Vascular mechanobiolology of diabetes and age-associated inflammation

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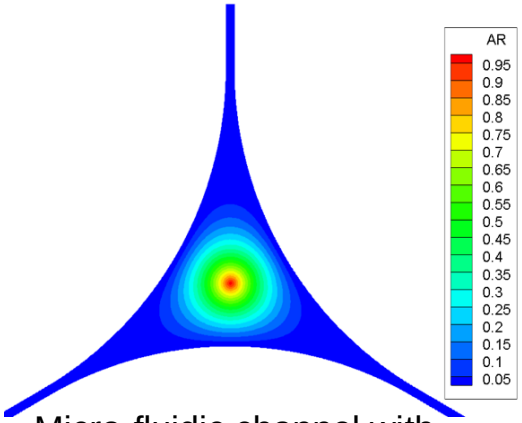
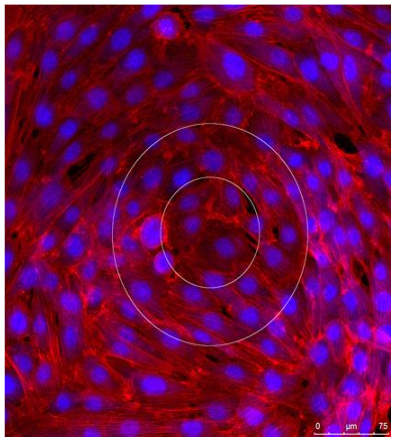
Goals of the Project

- Subject endothelial cells to unidirectional and bidirectional fluid shear stress and link cellular morphologies to functional changes.
- Characterize the impact of inflammation on the ability of the cell to sense flow stimuli.
- Relate changes in form to the gene expression levels of various atherogenic and thromogenic signaling molecules in endothelial monolayers

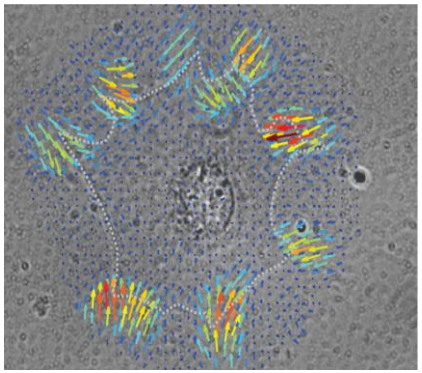
Cell contractility quantification using traction force microscopy



Micro-fluidic channel with circular shear rosette



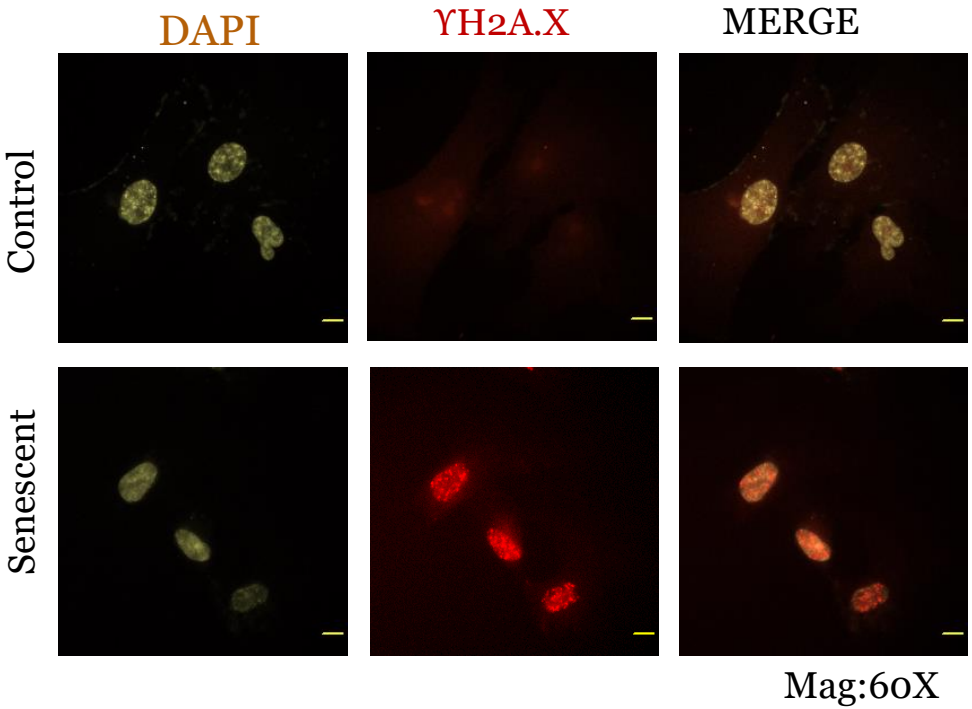
Endothelial cells under bi-directional shear stress



Traction forces exerted by cells on soft substrates

Krishna *et al*, JFM (2017); Krishna *et al,* J.Biomech (2020); Kulkarni *et al*, Soft Matter (2018)

DNA damage driven aging leads to changes in mechnobiology



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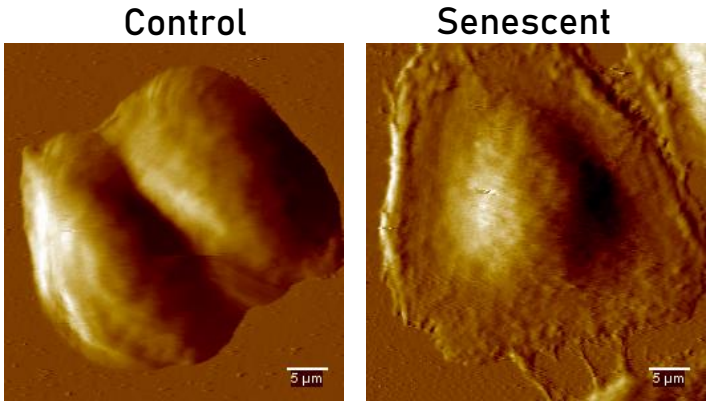
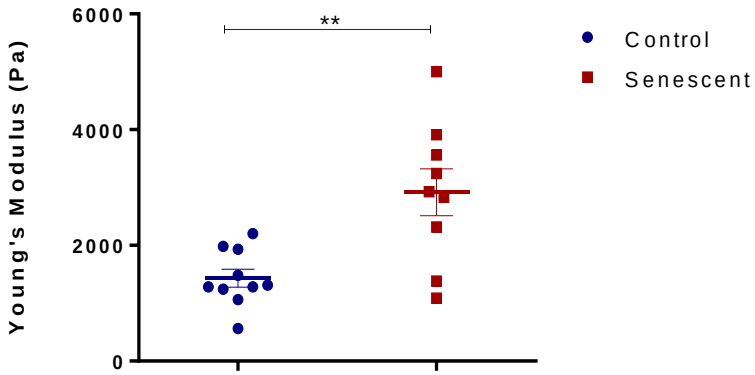
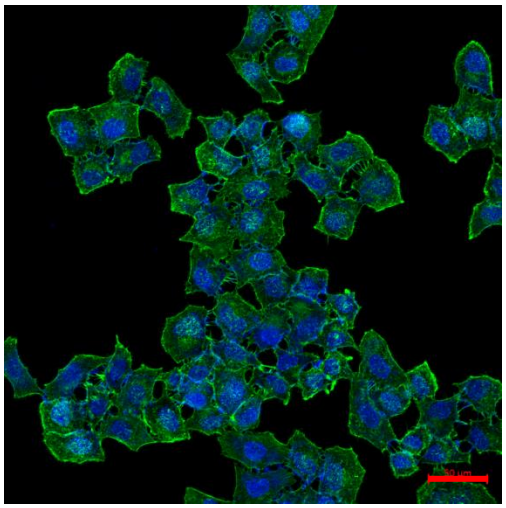
Increase in γH_2 A.X foci due to DNA damage in senescent aka aged cells

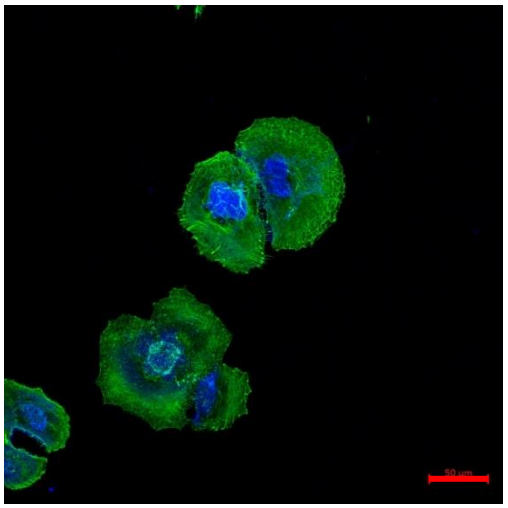


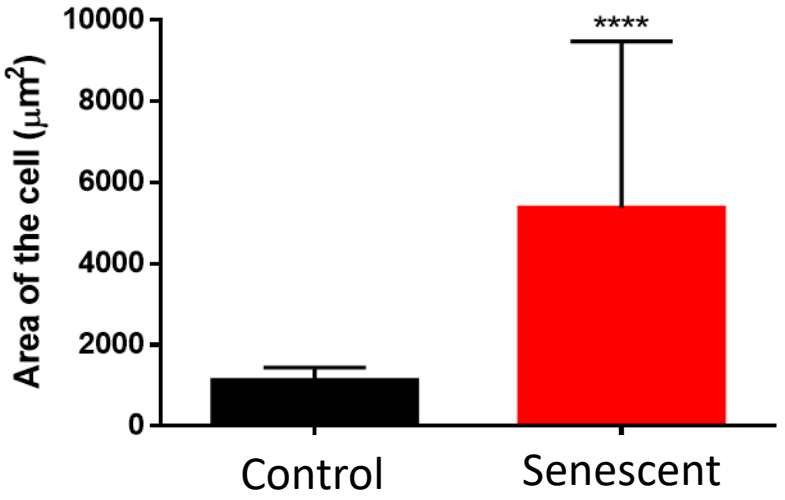


AFM analysis of senescent (aged) HeLa cells depicting increase in membrane stiffness

Senescent cells show altered morphology







Control Senescent

The projects aims to understand the physical/ mechanical drivers of aging and how it relates to various changes which take place during the process such as increase in inflammation and resistance to apoptosis.