Membrane-Wrapped Nanoparticles for Targeted Cargo Delivery to Homotypic Cells

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Biomimicry is an exciting new subfield of nanomedicine and at its forefront is the use of cell-derived membranes to coat nanoparticles (NPs). Membrane-wrapped NPs can avoid immune recognition and bind homologous cells *in vitro* and *in vivo.*[1-5] While membrane-wrapped NPs have been used to deliver hydrophobic drugs to tumors, they have not yet been adapted to deliver hydrophilic cargo such as small interfering RNA (siRNA). Further, they have not yet been investigated as tools to manipulate non-cancerous targets such as hematopoietic stem and progenitor cells (HSPCs). These are active areas of studies in the Day group. In this presentation, I will discuss the results of our *in vitro* studies that show: (1) siRNA cargo can be encapsulated in membrane-wrapped NPs, (2) siRNA-loaded membrane-wrapped NPs can be designed to target breast cancer cells or HSPCs by producing the membrane coating from different source cells, and (3) siRNA cargo remains functional inside targeted HSPCs or cancer cells upon delivery with membrane-wrapped NPs. These findings demonstrate that membrane-wrapped NPs have immense potential as vehicles for targeted siRNA delivery to homologous cells, and warrant future investigation of these materials in the *in vivo* setting.

References

1. Hu C-MJ, Zhang L, Aryal C, *et al*. Erythrocyte membrane-camouflaged polymeric nanoparticles as a biomimetic delivery platform. *PNAS USA* 2011; 108: 10980-10985.
2. Hu C-MJ, Fang RH, Wang K-C, *et al*. Nanoparticle biointerfacing by platelet membrane cloaking. *Nature* 2015; 526: 118-121.
3. Kroll AV, Fang RH, Jiang Y, *et al*. Nanoparticulate delivery of cancer cell membrane elicits multiantigenic antitumor immunity. *Adv Mater* 2017; 2017: 1703969.
4. Sun H, Su J, Meng Q, *et al*. Cancer-cell biomimetic nanoparticles for targeted therapy of homotypic tumors. *Adv Mater* 2016; 28: 9581-9588.
5. Zhu J-Y, Zheng D-W, Zhang M-K, *et al*. Preferential cancer cell self-recognition and tumor self-targeting by coating nanoparticles with homotypic cancer cell membranes. *Nano Letters* 2016; 16: 5895-5901.