

New wearable patch measures trace perspiration during activity and rest

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Conceptual illustration portrays fully assembled patch securely affixed to skin's surface. Credit: *Advanced Science* (2024). DOI: 10.1002/advs.202401947

Researchers at University of Tsukuba have pioneered a state-of-the-art wearable device capable of precisely and continuously measuring trace perspiration amounts. This innovative device is adept at monitoring

perspiration levels during not only physical activity but also rest. Its potential applications extend beyond monitoring dehydration caused by exercise or heat exposure, encompassing broader domains such as daily health management and disease detection.

Maintaining bodily water balance is essential for survival. Although sweat serves as a key indicator of physical and [mental health](#), existing [wearable technologies](#) can only monitor substantial sweat volumes.

To overcome this limitation, researchers conducted a new study and developed a lightweight (1 g), thin (1 mm thick) wearable patch that is attachable to the skin. This patch is capable of accurately measuring trace amounts of insensible perspiration, which refers to the [water vapor](#) that evaporates from the [body surface](#) even during rest. The findings are [published](#) in the journal *Advanced Science*.

The patch's channels, comprising sponges made from a superhydrophilic polymer, emulate the water absorption mechanisms observed in plants. This design facilitates the rapid and reliable monitoring of trace sweat amounts. Additionally, the sweat entering the channels is colored using a food dye to visually confirm the volume and rate of perspiration, thus indicating the state of dehydration.

The patch also incorporates a sensor that continuously monitors the concentration of hydrogen ions (pH) and chemical components such as sodium, potassium, and glucose ions, enabling the real-time detection of variations in such concentrations.

Experiments involving the application of this patch to various body parts during [daily activities](#) confirmed its effectiveness and measurement reliability. This novel wearable patch holds significant promise for applications in dehydration management, stress and tension monitoring, disease detection, sports performance optimization, and more. As the

patch is individually worn and utilized, it is poised to make substantial contributions to the advancement of personalized medicine.

More information: Hanlin Ding et al, Nature-Inspired Superhydrophilic Biosponge as Structural Beneficial Platform for Sweating Analysis Patch, *Advanced Science* (2024). [DOI: 10.1002/advs.202401947](https://doi.org/10.1002/advs.202401947)

Provided by University of Tsukuba

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