

Johns Hopkins Engineering

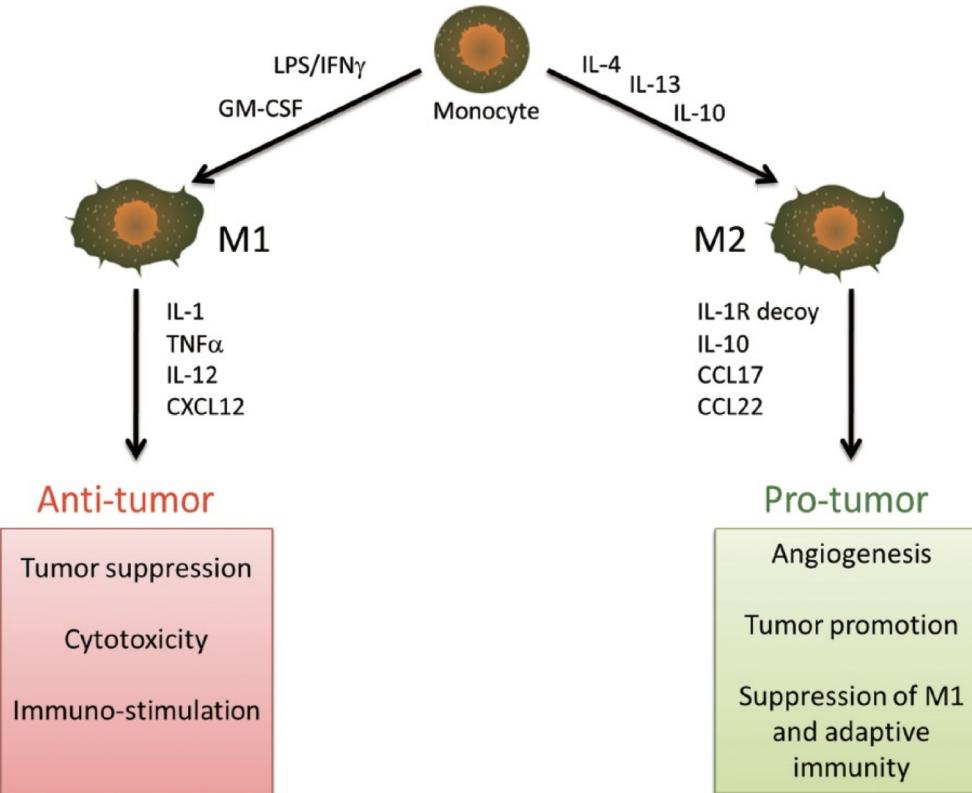
# Immunoengineering

Immunoengineering Cancer: Modulating Macrophages and NK Cells



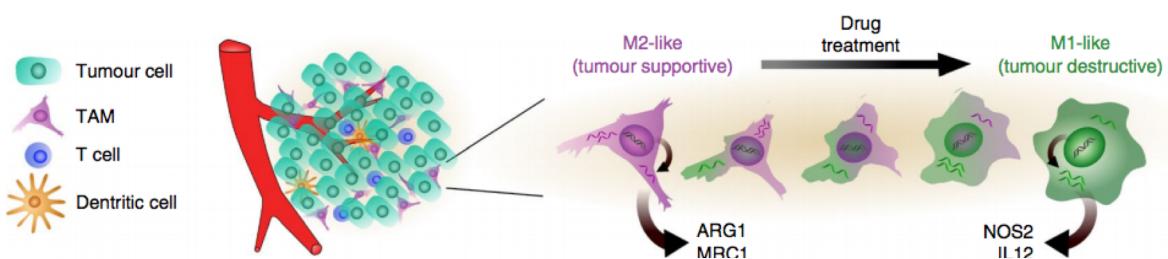
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# Modulating tumor-associated macrophages (TAMs)

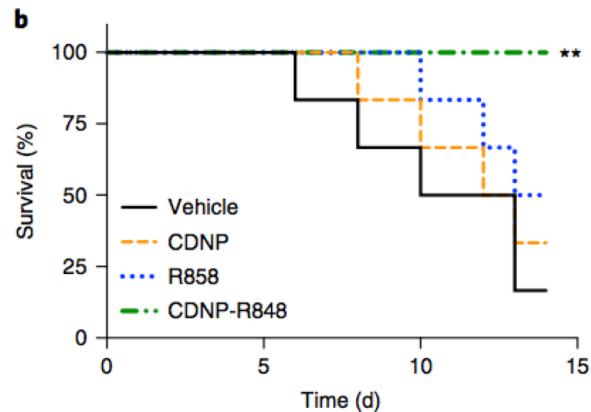
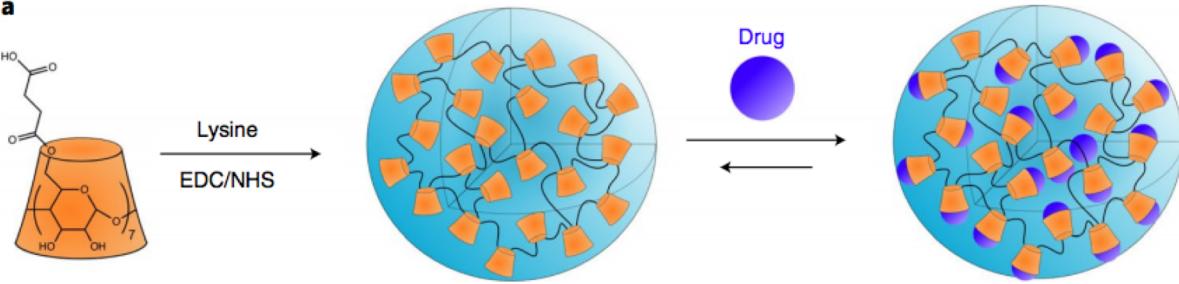


# Reprogramming TAMs

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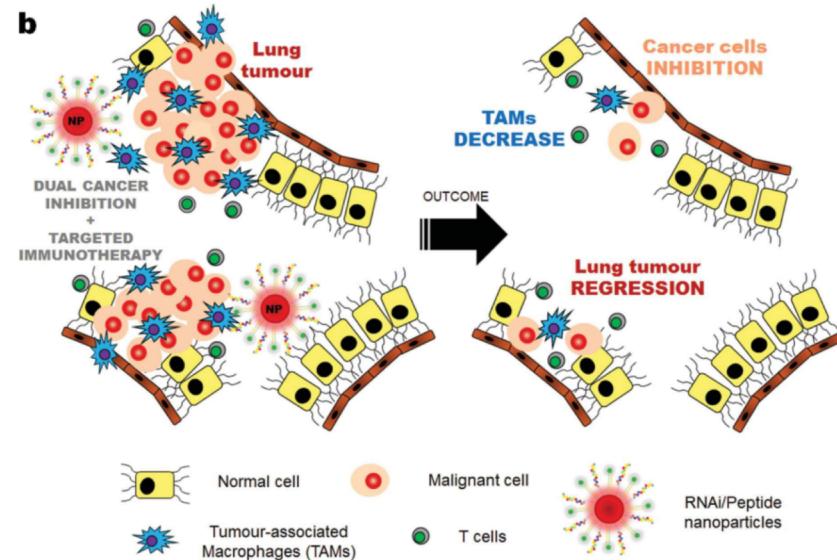
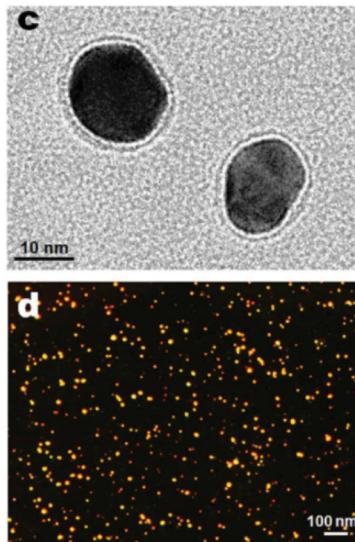
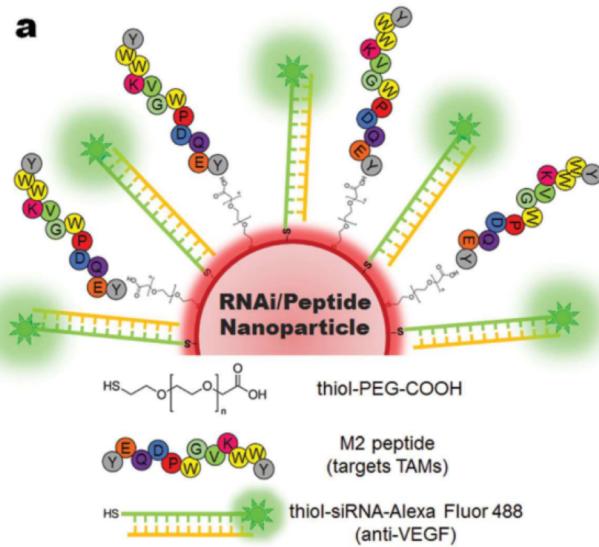


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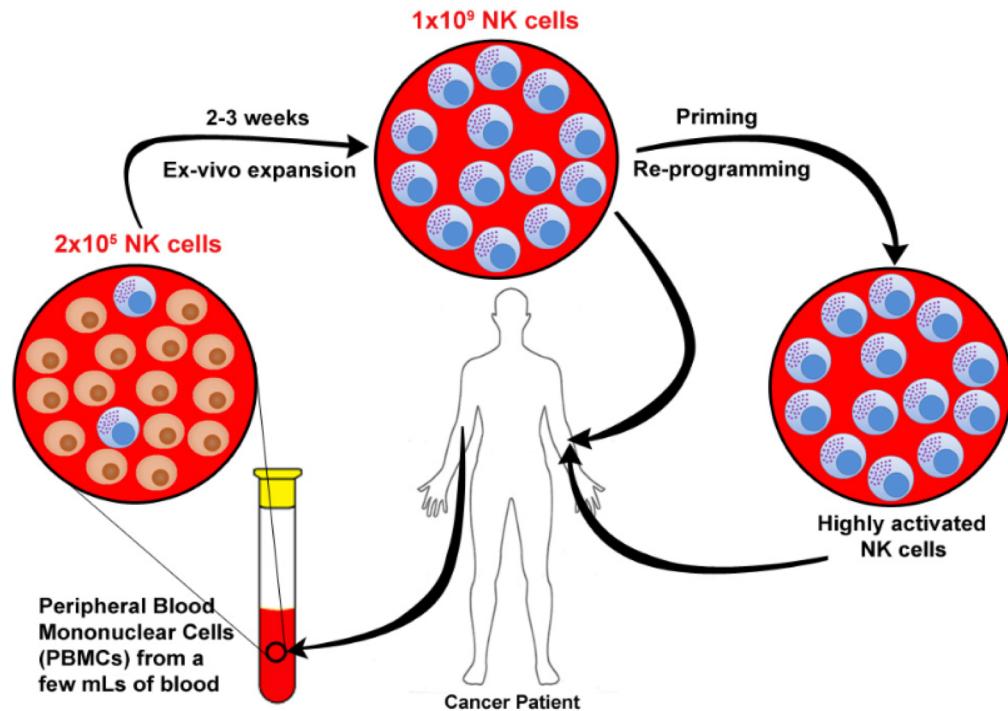
- $\beta$ -cyclodextrin (CD) NPs loaded with TLR7/8 agonist (R848) repolarizes TAMs from M2 to M1 phenotype

# Targeted RNAi delivery to TAMs



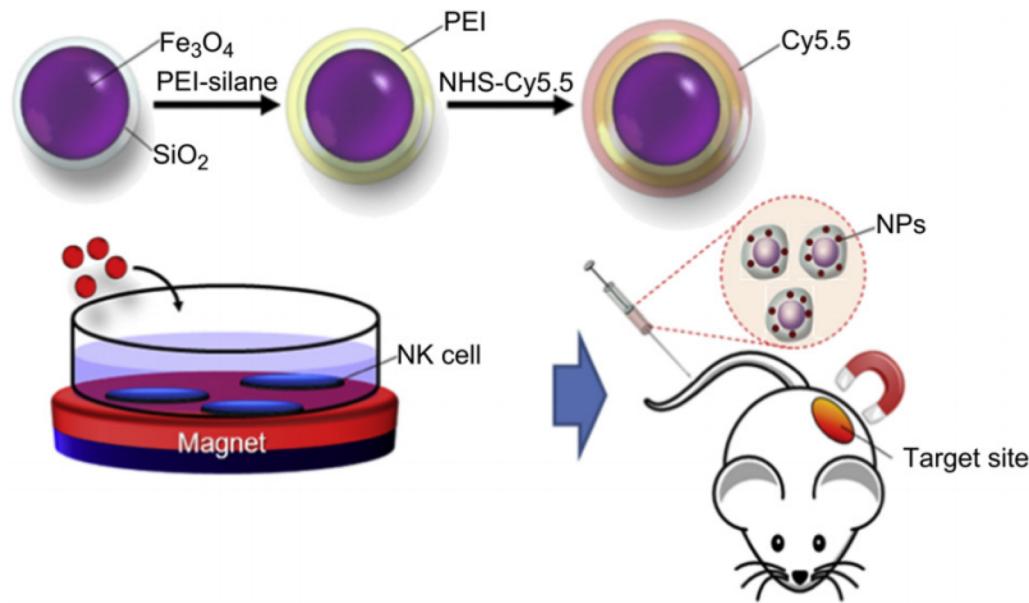
# Natural Killer (NK) cell immunotherapy

- Difficult to expand *in vivo*
- NK cells can be adoptively transferred similar to T cells
- Do not require antigen specificity
- Do not require HLA-matching
- Minimal toxicity



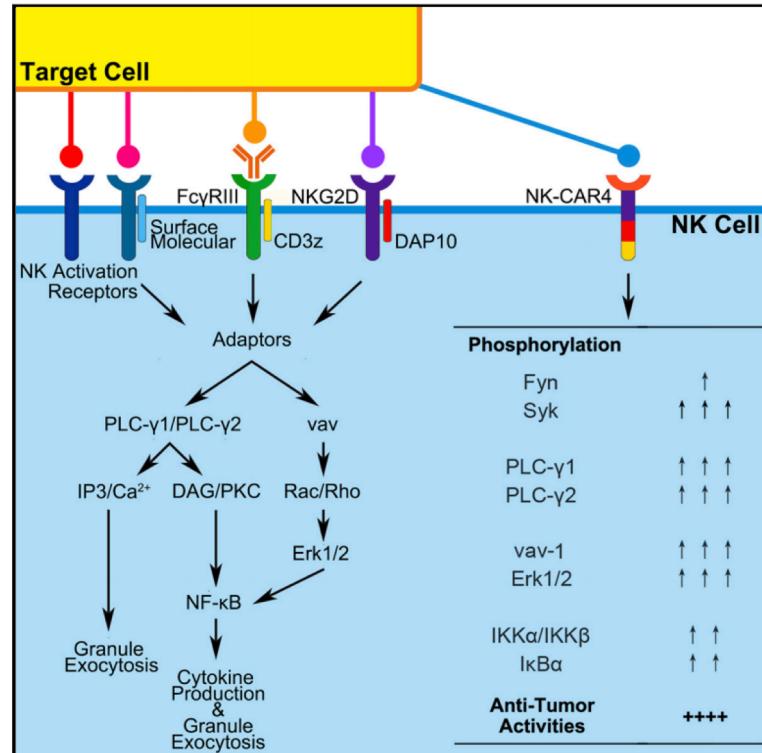
# Enhancing NK cell immunotherapy

- Limitation of NK cell therapy is trafficking to tumor site
- Magnetic NPs incubated ex vivo with NK cells, and cells trafficked to tumor with external magnetic field
- NK cells infiltrating tumor increased 17-fold with magnetic field and killing activity is maintained
- Low dose → limited toxicity



# CAR NK Cells

- iPSCs engineered to express CAR constructs
- NK cells derived from iPSCs
- “Off the shelf”
- CAR constructs contained NK cell activating domains and targeted a tumor antigen





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