Docket #: S21-359

3D printed lattice microneedle for therapeutic, drug and vaccine delivery and liquid sampling, including interstitial fluids

Background: Researchers at Stanford have discovered a method to create lattice microneedle structures using high resolution continuous liquid interface printing (CLIP) technology. CLIP makes it possible to manufacture highly precise micro-architectures at high speed, as compared to conventional 3D-printing methods.

Lattice microarray patches (L-MAPs) are novel systems for minimally invasive transdermal drug delivery and sampling of interstitial fluid (ISF). L-MAP design is made flexible by varying lattice cell size and strut size, as well as by varying the surface properties of the lattice structure. In doing so, the amount of solid or liquid cargo that is loaded onto the L-MAPs can be controlled. In addition, this design can also dictate the amount of ISF sample that can be drawn into the lattice. Additionally, because CLIP is a continuous, single-step production process, L-MAPs can also combine different features on a single patch, such as needle size and geometry. Manufacturing these complex designs using the aforementioned high resolution CLIP greatly expands the potential for therapeutic drug delivery and diagnostic applications with microarray patches.

Stage of Development: Prototype

Applications

- **Self-administration** of drugs and vaccines – can be employed in low-resource settings
- Transdermal diagnostics

Advantages

- Continuous manufacturing process
- Increased drug loading volume from increase in cell surface area
- Liquid droplet drug delivery of any therapeutic type
- Greater mechanical stability

Publications

- 3D-Printed Microarray Patches for Transdermal Applications ,*JACS Au*, 2022.

Patents

- Published Application: WO2023049267

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