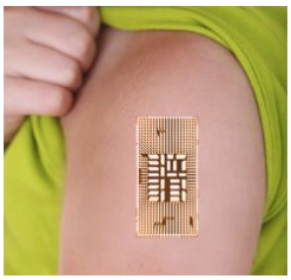
Bottom Line's
Daily Health News

Tattoo Medical Monitors



Imagine this. You're given an electronic sensor system made of an ultrathin, flexible silicon membrane attached to a thin piece of plastic. You press the membrane onto your skin and dab it with water to wash away the plastic backing, leaving just the membrane of circuits on your skin as if it were a temporary tattoo. Now, pretend that while this membrane is attached to your skin (you can barely feel it), it's going to act as a medical monitoring sensor, tracking and reporting the function of your brain, your heart and possibly dozens of other body systems.

If this sounds like technology from another planet, it isn't—researchers at University of Illinois at Urbana-Champaign have created these types of circuits, which are called *epidermal electronics*, and they can be applied without adhesive anywhere on the body. But the technology's potential in medicine is, well, out of this world. To find out more about how these gadgets work, I called John A. Rogers, PhD, professor of materials science and engineering at the university and the lead researcher.

A SCIENTIFIC BREAKTHROUGH

According to Dr. Rogers, what's really new in this technology is that the circuitry is not only very small and thin, but also as flexible as human skin—that's because it is written on a type of silicon membrane that's only about 100 nanometers (or 0.00005 of a millimeter) thick. The membrane can bend, wrinkle and stretch without being damaged and it doesn't interfere with the motion of the wearer's skin. And there's no glue or tape involved—the membrane stays in place due to the natural attractive forces between atoms and between molecules that are next to each other (known by scientists as van der Waals forces).

This development is exciting, said Dr. Rogers, because he and his team showed that these tattoos can measure heart rate, brain function and other electronic body signals—and the tattoos performed as well as the traditional, bulky electrode monitors that require adhesive gel and tape. The tattoos were attached to medical monitoring devices via thin-ribbon cables. For long-term monitoring, the tattoos have to be replaced every week or two because the external layer of skin cells is constantly sloughing off (and with it, the tattoos). So engineers—most of whom are at Illinois—are currently working on ways to make the electronic tattoos transmit data wirelessly and stay attached to the skin longer. They're also curious to see whether the devices could be made controllable by simple voice commands or even by body movements.

There's still a lot of work to be done before these devices become available to health-care practitioners, acknowledged Dr. Rogers. But when they do—possibly within two or three years, he said—they might be used not only for conveniently monitoring the brain (such as to determine someone's cognitive state or level of awareness) or the heart (such as to watch for arrhythmias), but also to track physiological changes during exercise…to monitor sleep patterns and problems…to monitor babies in neonatal care units…and even, later down the road, to stimulate muscles during physical therapy or help muscles or nerves control the motion of prosthetic appendages. Dr. Rogers speculated that electronic tattoos could also be used in fun ways—imagine several attached to different parts of your body and acting as video game controllers in a virtual-reality world.

DO YOU WANT AN ELECTRONIC "SECOND SKIN"?

I'm wowed by this technology, although I'm interested to learn more about the potential side effects and privacy issues as more research is done. (I mean, think about cell phones—they were revolutionary, but now there's concern that they might cause cancer.) Dr. Rogers agreed that these are issues that are worthy of future study.

Dr. Rogers has launched a commercial enterprise, MC10 Inc., to bring the electronic tattoos to the medical market. In the meantime, he said that he is currently working separately with Reebok on a sports-monitoring product that might be available later this year. I'll keep an eye out for that—and also for more studies that show the advantages and disadvantages of this new technology.

Sources: John A. Rogers, PhD, professor of materials science and engineering, University of Illinois, Urbana-Champaign.

Listing Details

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