ABSTRACT SUBMISSION

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Development of bioadhesive and antimicrobial coatings for implants functionnalization

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ABSTRACT

One of the main challenges in material implantation is the correct bio-integration that conditions the successful performance of the implant in the human body. In the context of orthopedic/dental implants, integration is often jeopardized by infections which reduce the lifespan and increase failure rate of implants, morbidity, and account for high medical costs. There is thus a crucial need of enhancing the implant-host tissue cross-talk by developing interfacial strategies that guarantee an optimal and stable seal of soft tissue onto the implant and that prevent early and late infection, without the use of antibiotics.

Thin films formed by the Layer-by-Layer assembly of oppositely charged polyelectrolytes are particularly attractive for applications involving cell-material contact, as they are easy to fabricate, can be used to modify the surface of many types of materials, irrespective of shape, and possess physicochemical properties that are readily controllable. Here we developed proactive and biomimetic coatings, able to guarantee long-term tissue attachment and integration, with antimicrobial properties. The extracellular matrix protein Fibronectin (Fn), known to play a role in cell adhesion, spreading, proliferation and differentiation, is incorporated as the anionic polymer during the film construction by the Layer-by-Layer technic, and will create a biomimetic interface at the surface of the implant that could enhance cells attachment. Poly-L-Lysine -exhibiting specific chain lengths- is used as the cationic polymer and confers remarkable antibacterial property to the film. We have demonstrated the feasibility to generate and control thin interfacial films of oppositely charged polyelectrolytes made with Fn and PLL[1] and characterized the physico-chemical properties of these films in terms of growth regime, thickness, surface morphology and Fn conformation within the film. PLL-Fn films were shown to enhance adhesion, spreading and proliferation of preosteoblasts. PLL-Fn films also revealed intrinsic antibacterial properties, and were shown to be highly efficient to inhibit bacterial growth of *Stapphylococcus epidermidis* and induce biofilm destabilization. Note that the molecular weight of the PLL has a strong impact on the antimicrobial activity.

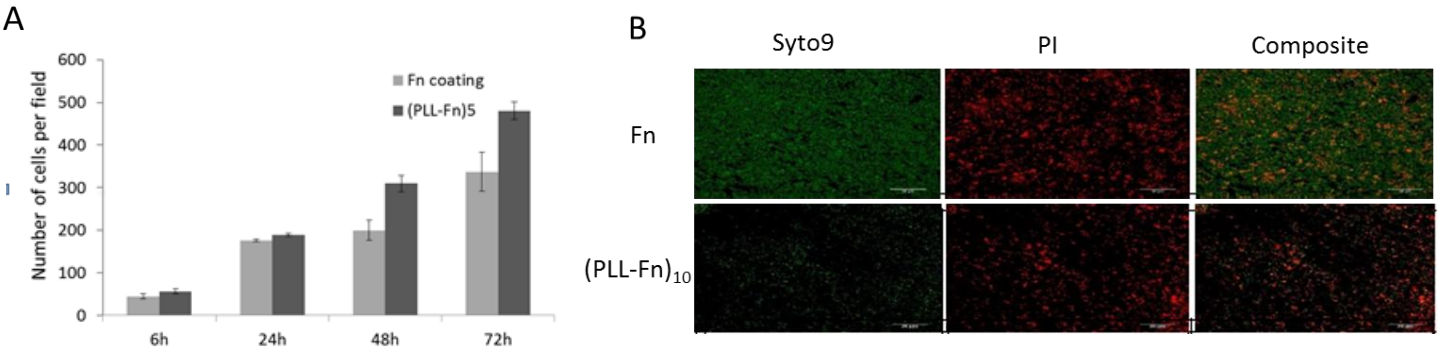

Figure 1 : Influence of Fn and (PLL-Fn) coatings on adhesion and proliferation of preosteoblastic cells (A) and on Stapphyloccocus epidermidis biofilms

References : [1] A. Gand *et al.*, Colloids Surf B Biointerfaces (2017) 156:313-319. doi: 10.1016/j.colsurfb.2017.05.023