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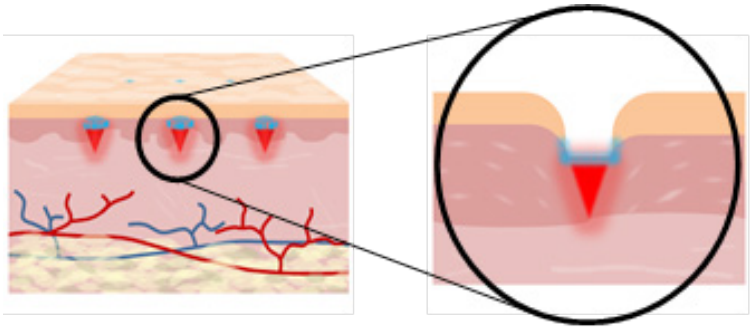
Microneedles: The future of painless drug delivery systems

Microneedles are micro dimensional needles capable of delivering biological therapeutics as well as cosmetics into the skin without causing pain, in a minimally invasive manner. In addition, microneedles are referred as the future of drug delivery systems due to their advantages compared to currently utilized drug delivery routes including topical application and hypodermic injection. There are various types of microneedles including solid type, hollow type and dissolving type. Solid microneedles are used to create pores onto the skin by which the therapeutics can be delivered with a higher efficiency. Hollow microneedles are micro scale hypodermic needles that are less painful than normally used needles. Dissolving microneedles which have been receiving big attention in recent years are referred to a type of microneedle that encapsulates drugs within its polymer and delivers it into skin upon insertion through dissolving process. Each of these microneedle types, based on the application purposes can be applied in different branches of drug or cosmetic compounds delivery. Through microneedles, achievement of a highly efficient delivery has become possible and we are expecting microneedles to replace the widely used hypodermic needles in the near future. We have so far developed various dissolving microneedle fabrication methods by which activity of encapsulated therapeutics within microneedles can be maintained the most. Centrifugal lithography (CL) is one of the recently developed fabrication methods that can be used for the fabrication of microstructures by a single centrifugation, and engineering the self-shaping properties of hyaluronic acid (HA). We have also developed microneedle implantation systems by which dissolving microneedles can be fully inserted into the skin in a minimally invasive manner.



Recent Publications

1. Yang H, Kim S, Kang G, Lahiji SF, Jang M, et al. (2017) Centrifugal lithography: self-shaping of polymer microstructures encapsulating biopharmaceutics by centrifuging polymer drops. Adv Healthc Mater 6(19).
2. Dangol M, Kim S, Li CG, Fakhraei Lahiji S, Jang M, et al. (2017) Anti-obesity effect of a novel caffeine-loaded dissolving microneedle patch in high-fat diet-induced obese C57BL/6J mice. J Control Release 265:41–47.
3. Kim S, Park M, Yang H, Dangol M, F Lahiji S, et al. (2016) Development of a quantitative method for active epidermal growth factor extracted from dissolving microneedle by solid phase extraction and liquid chromatography electrospray ionization mass spectrometry. J Pharm Biomed Anal. 131:297–302.

4. Dangol M, Yang H, Li CG, Lahiji SF, Kim S, et al. (2016) Innovative polymeric system (IPS) for solvent-free lipophilic drug transdermal delivery via dissolving microneedles. 223:118–125.
5. Lahiji S F, Dangol M and Jung H (2015) A patchless dissolving microneedle delivery system enabling rapid and efficient transdermal drug delivery. Sci Rep. 5:7914.

Biography

Hyungil Jung completed his PhD from Cornell University and his Post-doctoral studies from California Institute of Technology (Caltech). Since then he has received various awards such as "Outstanding Contributions", "Best Contribution Award", "Excellence in Research Award", "The 31st Industry-academic Cooperation Award", "Best technology Award", "Best Teaching Award" and many more in the field of Biotechnology, because of his outstanding research ability in the field. He has also recently registered his company, Juvic Inc., to further expand his research and to introduce novel microneedle based pharmaceutical and cosmeceutical products in the market.

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