DESIGN AND PRECLINICAL VALIDATIONS OF POLYSACCHARIDE-BASED NANO/MICRO/MACROSYSTEMS FOR TISSUE ENGINEERING AND MOLECULAR IMAGING

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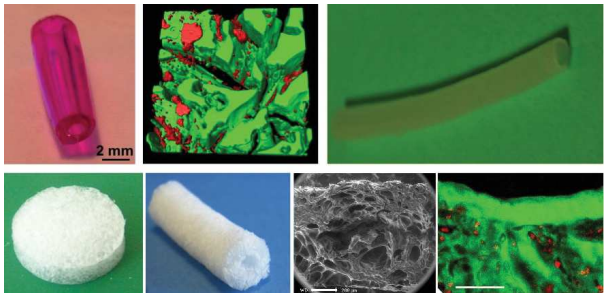
Abstract

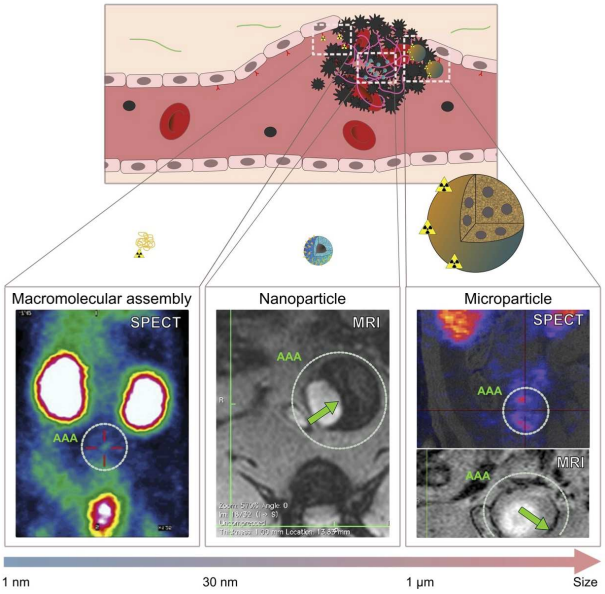
This presentation intends to present polysaccharide-based matrices for regenerative medicine and as drug delivery systems and targeted contrast agents for molecular imaging.

One main challenge of tissue engineering is to create an optimal environment for growing therapeutic cells to regenerate damaged tissues. This environment can be reconstituted by using 3D matrices, in which cells can be organized into a tissue-like structure. We have prepared polysaccharide-based porous matrices having controlled pores and porosity for several cell types. These porous hydrogels made of natural biodegradable and biocompatible polysaccharides have architectural characteristics adapted to the cell culture in 3D.

We have developed them to different shapes and sizes. Further studies have demonstrated the performance of these matrices for tissue repair in vitro as well as in small and large animals. Examples for heart, vessel, and bone will be presented.



Moreover, polysaccharide-based nano and microsystems were also designed and used for the imaging of cardiovascular pathologies as targeted contrast agents for molecular imaging. Examples will be provided using several types of imaging modalities for thrombus detection.



We will also present how to use nanomaterials for regenerative medicine. Indeed, adhesion by aqueous nanoparticle solutions can be used in vivo to achieve rapid and strong closure and healing of deep wounds in rat skin and liver. Nanoparticles can also be used to fix polymer membranes to tissues even in the presence of blood flow, such as occurring after liver resection, yielding permanent hemostasis within a minute. Furthermore, medical devices and tissue engineering constructs could be fixed to organs such as a beating heart.

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