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Strategy of topical vaccination with nanoparticles.

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ABSTRACT

Liposomes in the nanosize range have been recognized as a versatile drug delivery system of both hydrophilic and lipophilic molecules. In order to develop a liposome-based topical vaccination strategy, five different types of liposomes were tested as a putative vaccine delivery system on pig ear skin. The investigated liposomes mainly varied in size, lipid composition, and surface charge. Using hydrophilic and hydrophobic fluorescent dyes as model drugs, penetration behavior was studied by means of confocal laser scanning microscopy of intact skin and histological sections, respectively. Follicular penetration of the liposomes was measured in comparison to a standard, nonliposomal formulation at different time points. Dependent on time but independent of their different characters, the liposomes showed a significantly higher penetration depth into the hair follicles compared to the standard formulation. The standard formulation reached a relative penetration depth of 30% of the full hair follicle length after seven days, whereas amphoteric and cationic liposomes had reached approximately 70%. Penetration depth of negatively charged liposomes did not exceed 50% of the total follicle length. The fluorescence dyes were mainly detected in the hair follicle; only a small amount of dye was found in the upper parts of the epidermis.