

Nanotechnology-based Drug Delivery to Skin

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Nanotechnology-based carrier systems allow improving drug permeation, spreading within the tissue, retention, and even targeted and stimuli-responsive drug delivery. In skin inflammatory diseases, immune cells are the main key actors and thus the target of therapeutic treatments. Targeting of certain cell populations like dendritic cells may be achieved by means of biocompatible nanocarriers that can translocate to the skin viable layers. Thermoresponsive polyglycerol-based nanogels (tNGs) have been shown to penetrate very efficiently the outermost skin barrier and to be valuable tools for delivery of drugs to skin. In order to develop new types of formulations for anti-inflammatory dermatotherapy, tacrolimus, a high molecular weight, poorly skin penetrating drug, was loaded on thermoresponsive nanogels. Compared to a commercial formulation (Protopic 0.1%), the water-based nanogel formulation had comparable effects on an inflammatory skin model. On the other side, in the case of skin and wound infections, high local concentrations of the active material are necessary to eradicate the invading microorganism and avoid the development of resistances. At this purpose, we used PVP-based foils and nanofibers to deliver antimicrobial drugs in an infected wound model based on ex vivo human skin. Different delivery profiles were achieved depending on the used drug delivery system. Nanocarriers efficiently delivered drugs across the skin barrier with significant inhibitory effects on immune cells where as nanofibers and foils provided a sustained drug concentration within the skin tissue as well as very efficient antimicrobial effects. We conclude that nanotechnology-based drug delivery systems offer attractive alternatives to conventional drug formulations.

Biography:

Dr. Fiorenza Rancan is private lecturer and associated scientist in the Clinical Research Center for Hair and Skin Science at the Dermatology Department of the Charité – Universitätsmedizin Berlin. She earned a doctorate in Chemistry from the Humboldt University of Berlin and a degree in Pharmaceutical Chemistry and Technology from the University of Padua, Italy. Dr. Rancan expertise lays on dermal and transdermal drug delivery. Her main research topics are the development of new antimicrobial treatments using skin models for infected wounds, antigen and adjuvant delivery for transcutaneous vaccination, stimuli-responsive nanocarriers for the treatment of skin inflammatory conditions.