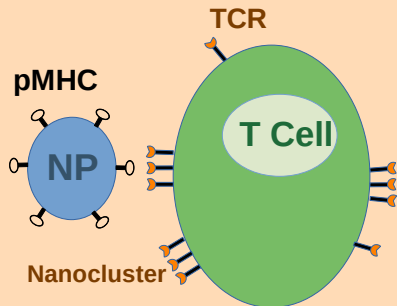


Introduction

Nanoparticles coated with pMHC molecules can directly reprogram T Cells by engaging their surface T Cell Receptors [1].



Nanoclusters of TCRs distinguish mature from naive T cells. Certain therapies require targeting specific T cell subpopulations [2].

Methods

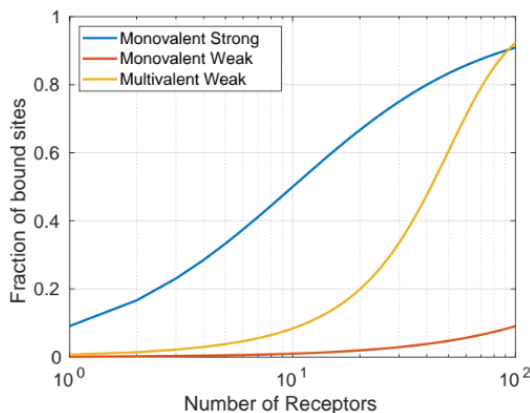
Numerical Monte Carlo simulations of the cell surface combined with a thermodynamic model of NP binding. **Avidity** measures the strength of the NP interaction [3]. It depends on ligand affinity (K), valence (k) and the number of receptors (n_R).

$$K_A^{av} = \Omega_1 K_A + \Omega_2 K_A K_{intra} + \Omega_3 K_A K_{intra}^2 + \dots$$

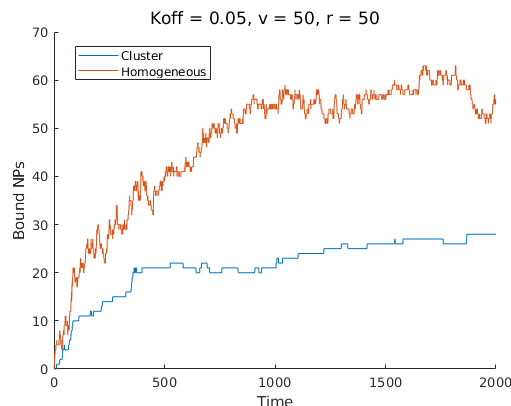
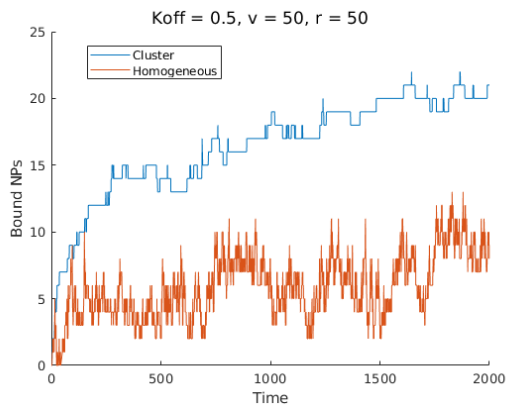
$$\Omega_i = \binom{n_R}{i} \binom{k}{i} i! = \frac{n_R! k!}{(n_R - i)! (k - i)! i!}.$$

The fraction of occupied sites is given by the avidity and the NP concentration in solution (ρ).

$$\theta = \frac{\rho K_A^{av}}{1 + \rho K_A^{av}},$$



Results



Future Work

Implications of NP design for T-cell activation by incorporating a kinetic proofreading model.

Validate with experimental IFNg dose-response curves.

Acknowledgements

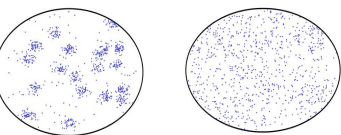
Pere Santamaria (Calgary) for IFNg dose-response curves.

Haley Tai (McGill) for contributions to numerical simulations.

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References

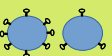
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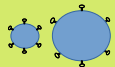
Mature **Naive**

Cell Surfaces
NP Properties

Valence



Radius



Affinity

