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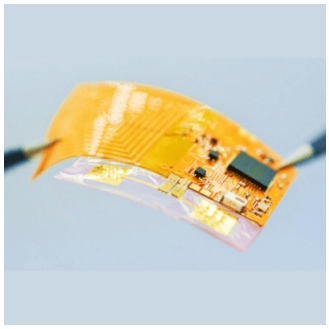
Neurodegenerative Treatment with Wireless Drug Delivery Patch



The Spatiotemporal On-Demand Patch's exposed circuit will be covered by material resembling a Band-Aid. It can receive commands wirelessly from a smartphone or computer to schedule and trigger the release of drugs from individual microneedles.

Recent developments in drug delivery systems are breaking new ground in the field of treatment for long-standing illnesses. A notable innovation from the University of North Carolina at Chapel Hill is the introduction of the Spatiotemporal On-Demand Patch (SOP), a groundbreaking wireless drug delivery device that has the potential to transform the approach to managing neurodegenerative conditions and neurological injuries.

The SOP is a wearable device equipped with electrically activated microneedles that facilitate the on-demand administration of medication. It can be controlled remotely through a smartphone or computer, enabling the microneedles to dispense medication according to pre-set schedules. Designed to be thin and flexible, much like a plaster, it emphasizes patient comfort and ease of use, especially for those suffering from chronic conditions.

The project is spearheaded by Prof. Juan Song and Dr. Wubin Bai, who have conducted tests on the SOP using a mouse model and melatonin to improve sleep, with their findings published in *Nature Communications*. Their research highlights the patch's potential in providing targeted treatments on demand, especially for conditions such as Alzheimer's disease.

The SOP's capability to administer multiple medications concurrently opens up new avenues for Alzheimer's disease therapy. This initiative is being supported by combined funding from the UNC School of Medicine and UNC Health, aiming to assess the SOP's effectiveness in a mouse model specifically designed for Alzheimer's disease research.

This endeavour is a testament to the power of interdisciplinary collaboration, drawing on expertise from the departments of applied physical sciences, pharmacology, and biomedical engineering. Notably, undergraduate students have played a significant role in this research, underlining the collective effort that drives forward scientific breakthroughs.

One of the most striking features of this device, as highlighted by Prof. Song, is its capacity to store and automatically sequence the release of dozens, if not hundreds of concentrated drugs and can be released automatically. This capability is vital for situations requiring rapid intervention or immediate therapeutic response. The device's gold-coated microneedles not only safeguard the medication and adjacent tissues but also ensure controlled release of drugs upon receiving an electrical signal.

Backed by funding from the National Science Foundation and the National Institutes of Health, the research on the SOP is set to redefine the management of chronic diseases. This innovative technology stands as a landmark achievement in drug delivery, offering a preview into the future of customised medicine and the prospect of improving treatment outcomes for individuals with chronic conditions.

Source & Image Credit: UNC School of Medicine

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