Wearable microfluidic band can measure sweat biochemistry during rest or exercise

September 5 2024, by Bob Yirka

Photograph of the band on an ankle. Credit: Soongwon Cho and Ruihao Song

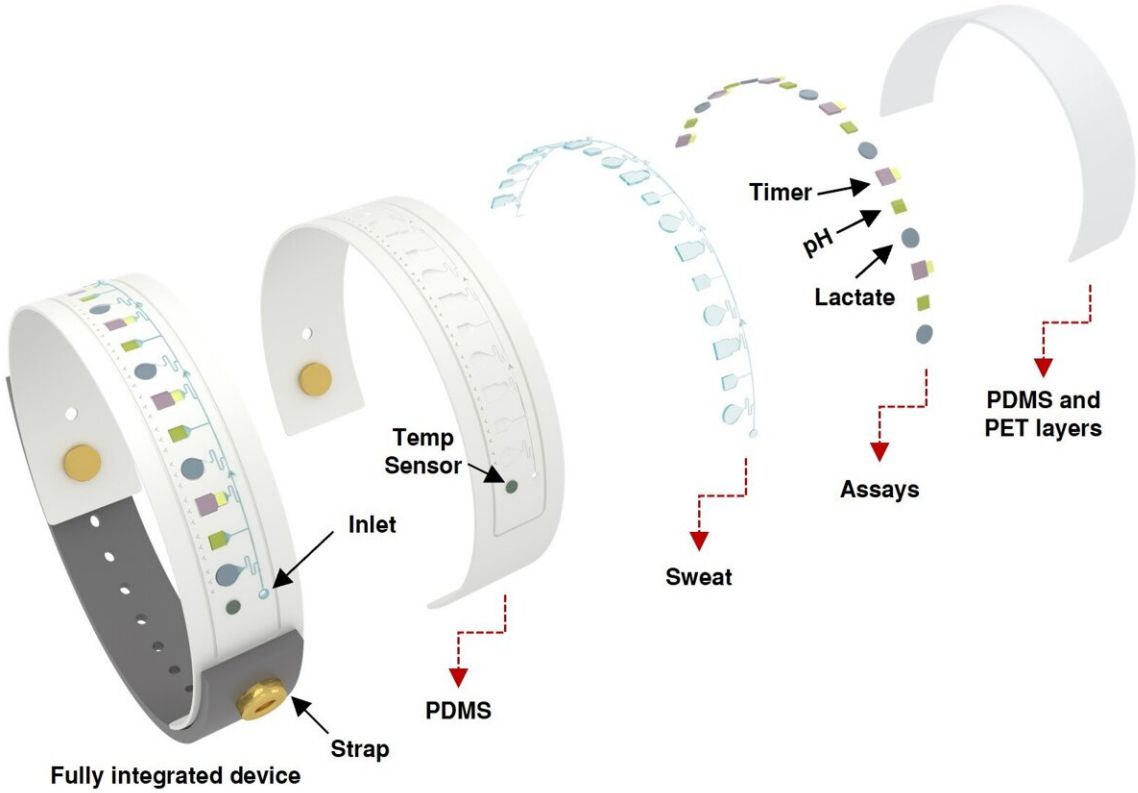
A large, international team of researchers with a variety of backgrounds has developed a band that can be worn on the wrist or ankle to measure changes in the chemical makeup of sweat over a short period of time.

Their paper is published in the journal *Science Translational Medicine*.

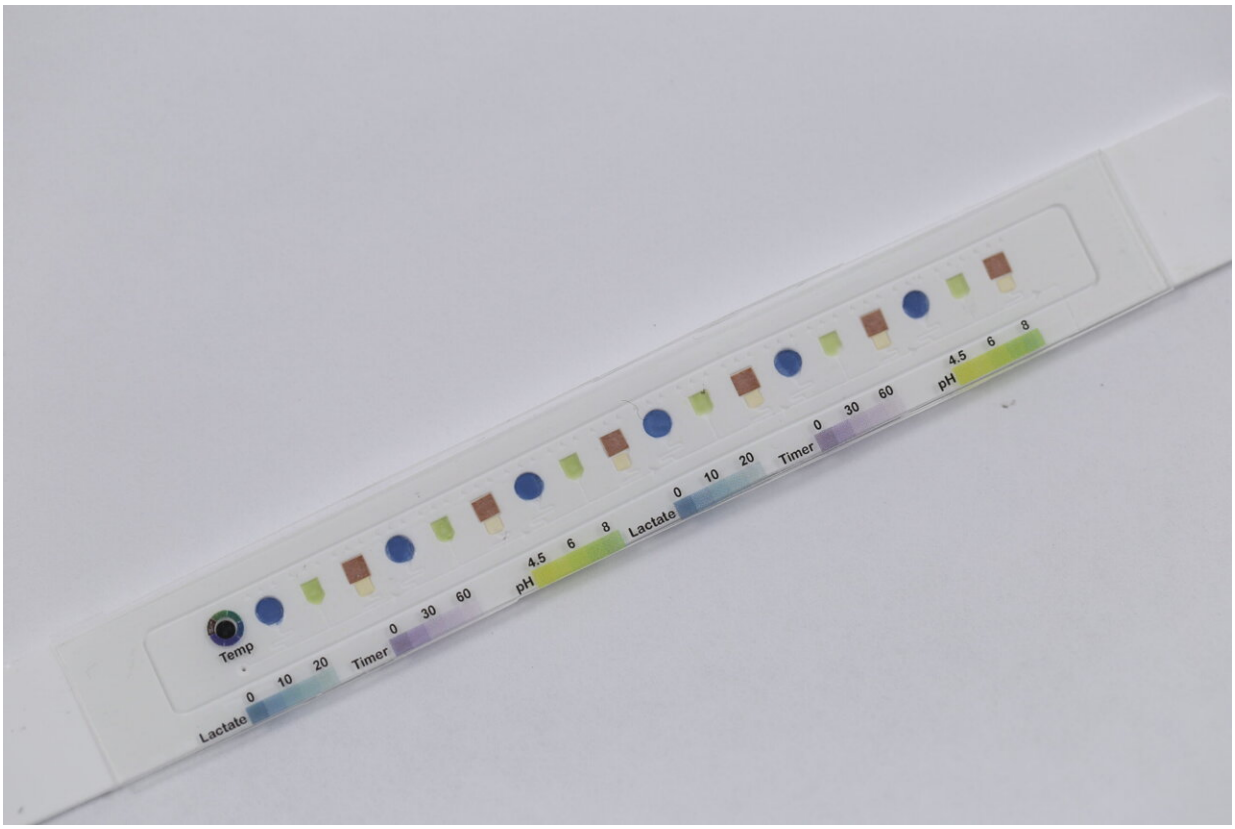
Prior research has shown that during exertion, muscles begin producing a chemical called lactate—as exercise continues, more of this chemical is produced. Prior research has also shown that measurement of lactate levels can be used to monitor physical endurance, because the more fit a person is, the longer it takes for lactate levels to build up.

Professional athletes or those training for events such as the Olympics have their levels tested through blood samples from finger pricks to determine their endurance. But that testing is not only painful, the researchers with this new effort note, it can also lead to infections. They have therefore come up with a different way to test lactate levels during exercise that does not involve testing blood but instead tests sweat.

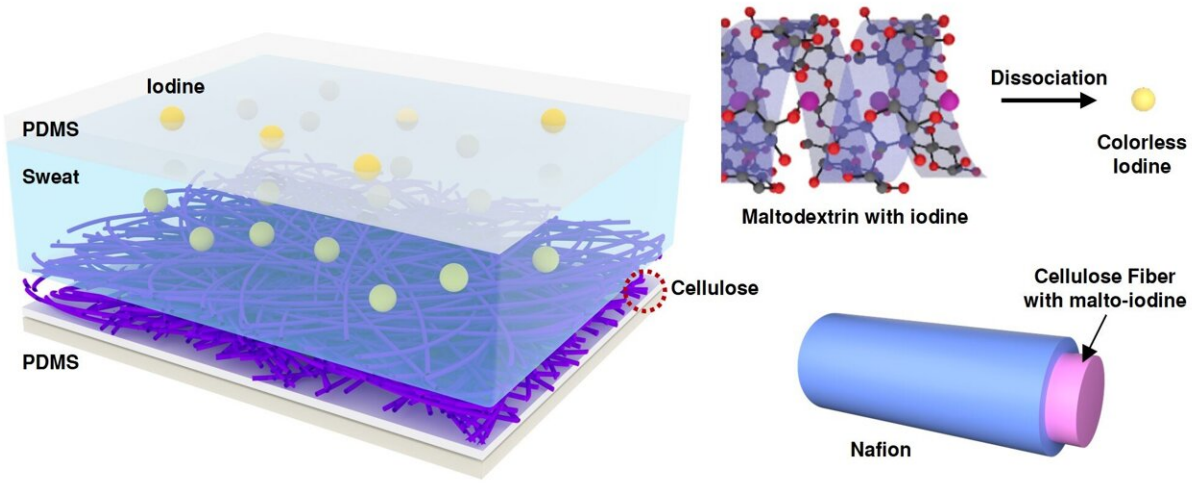
The research team found that over time, as exertion continues, the pH level of sweat drops and some amount of lactate appears. Suspecting that they might be able to use sweat to measure lactate levels during exercise, they developed a way to test for it.



Credit: Yirui Xiong



Credit: Soongwon Cho & Ruihao Song



3D illustration of the timer sensor. Credit: Yirui Xiong

The result was a band that looks much like a wristwatch. The band has several tiny reservoirs that collect sweat at prescribed timed intervals during exercise. Chemicals inside the reservoirs react with the sweat, producing a color that relates to pH and lactate levels. The results from the reactions can be processed by a monitor on the wristband or via smartphone app.

During testing with a group of volunteers, the research team found that the amount of lactate in the sweat did not relate to levels in the blood; thus, it was of no use. But they also found that pH level changes did correspond with the degree of change in lactate levels in blood samples, offering an alternative way to measure them over time.

More information: Soongwon Cho et al, A skin-interfaced microfluidic platform supports dynamic sweat biochemical analysis during human exercise, *Science Translational Medicine* (2024). DOI: 10.1126/scitranslmed.ado5366