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Hydrodynamic extrusion of membrane nanotubes: the role of the cytoskeleton KARINE GUEVORKIAN, Curie Institute, NICOLAS BORGHI, Stanford University, SÉBASTIEN KREMER, AXEL BUGUIN, FRANÇOISE BROCHARD, Curie Institute — We have investigated membrane-cytoskeleton adhesion properties by extrusion of tubes from tethered vesicles and cells using hydrodynamic flows. Our experimental results show that impermeable membranes (giant vesicles) act as entropic springs, i.e. the extruded tubes reach a stationary length, whereas porous membranes (vesicles decorated with pores) lead to tubes, which extrude at constant velocity without reaching a stationary length. On the other hand, experiments on red blood cells (RBC) suggest that the dynamics of extruded tubes is dominated by the detachment of the membrane from the cytoskeleton and the flow of lipids through the binding membrane proteins. We have estimated the membrane-cytoskeleton binding energy and the viscosity of the membrane for RBC-s. Tube extrusion from other cell types (S180, MDCK, BON) show phenomena such as healing time for the membrane-cytoskeleton rebinding, and cell aging (breakage of the tube after a few consecutive extrusions). We will discuss how these phenomena depend on the properties of the cytoskeleton and on the presence of cell adhesion molecules.

Karine Guevorkian
Curie Institute

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