Conference abstract L05

Nanomedicine for Drug Delivery across Epithelial Barriers: Intestines, Skin and Lungs

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Inflammatory bowel diseases, such as Morbus Crohn or Colitis Ulcerosa, are painful for the patient and moreover difficult to treat due to the increased mucus production and the occurrence of diarrhea. We could demonstrate that the anti-inflammatory drug rolipram, when delivered by nanoparticles made of biodegradable PLGA, led to a prolonged alleviation of colitis syndromes in rats and a reduction of central nervous side effects, compared to the same dose of the drug administered as an aqueous solution [1, 2].

With respect to skin drug delivery, there is an interesting new hypothesis that nanoparticles may penetrate along hair shafts and thus accumulate in hair follicles [3]. However, applying PLGA nanoparticles loaded with flufenamic acid, were mostly seen in the intercellular clefts between the keratinocytes [4]. The observed enhancement of epidermal penetration may instead be explained by an acidic microclimate around the hydrolyzing polymer particles, leading to a reduced dissociation and higher lipophilicity/better penetration of flufenamic acid [5]. This data points out that, besides of their small size, the chemical composition of such nanomaterials remains evenly important.

Due to their large surface area and excellent blood supply, the lungs are an attractive alternative route for drug delivery, both for local as well as for systemic action. By escaping mucociliary or macrophage clearance, inhaled nanopharmaceuticals could perhaps be used as platform for pulmonary sustained release delivery systems. Finally, nanoplexes formed between biodegradable polymeric carriers and DNA/RNA-based drugs can be used to facilitate cellular transfection [6]. We are currently using this approach for the delivery of telomerase inhibiting antisense oligonucleotides to lung cancer cells [7, 8].