Measuring intracellular stiffness in epithelial cells

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Epithelial cells form the boundary between an organ (or an entire organism) and its environment. Hence, epithelial cells experience a strong asymmetry in their environment – “out” versus “in”. It is therefore not surprising that epithelial cells are strongly polarized; for example, the actin meshwork is denser at the apical, or “outward facing”-side of the cell, while the nucleus is always located at the basal, or “inward facing”-side of the cell. However, to date it remains unclear if and how mechanical processes play a role in establishing and maintaining polarity.

Here I will present a project that focuses on measurement of intracellular activity and stiffness in MDCK-cells. Using both active and passive microrheology, we obtain cellular stiffness and activity as a function of position within the MDCK-cell. Once this is established, we can use drugs to up- or downregulate specific components of the cytoskeleton. Furthermore, since the mechanical environment is of crucial importance to cells, we hypothesize that variations in the extracellular matrix also have an influence on intracellular mechanics.