

Delivering polymer nanomedicines using living cells

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Cells provide attractive opportunities to develop innovative drug delivery systems. Red blood cells e.g. are uniquely designed to circulate in the bloodstream for extended periods of time. Immune cells, in particular lymphocytes from the adaptive immune system, are attractive as they potentially provide possibilities to home in to the disease site in a highly selective manner. Modifying the surfaces of these cells with synthetic polymers or polymer nanoparticles provides manifold opportunities to further enhance their functionality. Successful polymer cell surface engineering, obviously, requires conjugation chemistries that proceed under biological conditions and in high yields and without compromising cell viability and function. This presentation will discuss various polymer cell surface modification strategies and compare these different approaches in terms of the possibilities they offer to modify cell surfaces as well as their impact on cell viability and function. It will be shown that under appropriate conditions live cells can be surface modified with synthetic polymers while retaining their viability and functional properties.

Recent references:

- 1) M. Ayer, H.-A. Klok, Cell-mediated delivery of synthetic nano- and microparticles, *J. Control. Release* **2017**, 259, 92 – 104.
- 2) M. Ayer, M. Schuster, I. Gruber, C. Blatti, E. Kaba, G. Enzmann, O. Burri, R. Guiet, A. Seitz, B. Engelhardt, H.-A. Klok, T Cell-Mediated transport of polymer nanoparticles across the blood-brain barrier, *Adv. Healthcare Mater.* **2021**, 10, 2001375.
- 3) T. Thomsen, A. B. Ayoub, D. Psaltis, H.-A. Klok, Fluorescence-based and fluorescent label-free characterization of polymer nanoparticle decorated T cells, *Biomacromolecules* **2021**, 22, 190 – 200.
- 4) M. Ayer, O. Burri, R. Guiet, A. Seitz, E. Kaba, B. Engelhardt, H.-A. Klok, Biotin-NeutrAvidin mediated immobilization of polymer micro- and nanoparticles on T lymphocytes, *Bioconjugate Chem.* **2021**, 32, 541 – 552.
- 5) T. Thomsen, H.-A. Klok, Chemical cell surface modification and analysis of nanoparticle-modified living cells, *ACS Appl. Bio Mater.* **2021**, 4, 2293 – 2306.