# Human Neutrophil Haptokinesis and Chemokinesis on Microcontact Printed Fibronectin


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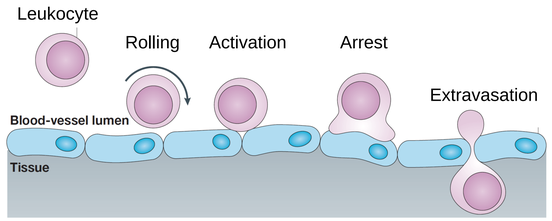
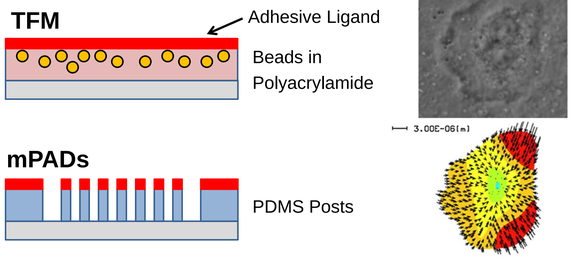
## Motivations

### Expanding a Canonical Cascade




Quantifying motility and traction on post-extravasation ligands (e.g. fibronectin) will help extend the present model of leukocyte recruitment.

### Comparing Traction Assays

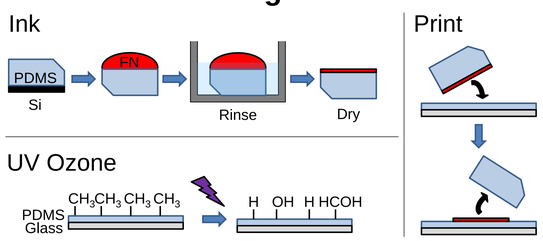




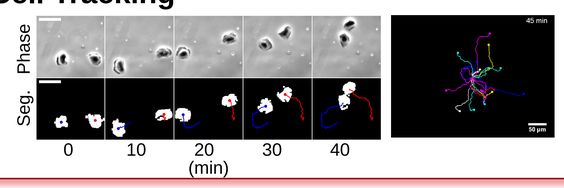

Neutrophils are an ideal cell type for the comparison of Traction Force Microscopy (TFM) and microfabricated-Post-Array-Detectors (mPADs). Presently, all traction maps of motile neutrophils are via TFM. Map adapted from (2).

## Approach

### Microcontact Printing




### Cell Tracking








References:

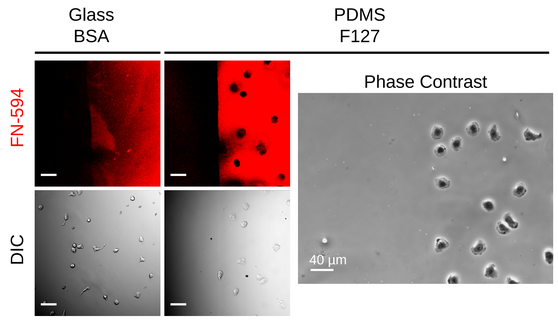
(1) Tatsuo Kinashi. 2005. Nat Rev Immunol. 5(7):564

(2) Jannat, R et al. 2011. Biophys J. 101(3):575

(3) Kishimoto, TK et al. 1989. Science. 245(4923):1238

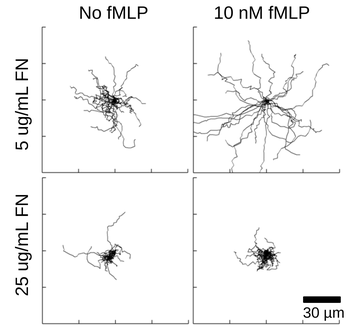

## Results

### Exquisite cell-FN interaction



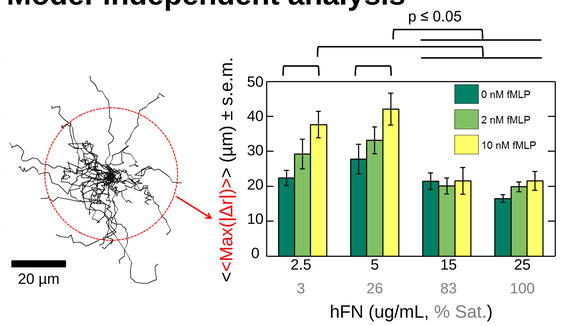

No off-FN adhesion is observed on printed PDMS, blocked with Pluronic F127.

### Tuning motility



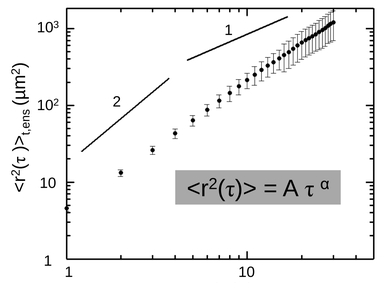

Single donor trajectories. Increasing adhesiveness decreases fMLP potentiation.

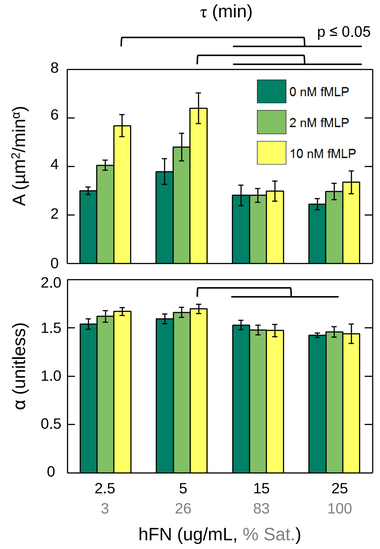
### Model-independent analysis




At low adhesiveness, fMLP increases extent of motility, but beyond an adhesive threshold fMLP sensitivity is attenuated.

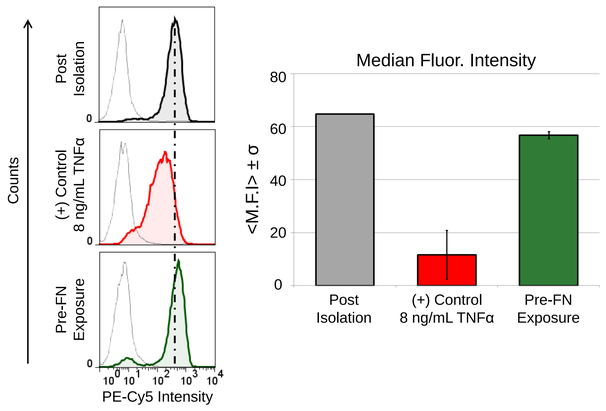
### Superdiffusive motility




Applying a power-law model preserves trend revealed previously. Across all conditions tested, initial motility (30 min) is superdiffusive ( α ~ 1.5).

### L-selectin as activation marker



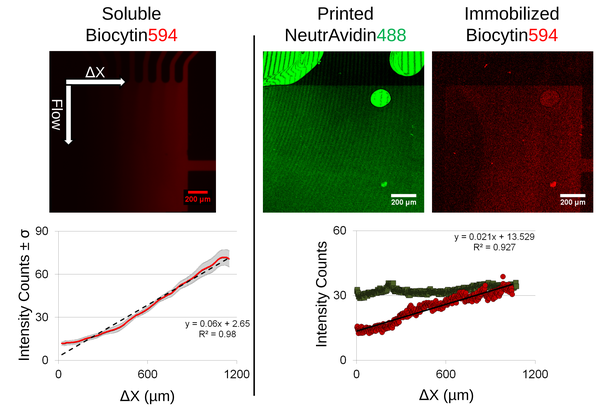

L-selectin is a sensitive marker of activation state (3). An active phenotype is **not** found before FN stimulation suggesting activation is FN-induced via an outside-in pathway.

## Summary

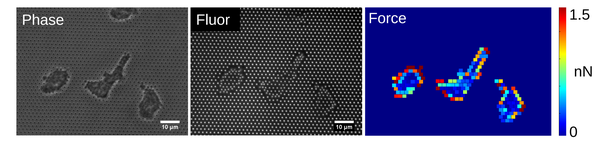
- fMLP potentiates human neutrophil motility on µCP FN (chemokinesis)
- Quantified baseline motility metrics on functionalized half-spaces
- FN haptokinesis is not result of pre-FN activated phenotype suggesting model of outside-in activation
- Adhesiveness alone can potentiate motility suggesting haptotactic potential of FN

## Future Directions

### Immobilizing adhesive gradients




### Traction Mapping via mPADs

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