Short Communication
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Novel transdermal patch for detecting Cystic fibrosis

Abstract

A genetic condition, termed as cystic fibrosis (CF) affecting numerous organs, including the lungs, pancreas, colon, liver, and reproductive system, is completely dormant and intrinsic. Better treatment and control of CF are facilitated by early diagnosis. With the advent of technological and healthcare developments, there has been tremendous advancements in detecting CF rapidly and administering therapeutics. Accordingly, these short communication overviews developments related to early diagnosis of CF with dermal stickers. Apart from this, the future perspectives are also appraised.

Keywords: cystic fibrosis, stickers, diagnosis, sweat, ions, sensors

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Introduction

The lungs, digestive system, and other body organs are severely harmed by cystic fibrosis (CF), a genetic condition. The cells that make mucus, perspiration, and digestive fluids are impacted by cystic fibrosis. Normally, these produced fluids are slick and thin. However, a faulty gene in CF patients makes the secretions thick and sticky. The secretions clog up tubes, ducts, and passages rather than lubricating them, particularly in the pancreas and lungs. Even though cystic fibrosis is progressive and necessitates daily care, most CF patients can go to school and work.They frequently have a higher quality of life than CF patients did in earlier decades. Infant CFscreening can lower hospital stays, lessen symptoms, improve nutrition, and even improve lungfunction. CF is an anomaly brought on by a mutation in a gene that code for the CF Trans membrane Conductance Regulator protein. The transfigured gene causes aberrant, sticky mucus to be produced, which clogs ductules and leads to infection and organ system damage. This has an impact on the duct epithelium's ability to reabsorb electrolytes.[1–5] Although there are schemes for rapid diagnosis, however, smart, and non-invasive techniques are very few.[5–13] This short communication deals with a smart sticker which can detect CF at an early stage.

Diagnosis

Since the 1960s, the main technique for identifying CF has been measuring chloride. This haslimitations because the device is cumbersome, difficult to fit on kids, and does not gather sufficient sweat for an assessment. The youngster may have to wait a few weeks if the test is unsuccessful before returning to retake it. They may have to travel for miles or even travel to a facility where the test can be performed. The University of Hawaii Engineering team believes their invention, sticker sweat collectors, offers a viable alternative to this method. They have developed a tiny, coin-sized adhesive that is flexible and changes colour when exposed to salty environments.[3]

The team leader from the University of Hawaii has been interested in wearable sensors and sweat testing for a while. Using a variety of valves, dyes, and channels, his goal in 2016 was to develop tools that could monitor body chemistry in real-time. Soon after, he released a report on wearable sensors that could measure sweat's levels of lactate, chloride, and glucose. Long-distance bikers were the target audience, along with members of the military. This might be used in gadgets like today's smart watches.[3–7]

Smart stickers and their operation

The stickers produced because of this research are an inch broad, flat, and sufficiently flexible to easily adhere to an adult or child's arm. The sweat is absorbed through the middle into tiny canals, which funnel it out the sticker's edge. They resemble conventional stickers and even include some cartoon stickers for kids. A sweat gland activation gel known as pilocarpine is then applied to the skin using a modest electric current. The sticker is put on five minutes later,at which point it starts to absorb sweat. The gel, which is originally transparent and turns colour as it meets chloride, is a silver substance called chlorinalite that the sweat interacts with. The gel stays clear, and the test is finished if there are no chloride ions in the sweat. If these ions are present in the sweat, the gel will gradually turn pink and continue to develop darker as more perspiration is gathered. The chloride levels will then be determined by analyzing this color using an analysis tool. Several techniques for reference colors and overlays were attempted, and algorithms within the app were built to process the photographs. They decided on a greenoverlay that improved the colour change's visibility and allowed a smartphone camera to capture sufficient information to reliably diagnose the condition. Fifty-two participants in this study, whose ages ranged from 2 months to 51 years, tried the sticker devices. These human studies primarily used to validate the efficacy of the sweat-collection technology in the sticker,which was found to be 33% more efficient than conventional sensors.

Since the new sticker collected twice as much sweat in 18 minutes than the old sensor did in 30 minutes, there have been no tests that have been reported that did not collect enough sweat.These bumper stickers may dramatically alter how CF is identified. The small sticker design may also enable at-home testing and daily monitoring of chloride levels, freeing patients from the need to go for testing. Patients and clinicians will be able to see how they respond to different medications, treatments, and food regimens with the help of daily monitoring. It is simple to understand why the researchers are enthusiastic about this new technique since there are currently no at-home chloride monitors.

This opens a wide range of research opportunities for medical professionals interested in learning more about cystic fibrosis, possibly addressing prevalent queries. Researchers are expecting that the 24/7 monitoring of chloride levels will improve their understanding of cystic fibrosis and, eventually, lead to the discovery of a cure. This innovative sticker technology and the emergence of new wearable gadgets and sensors give them hope.[3–10]

Future perspectives and concluding remark

This novel transdermal patch has the potential to improve the quality of life for CF patients, even if there is still more study to be done in this area. Future trends suggest that the use of health sensors will rise as more individuals adopt wearable technology, such as Fit bits and Apple watches. One excellent example of how technology may be utilized to enhance people's life is the use of stickers to diagnose CF patients more quickly and accurately.

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Conflicts of interest

The author declares no conflicts of interest.

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