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How a Surface Bound Polymer Matrix Can Regulate Surface Accessibility and Function of Cells

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The external interface of many cell types is not the plasma membrane. Rather, the gateway to a sub-class of cells is a sizable surface bound polymer brush like structure. This so-called pericellular matrix (PCM) extends a few hundred nanometers to tens of microns from the cell surface. The PCM affects filtration and transport of molecules to and from the cell surface. It also influences interactions of the plasma membrane with surrounding cells and extracellular matrix. Studies suggest that the PCM plays key physicochemical roles in processes as diverse as molecular sequestration, mediation of cell adhesion in proliferating and migrating cells, the formation of neuronal synapses, embryogenesis, and cancer metastasis. This talk will present insights into the macromolecular structure and the mechanics of the PCM gained from a spectrum of original biophysical assays, ranging from optical force probe microscopy to quantitative particle exclusion assays to fluorescent single molecule tracking. Accessibility of the cell surface and its screening by the PCM will be addressed. Preliminary experiments investigating (model) growth factor sequestration via electrostatic interaction with PCM molecules and its possible relation to the influence of PCM on mesenchymal stem cell differentiation will be discussed.