Exploring cellular adhesion and migration by variable-angle Total Internal Reflection Fluorescence Microscopy (va-TIRFM)

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Introduction

Cell adhesion in 2D:


Probing cell adhesion by measuring membrane-substrate separation distance $z_0$

va-TIRF microscopy

Recording a stack of 10 TIRF images:

U87MG-F8 cell on fibronectin-coated coverslip

Scale bar represents 10 microns

Adhesion strength at the single cell level

Recording a stack of 10 TIRF images of 30 living cells:

U87MG-F8 cells on fibronectin-coated coverslip

Probability density $p(z_0)$ of finding the membrane at distance $z_0$:

$\sum_{z_0} p(z_0) \delta(z_0)$ with $\int_{-\infty}^{\infty} p(z_0) \, dz_0 = 1$

Close contact

Distant contact

Dissociation energy $D_e = \text{adhesion strength}$

va-TIRF and micropatterns

U87MG-F8 cells on fibronectin 20 µm pattern

References

MC Dos Santos, Biophysical Journal, 111 (2016) p1316-1327
MC Dos Santos, AIMS Biophysics, 4 (2017) p438-450