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Stick It On: The Skin Patch For Electronic Health Monitoring

Engineers at the US University of Illinois and Northwestern University have showcased soft stick-on patches thin enough to move and stretch with the skin, and equipped with chip-based electronics for latest technology enabled wireless health monitoring. The researchers have published their design in the April 4 issue of 'Science'.

An innovative microfluid structure with folded wires gives the patch the flexibility required to bypass the rigid electronic components. Stuck to the skin these patches could wirelessly send everyday health tracking updates to a computer or mobile phone, revolutionising EKG and EEG clinical monitoring in the process.

As Yonggang Huang, the Northwestern University professor who co-led the work with Illinois professor John A. Rogers explained, the device was designed with the aim of monitoring human health with the least interference possible on the person's life. Its flexibility and softness resembles human skin, its features provide a variety of monitoring functions and its wireless power technology is able to send high quality, real-time data about the wearer to a computer.

In a comparison between traditional EKG and EEG monitors and the skin patch, the team of researchers found the wireless device capable of equal performance to the conventional sensors with the added benefit of increased patient comfort.

In long-term monitoring, this advantage is vital in stress tests, sleep studies or any other situation when the outcome is dependent on a patient's capability to behave and move naturally. It is also beneficial for fragile-skinned patients such as premature newborns.

While Rogers' group at Illinois has demonstrated skin electronics made of wearable designed and printed components offering high-performance monitoring in the past, this readily available chip-based enhancement provides a number of additional, low cost capabilities in engineering design.

The integration of relatively big, bulky electronic chips with the elastic, soft base of the patch was achieved through a microfluidic design. Constructing the patch with a thin elastic, fluid filled envelope, the team of engineers suspended the chip components on tiny raised support points, bonding them to the underlying patch but keeping the device's flexibility. The serpentine-shaped wires are folded like origami, allowing them to unfold in any direction and to accommodate the patch's every motion.

Rogers, a Swanlund Professor of Materials Science and Engineering at the University of Illinois, stated that skin-mounted devices allowed the wearer to obtain a more accurate and complete tracking of fitness activity level. He went on to explain that when motion is measured on a wristwatch type device, there is a discrepancy in the coupling of the body and the device, whereas skin-mounted devices allowed for a much richer and deeper set of information.

The multi-university research team hopes that their sophisticated, integrated sensing systems could, apart from monitoring health, also facilitate the identification of problems before the patient may be aware, such as the analysis of detecting motions associated with Parkinson's disease at its onset.

Describing the tremendous potential that the application of stretchable electronics has to medicine, Huang said that the continuous monitoring of our health via a comfortable, small, skin-mounted could lead to health conditions being caught before the patient experienced pain, discomfort and illness.

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