Needle Guard Tip Designs for Microneedle Holders Utilized for Interstitial Fluid Extraction

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Technology description

An innovative microneedle guard tip for the extraction of interstitial fluid (ISF).
The guard utilizes an alternative configuration rather than flat surfaces to increase the efficiency of needle insertion. In addition, the alternative shape allows the skin to lift into the holder, decreasing constriction; resulting in increased flow of ISF into the needle. The extracted volumes from this novel microneedle guard tip can then be utilized for advanced analysis methods, including proteomics and transcriptomics.

Background

Microneedle technology has advanced dramatically over the last decade. Microneedle-based devices advantageous to use because they are minimally invasive and require little training. To efficiently utilize microneedles, holders are required to ensure accurate penetration and stabilization. Current holders utilize flat tip guards, allowing the surface to lay flat against the skin. This allows the needles to penetrate the skin and enter the dermis layer. The holder limits the needle protrusion to 300 - 3000 μm, overall eliminating any interaction with nerves and the blood supply. As a result, dermal interstitial fluid (ISF) can be extracted with microneedle-based devices and utilized in glucose monitoring, drug monitoring, and drug delivery analyses. Analytics on the ISF itself could also be beneficial to the medical field especially for monitoring, diagnosing and improving treatment methods for certain diseases. However, the current samples of ISF collected from flat tip guards are lacking in volume for extensive investigation. Thus, there is a need for microneedle holder designs capable of increasing ISF extraction volumes for further analyses.

Technology Description

Researchers at the University of New Mexico have developed an innovative microneedle guard tip for the extraction of interstitial fluid (ISF). The guard utilizes an alternative configuration rather than flat surfaces to increase the efficiency of needle insertion. In addition, the alternative shape allows the skin to lift into the holder, decreasing constriction; resulting in increased flow of ISF into the needle. The extracted volumes from this novel microneedle guard tip can then be utilized for advanced analysis methods, including proteomics and transcriptomics.

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Application area

Increased collection volumes (0.5 µL/min to ~2.0 µL/min)
Advanced analytical investigations of samples (proteomics and transcriptomics)
Simple operation
Additional non-flat tip configurations achievable
Potential to improve research and analytic processes within the medical field
Improved research could lead to improved monitoring, diagnosis and treatments

Institution

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