Enhanced Delivery of Bioactives into Skin with STAR Particles (#7222)

A technology called STAR particles that captures the ease-of-use of formulation additives and the efficacy of microneedles

To address the limitations of conventional skin delivery methods, Mark Prausnitz and Andrew Tadros from the School of Chemical and Biomolecular Engineering at Georgia Tech have developed a novel technology called STAR particles that captures the ease-of-use of formulation additives and the efficacy of microneedles. STAR particles are millimeter-scale particles with micron-scale projections (Fig. 1). These projections are similar in size and shape to conventional microneedles, which painlessly penetrate skin's stratum corneum and dramatically increase skin permeability to exogenous molecules. From the perspective of the user, these holes are microscopic (i.e., 10 to 100 μm diameter) and therefore do not cause pain or irritation. However, these microscopic puncture sites are large enough to allow delivery of essentially any molecule – especially hydrophilic molecules and macromolecules (e.g., DNA/RNA-, protein-, and peptide-based therapies) – into skin. Moreover, since STAR particle skin products are indistinguishable to the user from conventional topicals, no training is needed and user acceptance is expected to be high. The simple end use, low cost, painless application and dramatically increased delivery of bioactive agents make STAR particles an attractive delivery technology with the potential to significantly broaden the range of therapeutic compounds that can be administered to skin.

Benefits/Advantages

- Novel and differentiated delivery technology demonstrated to significantly increase skin delivery.
- Large market potential and target population.
- Enable delivery of a broad array of molecules regardless of molecular weight or lipophilicity.
- Simple to use and indistinguishable from conventional topical skin products, thereby eliminating the need for user training.
- Painless and tolerated very well in initial human assessments.
- Inexpensive cost of goods and manufactured through readily scalable mass-production methods.

Potential Commercial Applications

The dermatologic (e.g., treatment of psoriasis or eczema) and cosmeceutical (e.g., treatment of wrinkles or altering of skin tone) drug markets are predicted to grow to over $40B (2026) and $61B (2020), respectively. STAR particles, as a platform delivery technology, represent an opportunity to open the dermatological and cosmeceutical markets to a broad array of targeted bioactive compounds otherwise rendered inefficacious because of limited skin penetration. STAR particles have the potential to grow and add significant value to the skin care market.

Background/Context for This Invention

Skin has exceptional barrier properties that severely limit delivery of bioactive compounds for cosmeceutical, medical and other applications. Therefore, there is a significant unmet need for innovations that enhance delivery of bioactive agents for skin treatment.

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More Information

Publications

For more information about this technology, please visit:
https://licensing.research.gatech.edu/technology/enhanced-delivery-bioactives-skin-star-particles

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot