Hi-tech skin patch might someday track your health

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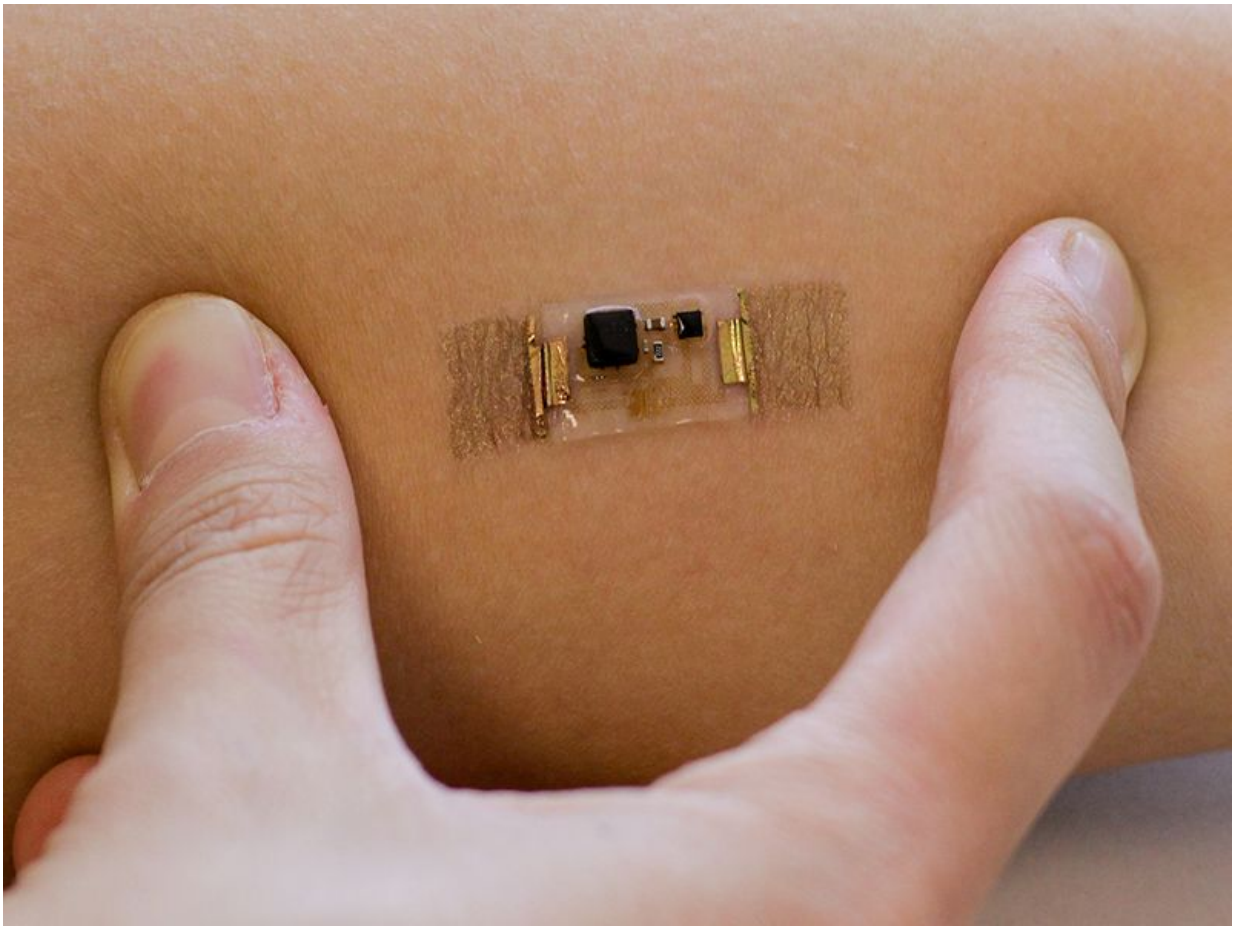

Skin patch health monitor.

A new type of acoustic sensor that resembles a small Band-Aid on the

skin can monitor your heartbeat and other health measures, researchers say.

The sensor may one day offer a way to painlessly and wirelessly track an individual's health. The patch, which weighs less than one-hundredth of an ounce, can help doctors monitor heart health, stomach condition, vocal cord activity, lung performance and potentially many other bodily functions, researchers say.

"We've developed a soft, skin-like device that can listen to internal sounds created by function of internal organs," explained study co-author John Rogers. He was a professor of materials science and engineering and a professor of chemistry at the University of Illinois at Urbana-Champaign during the study and is currently at Northwestern University.

"Think of the device as a wearable, skin-mounted stethoscope. But with capabilities for continuous listening and recording of not only sounds, but also low-frequency vibrations," Rogers said.

The research team behind this latest example of so-called "epidermal electronics" said the patch is both soft and thin. Its silicone core construction is intended to comfortably match the pliable feel of skin tissue. That makes it easy to adhere and wear anywhere on the body.

The patch is designed to "listen" through skin, tissue and fluid to register the telltale sounds and vibrations generated as you breathe, eat, move and sleep.

Those "mechano-acoustic" signals, or waves, can then be used to remotely track very specific functions, such as how well a heart valve closes, a muscle contracts, a lung expands or a vocal cord vibrates, the study authors explained.

Such signaling might even track the function of implantable mechanical devices, such as a heart pump. And because more than one type of acoustic signal can be registered at a time, the patch can keep track of multiple concerns simultaneously, the study authors said.

The patch can also be outfitted with electrodes that can record electrocardiogram (ECG) signals to keep track of the electrical health of a patient's heart, according to the researchers.

There's additional potential for helping with speech recognition. In theory, this could translate into all sorts of future applications, ranging from assisting patients who struggle with speech impairments, to offering individuals remote vocal control of all sorts of technology, the researchers said.

The researchers have tested a range of such possibilities in the lab, and also among a group of elderly volunteers at a private cardiology clinic in Tucson, Ariz.

For example, the patch was used to monitor the cardiovascular health of an 82-year-old woman diagnosed with heart valve trouble and an irregular heartbeat. It was also tried out on a 78-year-old woman who had a heart murmur.

Rogers said the results were encouraging, and "represent important extensions of the capabilities of 'skin-like' wearable devices."

Dr. Gregg Fonarow shared Roger's enthusiasm. Fonarow is a professor of cardiology at the University of California, Los Angeles.

"These types of noninvasive sensors, which have the profile of a small wearable skin patch, are likely to be well received by patients," he said.

Fonarow especially liked the patch's potential as a way for physicians to keep tabs on heart disease progression or the post-surgical functioning of devices such as heart pumps.

"However, further study and ultimately randomized clinical trials will be necessary to evaluate the accuracy, effectiveness and safety of such monitors," he cautioned.

The study was published in the Nov. 16 issue of *Science Advances*.

More information: Y. Liu et al. Epidermal mechano-acoustic sensing electronics for cardiovascular diagnostics and human-machine interfaces, *Science Advances* (2016). DOI: 10.1126/sciadv.1601185