Development of 3D scaffolds for tissue engineering

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ABSTRACT:

With the aging of population and affliction coming as consequences, replacement of organs and biomedical implants is of first importance. The development of biomaterials for this purpose is an important subject of research. Biomaterials are evolving from being bioinert to bioactive, meaning that that play a direct role in their integration/inclusion in the body. The control of the structure [1,2], conductivity [3,4] and mechanical properties [5] is very important, as they are some of the key parameters for cell differentiation (Fig. 1a). CoPEC (Compact PolyElectrolyte Complexes) are formulated by polyelectrolytes of opposite charges at high concentration in polymer and salt and formed through ultracentrifugation [6] or drop-casting. They can have mechanical properties close to biological tissues, important for a better integration and be made from biocompatible polysaccharides, such as chitosan and alginate [7].

In this study, we developed a simple method to obtain PSS/PDADMA (poly(styrene sulfonate)/poly(diallyldimethyl ammonium)) CoPEC materials by a simple change of solvent focusing on their characterization depending on the polymers molecular weight (M_w). The porosity of the materials has been studied using fluorescent confocal microscope along with their mechanical properties using a rheometer and tensile test machine. The size and distribution of the pores increase with the $M_{w,}$ with a mean size between 5 and 50 µm. The mechanical properties of the materials evolve from a brittle behavior at low M_w to a stretchable property at high M_w.

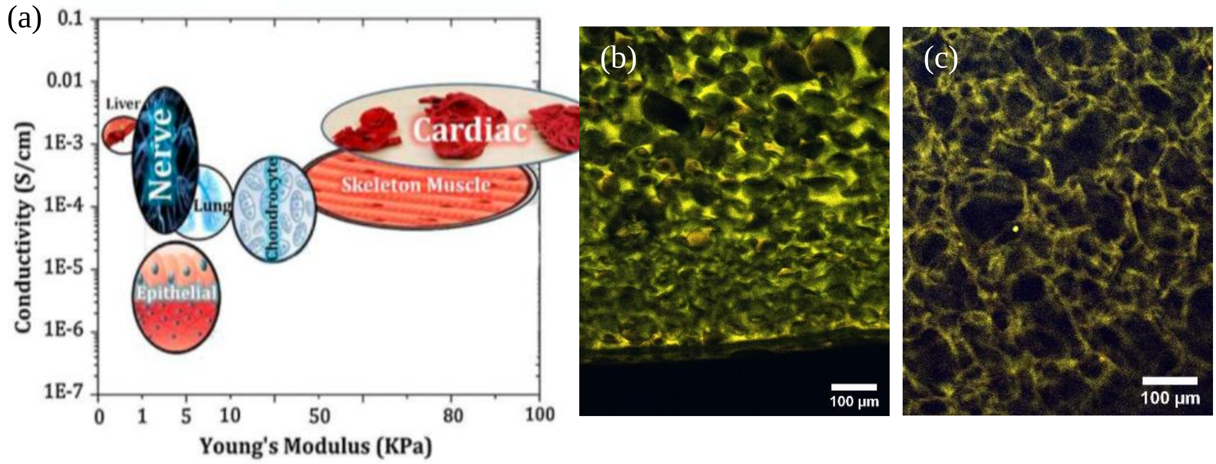

***Figure 1* : (a)** Conductivity and young modulus values of different biological tissues [8]
(b) confocal microscopy picture of an average M_w CoPEC and **(c)** of a high M_w CoPEC

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