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Cream formulation impact on topical administration of engineered colloidal nanoparticles

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While nanoparticles, intravenous administration is the most prevalent practice for drug delivery, the transdermal penetration is still poorly understood and this important administration method remains almost unexplored. In the present study, we aim to explore the topical administration in order to minimize the impact of systemic toxicity of drugs in the treatment of local acute and chronic inflammatory reactions. We have synthesized iron oxide nanoparticles (MNP) coated with an amphiphilic polymer and included a water-in-oil emulsion formulation. We compared the skin penetration routes of the nanoemulsion with the colloidal nanoparticles suspension. Transmission and scanning electron microscopies pointed out that the amphiphilic nanoparticles (PMNP) cream formulation allowed a more efficient penetration through all the skin layers compared to suspension formulation, involving both the intracellular and intercellular pathways, in addition to the follicular one. PMNP that crossed all skin layers were quantified by inductively coupled plasma mass spectrometry (ICP-MS). *In-vivo* experiments showed that the subcutaneous NPs administration resulted in preferential phagocytic uptake and migration to draining lymph nodes, while cream formulation favoured the maintenance of nanoparticles in the dermal architecture avoiding their dispersion and migration to draining lymph nodes via afferent lymphatics. The obtained data suggested that combining PMNP amphiphilic character with cream formulation improved the intradermal penetration of nanoparticles.

Biography

Benedetta Santini graduated in Pharmacy in 2013, and is now in the second year of PhD in Material Science and Nanotechnology at University of Milano-Bicocca. She spent six months at the King's College of London as a visiting student in Maya Thanou's research group. Until now, she has published 5 papers.

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