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Jena, 16. Januar 2019

EINLADUNG

Am Dienstag, **5. Februar 2019**, spricht um **14:00 Uhr**
im Hörsaal des ZAF, Philosophenweg 7, 07743 Jena

Herr Prof. Dr. Volker Mailänder

Center for Translational Nanomedicine
University Medicine oft he Johannes Gutenberg University Mainz

zum Thema

"Nanocarriers and Proteins: Stealth and Targeting"

Alle Interessenten sind herzlich eingeladen.

gez. Prof. Dr. Ulrich S. Schubert

Es handelt sich um eine Veranstaltung des SFB 1278 - POLYTARGET

Nanocarriers and Proteins: Stealth and Targeting

Prof. Dr. med. Volker Mailänder, Center for Translational Nanomedicine, University Medicine of the J ohannes Gutenberg University Mainz, Mainz (D)

To promote drug delivery to exact sites and cell types, the surface of nanocarriers are functionalized with targeting antibodies or ligands, typically coupled by covalent chemistry. Once the nanocarrier is exposed to biological fluid like plasma however, its surface is inevitably covered with various biomolecules forming the protein corona, which masks the targeting ability of the nanoparticle. We show that we can use a pre-adsorption process to intentionally convey targeting antibodies to the surface of the nanocarrier. Pre-adsorbed antibodies or also ligands like interleukin-2 (IL-2) remain functional and are not completely exchanged or covered up by the biomolecular corona, whereas coupled antibodies are more affected by this shielding. We conclude that pre-adsorption is potentially a versatile, efficient and rapid method of attaching targeting moieties to the surface of nanocarriers. We demonstrate that the pre-adsorption of antibodies is an easier, more flexible and highly effective process in targeting nanocarriers towards the cell compared to the widely performed process of chemical coupling.

But also the other proteins which are adsorbed to nanocarriers will remodel the targeting and the fate of the nanocarriers in the organism. For this we demonstrate how the biomolecular corona can contribute to a mistargeting and how we can one day may be able to predict the effect of the mistargeting in the end.

Tonigold M, Simon J, Estupiñán D, Kokkinopoulou M, Reinholz J, Kintzel U, Kaltbeitzel A, Renz P, Domogalla MP, Steinbrink K, Lieberwirth I, Crespy D, Landfester K, Mailänder V: Pre-adsorption of antibodies enables targeting of nanocarriers despite a biomolecular corona..Nat Nanotechnol. 2018 Jun 18. doi: 10.1038/s41565-018-0171-6. [Epub ahead of print]

Simon J, Müller LK, Kokkinopoulou M, Lieberwirth I, Morsbach S, Landfester K, Mailänder V. Exploiting the biomolecular corona: pre-coating of nanoparticles enables controlled cellular interactions. Nanoscale. 2018 Jun 14;10(22):10731-10739. doi: 10.1039/c8nr03331e. Epub 2018 May 30.

Univ.-Prof. Dr. med. Volker Mailänder

Volker Mailänder studied medicine at the University of Ulm supported by a stipend from the Studienstiftung des Deutschen Volkes and was in the graduate program "Molecular Biology". He worked in the Blume/Negrin lab in Stanford, California, on natural killer cells and was involved in patient care in the bone marrow transplantation unit. Afterwards he received training in internal medicine (haematology/oncology) in the Charité hospital in Berlin. After relocating to the Institute for Clinical Transfusion Medicine, University Clinic of Ulm, he worked on stem cell manipulation, the interaction of nanoparticles with cells and especially uptake mechanisms and the intracellular pathway. He was board certified in transfusion medicine. Further work focused on using polymeric nanoparticles for labelling or manipulation of stem cells and other cell types. Since 2008 he is leading a joint research group between the University Medical Clinic and the MPI for Polymer Science in Mainz. He has been appointed a professorship dealing with the translation of nanocarriers into medical applications. He is proficient in the procedures of manipulating, freezing and storing stem and immune cells for patients care as the head of production and qualified person. He is active in several cooperative projects (SFB1066 "Nanodimensional polymeric therapeutics for tumor therapy", BMBF projects) and is vice speaker of the center BiomaTiCS (Biomaterials, Tissues and Cells in Science) of the University Medical Center. Since 1.1.2016 he is W2 professor at the University Medicine Mainz and associated to the Dermatology department and heads the Center for Translational Nanomedicine – CTN. He is especially interested in understanding and overcoming the hurdles of applying nanocarriers for use in clinical applications. Therefore, protein corona, targeting and GMP-conform production of nanocarriers are the main focus of his research.

Publications

Schöttler S, Becker G, Winzen S, Steinbach T, Mohr K, Landfester K, Mailänder V, Wurm FR.: Protein adsorption is required for stealth effect of poly(ethylene glycol)- and poly(phosphoester)-coated nanocarriers. Nat Nanotechnol. 2016 Apr;11(4):372-7

Schöttler S, Klein K, Landfester K, Mailänder V.Protein source and choice of anticoagulant decisively affect nanoparticle protein corona and cellular uptake. Nanoscale. 2016, 8: p. 5526-5536

Hofmann, D., et al., Drug delivery without nanoparticle uptake: delivery by a kiss-and-run mechanism on the cell membrane. Chemical Communications, 2014. 50(11): p. 1369-71.

Paven, M., et al., Super liquid-repellent gas membranes for carbon dioxide capture and heart-lung machines. Nature Communications, 2013. 4: p.2512

Lerch, S., et al., Polymeric nanoparticles of different sizes overcome the cell membrane barrier. European Journal of Pharmaceutics and Biopharmaceutics, 2013. 84(2): p. 265-274.

Landfester, K. and V. Mailaender, Nanocapsules with specific targeting and release properties using miniemulsion polymerization. Expert Opinion on Drug Delivery, 2013. 10(5): p. 593-609.

Hofmann, D. and V. Mailander, Pharmacology of nanocarriers on the microscale: importance of uptake mechanisms and intracellular trafficking for efficient drug delivery. Nanomedicine, 2013. 8(3): p. 321-323.

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Lerch, S., et al., *Polymeric nanoparticles of different sizes overcome the cell membrane barrier.* European Journal of Pharmaceutics and Biopharmaceutics, 2013. 84(2): p. 265-274.

Landfester, K. and V. Mailaender, *Nanocapsules with specific targeting and release properties using miniemulsion polymerization.* Expert Opinion on Drug Delivery, 2013. 10(5): p. 593-609