MECHANICAL ENGINEERING MSc SEMINAR (30 min.)

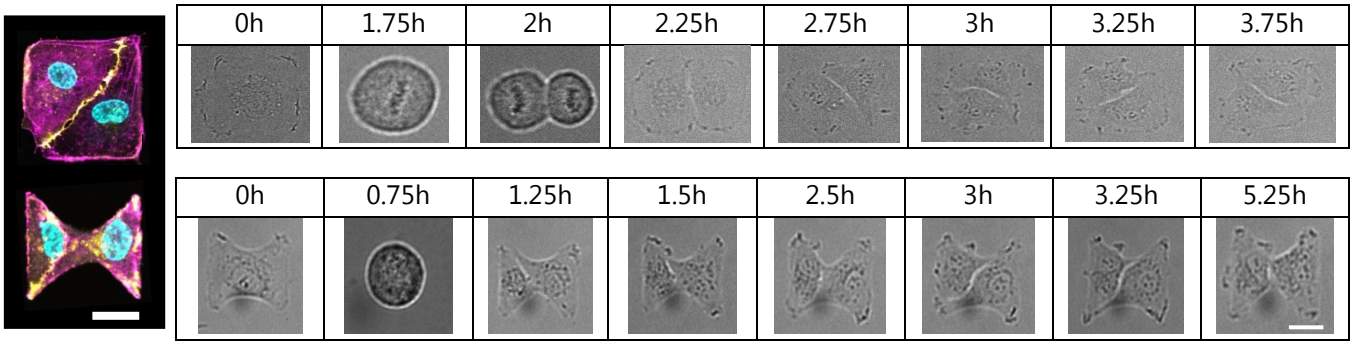
Thursday, September 3 2026 at 13:30-14:00, Lady Davis Building, Auditorium 250

Extracellular Matrix Micropatterning for Regulation of Endothelial Cell-Cell Junction Position

Sapir Solomon

Adviser: Asst. Prof. Leeya Engel

Endothelial cells line blood vessels and continuously remodel their intercellular contacts during processes such as inflammation, wound healing, and vascular remodeling. At endothelial adherens junctions, vascular endothelial cadherin (VE-cadherin) connects neighboring cells and links the cell–cell interface to the actin cytoskeleton. The internal organization of the cell, specifically the actin cytoskeleton and its association with the VE-cadherin complex, is affected by intercellular tension and by physical cues from the extracellular matrix (ECM). Here, we developed a maskless photopatterning method to generate gelatin-based ECM micropatterns in defined geometries to test how cell shape influences intercellular junction dynamics. These patterns enable the positioning of pairs of human umbilical vein endothelial cells (HUVECs) in controlled shapes that are expected to generate different levels of intercellular tension. Several pattern shapes and sizes were tested, including hollow square, full square, H-shape, and bowtie-shaped patterns. A characteristic length of 50 μm was found to be the most suitable for stable attachment of endothelial cell pairs. We used immunofluorescence to visualize the nuclei, F-actin, and VE-cadherin and monitored cellular dynamics using live-cell imaging. Our results demonstrate that ECM geometry strongly affects cell-pair dynamics. On square micropatterns, the cells rotated around one another without a preferred clockwise or counterclockwise direction. In contrast, on bowtie-shaped micropatterns, the location of the cell–cell contact remained relatively stable, and no rotation of the cell pair was observed. These findings indicate that the spatial organization of the ECM can regulate endothelial cell pair dynamics and the positioning of intercellular junctions.



Left: immunofluorescence images of fixed HUVECs micropatterned with Oregon Green 488-gelatin on 50μm square and bowtie shapes. Images were stained for F-actin (magenta), VE-cad (yellow) and nucleus (cyan). All photos were taken on a confocal spinning disk microscope with a 60x oil immersion objective. Right: live cell imaging of cells dividing on a square pattern (top) and bowtie pattern (bottom) in a size of 50 μm at different time points. The video was taken on confocal spinning disk microscope in BF mode with a 60x oil immersion objective. Scale bar: 20μm.

Seminars Coordinator: Prof. Sefi Givli

Note: the seminar will be given in English