

Séminaire LIONS



Jeudi 22 mai 2014 à 11h00, pce. 157, bât. 125

Liquid crystal phases of collagen I and their fibrillogenesis for the synthesis of artificial corneas

Gervaise MOSSER

Equipe Matériaux et Biologie, Laboratoire Chimie de la Matière Condensée de Paris, UMR7574-UPMC/CNRS/Collège de France, 4 Place Jussieu, 75005 Paris

Collagen I is the major structural protein in connective tissues in mammals. It exhibits highly organized distributions. Fibril diameters and spatial organisation are dependent on the species, tissue type and stage of development. The corneal secondary stroma is unique as it possesses collagen fibrils of uniform diameter and lateral spacing. Moreover fibrils are arranged in parallel arrays of orthogonal lamellae mostly perpendicular to the optic axis (plywood organization). These characteristics are required for transparency, refractive properties and mechanical toughness of this tissue.

In vitro, acidic solutions of collagen I generate lyotropic liquid crystals that can be stabilized by a pH increase. This increase induces the fibrillogenesis of collagen without disturbing the organization. At the end of those two steps, we obtain fibrillated collagen matrices that are hierarchically organised.

Taking advantage of these properties, we have been studying, over the past years, the physicochemical parameters to drive the system into plywood liquid crystal organisation and to control the diameter of the fibrils. We thus succeeded to synthesise highly organized transparent fibrillated matrices. We are now testing and adapting the process step by step to enable the colonization of all corneal cell types. Our goal is to deliver either free-cell matrices allowing their repopulation by human corneal stem cells in vitro and all recipient cells in vivo or cell-loaded corneal substitutes.

During this seminar, we will overview this quest up to its present stage.

This work is supported by the Fondation pour la Recherche Médicale.