

Morphological Studies of Penetration Pathways via Stratum corneum and Hair Follicles using Nano-sized Iron Oxide

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Nano-industry could contact easily in surrounding of our life already along with development of industrial technology. However, nanomaterial is bringing positive effects and negative effects at the same time to our human. In affirmative part, this supplies innovative medical therapy being applied in field such as nanomedicine but, it can have toxicity in in vivo and in vitro by exposure that do not want in contradictory. Therefore, we studied possibility that nanoparticle is permeated via skin among various absorption pathways in our body.

We treated with a topical 15nm sized iron oxide to tracing by each for 1 minute, 5 minutes, 1 hour and 24 hours in C57BL/6 mice skin. And we observed aspect that iron oxide nanoparticles are permeated on skin using TEM, and analyzed permeation route of tracers. Iron oxide nanoparticles (INPs) observed in mostly upper stratum corneum, hair follicle and sebocyte through pilosebaceous duct. Represented equal permeation aspect from all groups regardless of application time but, according to increase of application time, confirmed that the permeation amount of INPs is increased in sebocyte specially. Also, INPs confirmed that is permeated to upper hair bulb through inner root sheath and hair cuticle interface in hair follicle. But, permeation of INPs could not observe from dermis except hair follicle and sebocyte in all groups. This study expects to become useful basis data regarding transdermal drug delivery research.

References:

[1] Biancamaria B *et al*, *J Invest Dermatol* **127** (2007), p.1701.

[2] Gupta AK and Gupta M, *Biomaterials* **26** (2005), p. 3995.

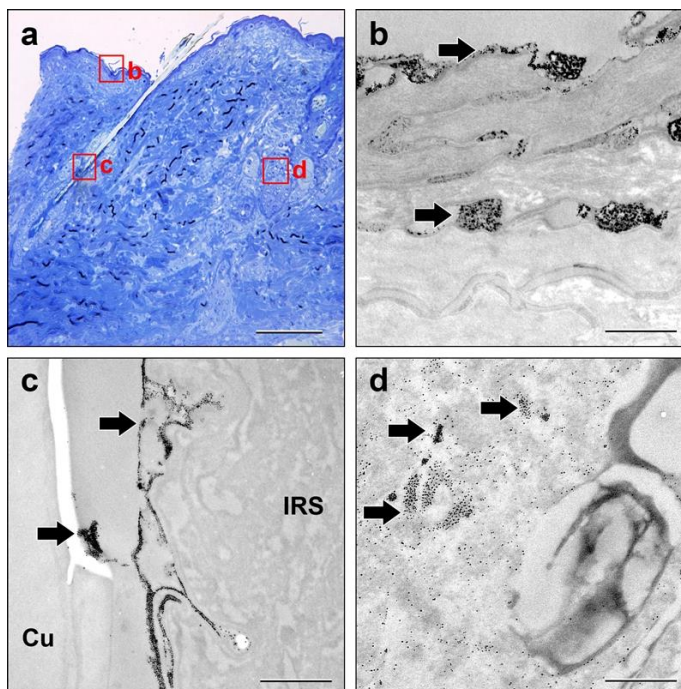


Figure 1. Electron micrographs of iron oxide-NPs treated skin sample for 24 hours. Light micrograph(a) shows the location of the NPs has penetrated in red small box. And at high magnification, NPs were seen to be trapped in the intercellular regions in the SC(b, arrows), hair follicles(c, arrows) and sebocyte(d). More pronounced penetration of NPs was observed then early treated group. And NPs were localized primarily in the intercellular spaces in the epidermis(b and c, arrows). Cu: hair cuticle, IRS: inner root sheath. Scale bar = 1μm.

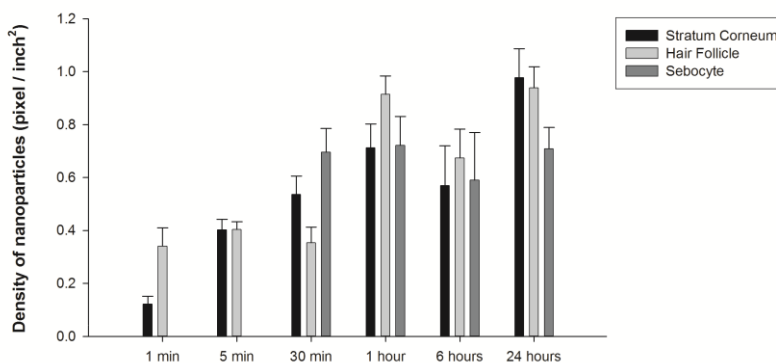


Figure 2. Quantitative analysis of nanoparticles. Transmission electron micrographs of stratum corneum, hair follicle and sebocyte were processed by image analysis tools to identify and quantify density of nanoparticles in application for each time. Permeation density of NPs increased in topical treated samples since 30minutes. And after 30minutes from the sebocyte are kept constant density of NPs.