

Positively charged polysaccharides as drug delivery system for RNA transfection

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Technology

Prof. Kost developed technology based on positively charged polysaccharides for RNA transfection, including miRNA. He also examined the use of quaternized (Q)-starch/miR-197 complexes for topical treatment of Psoriasis. He succeeded to enhance the skin permeability of the complex using pre-treatment with low frequency ultrasound (US). The optimal molar ratio between Q-starch and miR-197 was chosen based on Zeta potential measurements, followed additional characterization of size, shape and stability at concentration that will be relevant for in vivo experiments. To simulate psoriatic in vivo lesions, a psoriatic mouse model was utilized, in which psoriatic patient-derived uninvolved skin was transplanted onto SCID mice. To activate the transplanted skin, psoriatic activated lymphocytes from psoriatic patients were injected into the implanted skin graft. After the skin graft developed psoriatic-like lesion (3-4 weeks), treatment was examined. Only skin samples that were pretreated by US presented penetration of the complexes through the stratum corneum (SC) barrier. Moreover, they internalized into the epidermis, including the basal cells, which produce miR-197 target proteins, IL-22RA1 and IL-17RA. The ability of Q-starch/miR-197 complexes to reduce the expression of IL-22RA1 and IL-17RA was next assessed utilizing immunohistochemistry (IHC). To assess the therapeutic benefit, psoriatic pathological scoring method was applied. To further assess therapeutic effect of miR-197 delivered by US and Ki-67 IHC was utilized.

Application

Drug delivery system for RNA molecules. It can be applied for treatment of Psoriasis and additional topical diseases and disorders.

Advantages

- Non-invasive methodology that promotes delivery of miRNA via the SC
- Stable complex that protects miRNA from enzymatic degradation and immunological responses
- Based on natural carrier, starch - biodegradability, biocompatibility, low immunogenicity and minimal cytotoxicity
- Using US is FDA approved for different pharmaceutical products such as SonoPrep®, (FDA-approval K04052) – developed by Prof. Kost and Prof. Robert Langer
- Platform that can be relevant for various indications

Patent

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