

Single and collective mechanosensing and mechanotransduction

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During cancer development, tumor cells encounter various mechanical constraints. When the tumor expands, active and passive remodeling of the extracellular matrix increases the tissue's stiffness and cells experience resistance from the basement membrane surrounding the tumor. Via various mechanotransduction pathways such mechanical stimuli influence cell behavior.

Our group approaches this complex from three perspectives:

- 1) Tumor cell aggregates are produced via alginate microcapsules. The development of integrated lab-on-a-chip devices will allow for global observation of numerous tumor spheroids in parallel and thus screening applications.
- 2) Using light-sheet microscopy individual spheroids as well as individual cells at the periphery of spheroids can be observed on time scales of several weeks. Of special interest is the response to mechanical stimuli that enable some cells to leave the collective.
- 3) Using substrate deformation, shear flow and osmotic stress we study the individual response of cells to mechanical stress focusing on the caveolae-mediated mechanotransduction pathway.

The aim of these studies is to exploit new technologies in optical and tissue engineering as well as microfabrication to study principal physical mechanisms underlying and determining tumorigenesis.