

Proteins structure imaging in biological tissues using synchrotron X-ray microdiffraction

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We will present two main examples of tissue studies that we carried out at the ESRF. In the first one we will describe the molecular structures distribution along a mature hair shaft.

Mechanical stress effects will then be imaged across a fibre section showing keratin intermediate filaments molecular transformation from α -helices to β -sheets.

Keratin intermediate filaments behaviour in the keratinisation zone during the differentiation process and the fibre formation will also be presented. We will follow the various keratinisation steps at molecular and supra-molecular levels.

The second example concerns internal structures of an amyloid deposit. We show the importance of using a micron-sized beam to locate fibrous zones as well inside *in vitro* preparation as inside an amyloid laden tissue such as a kidney cut. In this last case, we carried out the first study of an amyloid deposit directly in human renal tissue sections, avoiding any possible extraction-induced artefact. Using X-ray microdiffraction, we reveal the presence of the typical cross- β features from a frozen sample, similar to those observed for *in vitro* formed or extracted fibres. Moreover, mapping through the tissue section shows intrinsic orientation of the fibres with a micrometer scale resolution, which interestingly is correlated to the glomerulus morphology.