boiziau C & Petry KG. MRI to predict severe tissue damage in inflammatory lesions in animal models of multiple sclerosis. Brain (2008), 131:e92.

- Petry KG, Boiziau C, Dousset V & Brochet B. MRI of human brain macrophages. Review. Neurotherapeutics (2007), 4:434-42.

- Kolb G & Boiziau C. Selection by phage display of peptides targeting the HIV-1 TAR element. RNA Biol (2005), 2:28-33.

- Boiziau C, Dausse E, Yurchenko L & Toulmé J-J. DNA aptamers selected against the HIV-1 TAR RNA element form RNA/DNA kissing complexes. J Biol Chem (1999), 274:12730-12737.

- Boiziau C, Thuong NT & Toulmé J-J. Mechanisms of the inhibition of reverse transcription by antisense oligonucleotides. Proc Natl Acad Sci USA (1992), 89:768-772.

Patent:

- Boiziau C, Vekris A & Petry KG (2011). Procédé d'hybridation soustractive entre deux populations d'acides nucléiques. Patent FR 2952071-A1.

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- National funds from ANR: Bio3 (2016-2020)
- European funds: ITN ImplantSens (2019-2023)

Memberships:

Société Française d'Immunologie. CFATG-Club Francophone de l'Autophagie.

Education:

2000	Accreditation to direct research (HDR)	University of Bordeaux, France INSERM U386, Bordeaux
1988-91	Ph.D. in Mol & Cell Pharmacology	P. and M. Curie University Paris 6, France Muséum National d'Histoire Naturelle, Paris INSERM U201, Paris CJF 90-13, Bordeaux
1985-88	Engineer school	ENSTA ParisTech, France

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