Non-Invasive, Long-Lasting Topical Administration of High-Molecular Weight Hyaluronic Acid

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Technology

Novel non-invasive, long-lasting topical administration of high-molecular weight hyaluronic acid (HMW HA, up to 8000kDa). Two key components enable the skin penetration of HMW HA, pre-treatment of the skin with ultrasound (seconds duration, feedback loop) and complexing of HMW HA with quaternary starch (Q-starch). The ultrasound temporary and in reversable manner increases the skin permeability. The combination of HA with the positively charge Q-starch changes the mean surface charge of the negatively charged HA and reduces the effective size of the HA. Different complexes of Q-starch-HA were generated and examined. The ability of HA to penetrate through the skin into the dermis layer was compared between the suggested methodology, free HA, Q-starch-HA complexes, and ultrasound pre-treatment with free HA. The skin penetration was evaluated using the standard goal model, *ex vivo* porcine ear model. Q-starch-HA complexes themselves have beneficial outcome. The Q-starch carrier protect HA from enzymatic degradation within the dermis and allow controlled release of HA over time, meaning generate prolong effect. Prof. Kost's lab examined the safety, biodistribution, residence time and biological effect on collagen of injected Q-starch-HA in *in vivo* mice model. Promising results were obtained. The Q-starch-HA complexes didn't show any effect on body weight or body organs of the mice (examined in the lung, spleen, heart, kidneys). The Q-starch-HA complexes improved the residence time of HA in the dermis. Importantly, the Q-starch-HA complexes cause collagen production in the skin, meaning it is biologically active! ***The technologies presented here offer: (1) a new injectable formula for long lasting active HA; (2) non-invasive, long-lasting topical application of HMW HA using ultrasound pre-treatment.***

Application

Passive penetration through skin is limited to small molecules (<500 Da), therefore intradermal and transdermal delivery of molecules using non-invasive topical administration has great commercial interest. Here, the current invention offers non-invasive, long-lasting topical delivery of HMW HA for clinic use or the patient's home.

Advantages

- Non-invasive technology
- Long-lasting effect
- Improve patient compliance - no needles, no need visiting the clinic, no associated side effects (swelling & hematoma)
- Non-painful treatment
- Easy-to-use
- No need for injections to be performed by a qualified professional/physician – more clinics
- Can be home used
- Such Ultrasound is already FDA approved for different applications
- Safe – ultrasound and complexes
- Using high molecular HA (up to 8000kDa) allows long effect by itself
- The Q-starch complexes offer controlled release system and also protect HA from degradation
- Potential utilization in different markets - cosmetic and therapeutics

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