Microneedle Array for Universal Vaccine Delivery Developed

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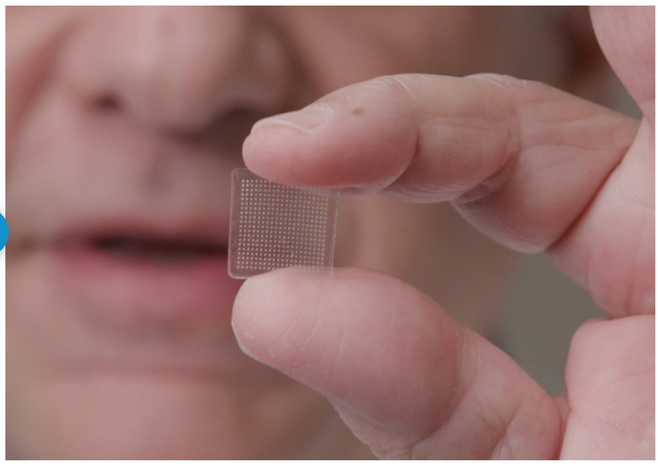

Microneedle arrays (MNAs) are a promising way of delivering vaccines into the body. They are nearly pain-free and can penetrate a substantial portion of the skin, which is considered an excellent place to inject vaccines because of the skin's sensitive and very reactive immune network. Injecting small amounts of a vaccine strategically into the skin can, therefore, produce a significantly more intense immune response than that created using conventional hypodermic needles.

A team at the University of Pittsburgh School of Medicine have now developed a microneedle array patch that can carry live or attenuated viral vectors, as well as adjuvant compounds to boost vaccine effectiveness. The patch is very impressive at activating a strong immune response.

The patch has 400 nearly microscopic needles that are made from sugar mixed with the viral vectors and adjuvant that are required for the application. When pressed against the skin, reportedly the patch feels just like touching a piece of Velcro. The needles punch through the upper layer of the skin where they absorb fluids from the skin that cause them to dissolve and the vaccine compounds within to begin their activity within the body. The researchers believe that this approach should improve the cellular immune response to vaccinations.

"We are developing this new delivery technology because while traditional vaccines are often effective in inducing antibody responses, they frequently fail to generate the cellular responses that are essential to prevent or treat many cancers or infectious diseases," said Louis D. Falo, Jr., MD, PhD, lead author of the study appearing in *Journal of Investigative Dermatology*, in an Elsevier press release.

The researchers demonstrated their approach by utilizing a live adenovirus-encoded antigen combined with polyinosinic:polycytidylic acid (poly I:C), an immunostimulant, to generate a large production of antibodies and a strong cellular immune response in laboratory mice.

"Remarkably," added Dr. Falo, "the MNA vaccine platforms incorporating both antigen-encoding adenovirus and poly I:C augmented the destruction of targeted cells significantly compared to MNA-delivery of the same adenovirus alone."

The researchers claim that in addition to a better immune response, their patches are cheap to manufacture, easy to integrate with other vectors, and can be stored for extended periods of time.

The researchers also found that the MNAs integrating both poly I:C and adenovirus retained their immunogenicity after one month of storage at 4^0 C. MNA-delivered vaccines also have advantages in their ease of fabrication, application, and storage compared with other vaccine delivery platforms.

"Our results suggest that multicomponent MNA vaccine platforms uniquely enable delivery of both adjuvant and antigen-encoding viral vectors to the same skin microenvironment, resulting in improved immunogenicity including cellular immune responses," added Dr. Falo. "This MNA delivery approach could improve the effectiveness of adenoviral vaccines now in development for the prevention of coronavirus disease (COVID-19)."

Study in *Journal of Investigative Dermatology*: Improved cutaneous genetic immunization by microneedle array delivery of an adjuvanted adenovirus vaccine.

Via: Elsevier

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