

Biodegradable protein nanocarriers synthesized in inverse miniemulsion for the development of nanovaccination strategies

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Nanocarriers for drug delivery are often based on synthetic polymers. For biomedical applications they have to be biocompatible and, moreover, -degradable with non-toxic degradation products.

To minimize the risk of side effects caused by foreign carrier substances and to meet the requirements described above, nanocarriers composed of substances available naturally in the body such as albumin proteins are a suitable alternative to synthetic materials. Nanocarriers entirely composed of proteins and with a diameter of 300nm are synthesized through an interfacial polyaddition reaction in the inverse miniemulsion.[1] While the dense shell structure inhibits a premature leakage of the hydrophilic payload, the release is easily triggered through proteolytic cleavage. The protein nanocarriers (PNCs) are readily uptaken by human dendritic cells (DCs) and non-toxic. Upon incubation with human blood plasma, the PNCs do not agglomerate as verified by dynamic light scattering. Hence, an enhanced stability for blood circulation is provided. The examination of the protein corona formed upon contact with blood plasma gives further insights in the PNC interaction with biological media. Additional functionalization of the PNC surface enables besides a targeted delivery of the carrier content also the simultaneous transport of antigens and adjuvants promoting the activation of T cell responses. Besides the carrier function, PNCs composed exclusively out of antigens can be considered as a promising delivery platform for nanovaccination strategies to help overcoming tolerance and inducing antigen specific cellular immunity. [2] The induction of intrahepatic cellular immune responses provides the basis for the development of vaccines tackling liver-associated pathogens like Hepatitis C Virus or Malaria.

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[2] Piradashvili, K., Fichter, M., Mohr, K., Gehring, S., Wurm, F. R., and Landfester, K., *Biomacromolecules*, 2015, **16**, 815.