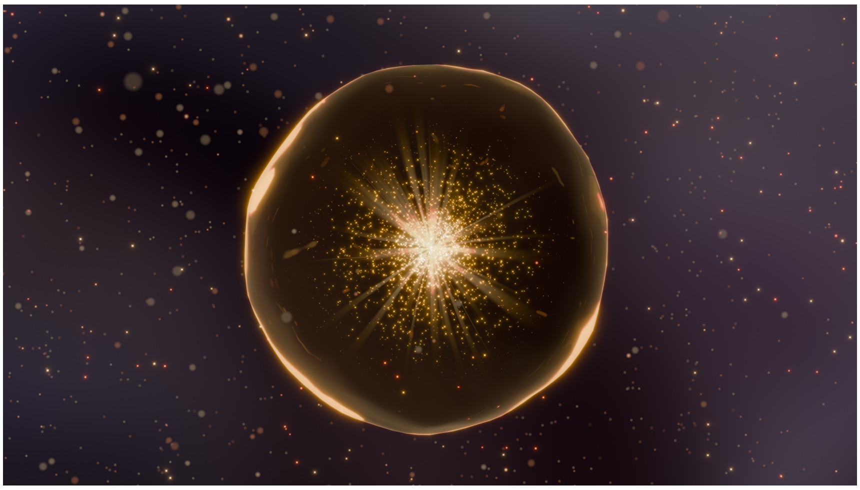
Deep Reactive Ion Etched Microneedle Array for in-vivo Cancer Monitoring via Cancer Exosome Isolation

Technology number: 2023-102



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Category
Diagnostics

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OVERVIEW

A microneedle system for in vivo cancer-associated extracellular vesicle isolation.

- Provides real-time cancer monitoring with less invasiveness compared to tissue biopsies
- Applications include cancer diagnosis, monitoring, and personalized treatment adjustments

BACKGROUND

Microneedles have increasingly been integrated into medical devices due to their minimal invasiveness and ease of use. Historically, tissue biopsies were the gold standard for cancer diagnosis and monitoring, yet they are invasive, painful, and carry a risk of complications. While various non-invasive techniques exist such as liquid biopsies, these often require expert handling and can still be challenging to perform. Traditional microneedles have been successfully used for drug delivery and wound healing by exploiting the skin's porosity, but their application in cancer diagnostics remains limited. There is a need for a more straightforward, less invasive method to monitor cancer progression, allowing for real-time data collection without the discomfort and risk associated with conventional procedures.

INNOVATION

Researchers have created a microneedle array system that isolates cancer-associated extracellular vesicles (EVs) directly from the skin's interstitial fluid in a minimally invasive manner. Technically advanced through the Deep Reactive Ion Etching (DRIE) and subsequent wet etching processes, these microneedles are sharpened to precise dimensions for optimal performance. A hybrid hydrogel of Polyvinyl alcohol (PVA) and alginate is conjugated with Annexin V (Av) protein, providing targeted affinity for cancer-related exosomes. This hydrogel-patched microneedle array can be applied and performs effectively due to its enhanced material composition and design. Potential real-world applications include real-time cancer diagnosis, monitoring, and personalized treatment, significantly reducing the need for invasive biopsies. This technology offers a promising solution for continuous, non-invasive cancer management, enhancing patient comfort and care.