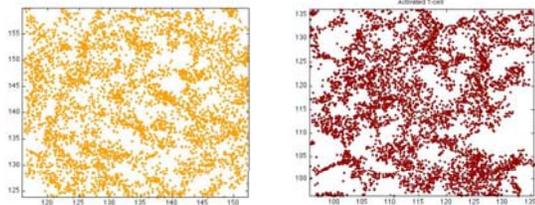




Objective

To find is there is a distinguishing characteristic between LAT protein patterns of activated and non-activated T-cells



Morphological Metric

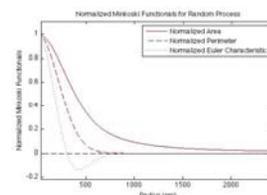


Minkowski functionals:

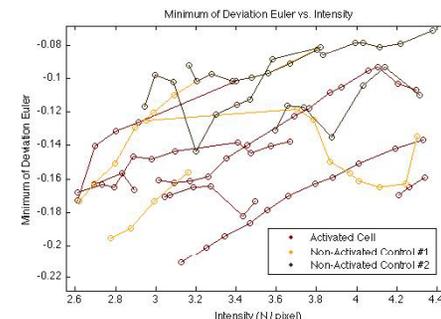
$$a(r) = A_A(r) / \lambda \pi r^2$$

$$p(r) = P_A(r) / 2\lambda \pi r^2$$

$$n(r) = N_A(r) / \lambda$$



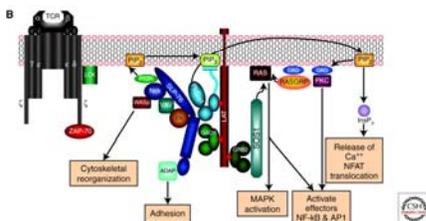
Extrema Behavior



Introduction

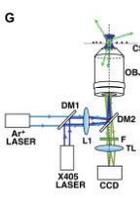
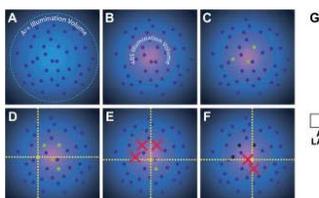
LAT Proteins

- Named for its functionality in T-cells: Linker for Activation of T-cells
- An intermediary molecule present in nearly all T-cell activation pathways



PALM Imaging Method

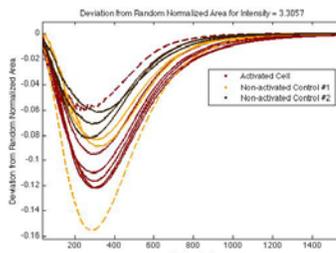
- Photoactivation Localization Microscopy
- Imaging method with ~10 nm resolution



Methods

- Starting with point patterns for 35 different cells, a cropping algorithm was performed on the data to generate an intensity distribution for each cell, summing to over 2000 data files
- Cropped point patterns were placed in 10% intensity bins
- If point patterns within a bin intensity belonged to the same cell, the cropping near the middle the cell's intensity distribution were favored in an attempt to reduce edge effects

Cells with Same Intensity



Minkowski functionals were calculated using the program Morph2D.exe (written by A. Tscheschel using the ideas of Brodatzki and Mecke)

Dashed lines represent cells which deviate the greatest from the mean intensity or mean number of points

Discussion

- When window size is "small" (10-22.5 nm) or when the $N_{dev} \ll \lambda \cdot A_{dev}$ we have outliers
- Non-activated Control #2 contained no outliers which may indicate that it is a consistently stable process, i.e. less cell to cell variability
- Extrema graphs show a more uniform distribution in Active cells, which suggests long-range ordering behavior

Future Work

- Explore other methods of varying the intensity of a point pattern, including random down sampling
- Study other null models which take into account non-uniform cell footprint voids
- Perform the same analysis for different T-cell varieties and different photoactivatable-protein.