

Fertility app for parents-to-be

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The Ava wristband is worn at night and records the necessary data mainly in the second half of the night. In the morning, the user synchronizes the data with a smartphone app – and receives the calculation of her fertile days. Credit: Ava AG

Since January 2017 a sensor wristband that, according to the manufacturer, is capable of detecting a woman's fertile days in her cycle with 89 percent certainty has been on the market. Empa helped developing the sensor technology.

When is the right moment to get pregnant? A tricky question for couples who wish to have children. For many, using the [temperature](#) or rhythm method to pinpoint the fertile days is too inaccurate; other methods require lab tests and are thus inconvenient.

The medtech start-up Ava is now looking to answer this question with a state-of-the-art sensor [wristband](#), which is worn at night and registers nine [physiological parameters](#) in the woman's calm sleep cycles: resting heart rate, [skin temperature](#), [heart rate variability](#), sleep, breathing rate, movement patterns, circulation, bio-impedance and heat loss from the skin. In the morning, the data is synchronized with a smartphone app, which calculates the increase in the sexual hormones estradiol and progesterone.

The Ava wristband is able to display 5.3 fertile days per month with an accuracy of 89 percent, as the manufacturer writes in a [press release](#) citing a study conducted at the University Hospital in Zurich. The device has been on the market in the US since the fall of 2016 and in Switzerland since January 2017.

It all began in the fall of 2014 with an Empa research project funded by the Commission for Technology and Innovation (CTI). As Empa researcher Simon Annaheim from the Laboratory for Biomimetic Membranes and Textiles recalls: "The aim was to determine a woman's hormonal status as accurately as possible using non-invasive methods." Annaheim began with conventional smartwatches and monitoring shirts, which were fitted with various sensors to gauge body temperature, [heart rate](#), acceleration, movement and body position, for example. The next step for the Empa team was to develop prototypes of the Ava wristbands and test them on volunteers.



Difficult measurements

It soon became clear just how difficult it is to measure the temperature with a wristband worn at night. The readings need to be accurate to within a tenth of the degree to provide reliable information about the hormonal cycle. However, the behavior of the test subjects caused far greater deviations. Alcohol consumption, a sunbath in the afternoon or a jog in the evening, for instance, triggered a much more significant increase in body temperature. The position of the hand with the wristband – under or on top of the blankets – also influenced the readings.

The solution: the researchers used two temperature sensors, one for the wristband's surroundings and one for the skin. Moreover, the measurements were postponed from the early sleep phases to the middle of the night as this is when all the bodily functions are more balanced and the readings become more stable. "The most important thing, though: we have to correlate the skin temperature with the series of other physiological parameters," says Annaheim. "Only then can we draw accurate conclusions about the cycle." The software that compares the readings was developed at the Centre Suisse d'Electronique et de Microtechnique (CSEM) in Neuchatel.

Empa's research activities soon bore fruit: the project was completed in December 2015 and by the summer of 2016 the wristband had reached the market in the US. According to a press release over 50 pregnancies have already been confirmed among wearers of the wristband.

"Empa was one of Ava's first research partners and instrumental in the development of the basic concept. We're delighted to underscore this with joint publications," says Peter Stein, VP R&D at Ava.

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