Getting a grip on strongly hydrated biomolecular films – the example of the pericellular coat.

N. Baranova, P. Wolny, and Ralf P. Richter

CIC biomaGUNE, Biosurfaces Unit, Paseo Miramón 182, 20009 Donostia – San Sebastian, Spain
rrichter@cicbiomagune.es

The plasma membrane is commonly considered the boundary of the living cell, although peripheral polysaccharides and glycoproteins often self-organize into an additional coating layer on the cell surface (Figure). These pericellular coats (PCC), several hundred nanometres or even a few micrometers thick, play a crucial role in the general protection of the cell, and act as a mediator in the communication with its environment. The highly hydrated nature of these coats, and the complex structure and dynamics of the living cell make them difficult to probe in their native environment or to determine the coat's structure with high resolution methods. Therefore, to understand structure/function inter-relationships of these supra-molecular assemblies, it is vital to move from living cells to simplified model systems.

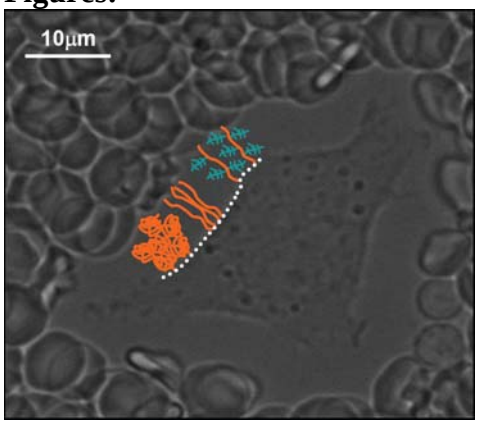
We have recently developed a new method to create *in vitro* model systems of the PCC that is based on the end-grafting the polysaccharide hyaluronan, a key component of the PCC, to a supported lipid bilayer [1]. The model systems are well-controlled and capture characteristic properties of the PCC, including its dimensions and hydration. With these models, the dynamics of coat organization and relevant physico-chemical properties can be investigated in a quantitative manner.

Here, I will present data on the detailed characterization of such model systems using a toolbox of characterization techniques. Using techniques such as QCM-D, ellipsometry, microinterferometry and colloidal AFM, we investigate *in vitro* the properties of hyaluronan films, including its mechanical properties, its permeability to solutes, and its response to hyaluronan-binding proteins. These characterization approaches are also promising beyond the scope of this work, for the characterization of the soft and hydrated films in general.

References:

[1] Richter, R. P.; Hock, K. K.; Burkhartsmeyer, J.; Boehm, H.; Bingen, P.; Wang, G.; Steinmetz, N. F.; Evans, D. J.; Spatz, J. P. J. Am. Chem. Soc., **127** (2007), 5306-5307

Figures:



The pericellular coat, visualized by a particle exclusion assay: red blood cells that have been added in abundance to a living chondrocyte (centre) cannot penetrate into a zone of several micrometers in thickness around the cell. They mark the outer limit of the strongly hydrated pericellular coat. The sketches represent but a few supramolecular conformations that are thought to give rise to the coat. Our work aims at understanding the structure, the physico-chemical properties and eventually the biological function of these soft and hydrated architectures at the nanoscale. Micrograph by H. Boehm (Max Planck Institute for Metals Research, Stuttgart, Germany).