

Discoveries in sensor technology advance personalized medicine

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Imagine a world where you could present your personal physician with a year's worth of not only your real time heart rate and activity levels but also dynamic glucose and insulin concentrations, cortisol, dopamine, serum fibrinogen, and a large panel of biomarkers of human health.

A group of international scientists including pioneers of medical diagnostics and therapies as well as experts in biochemical sensors and nanotechnology engineers from King Abdullah University of Science and Technology (KAUST) working with leading universities in Australia, Spain, U.S. and the UK has pooled their knowledge to identify the future opportunities for human health monitoring.

In their study published in the journal *ACS Sensors*, the team identified how the long record in science of tracking animals provides insights as to how human health can be monitored. "When this data is combined with movement and other easily acquired data already available in the devices most of us carry—there is the potential for this

information to be applied to create massive leaps forward for benefits to human health," said Dr. Carlos Duarte, professor of marine science and head of the KAUST Sensors Initiative.

Thanks to information recorded by simple sensors specially designed not to impact the natural behavior of animals, the team of scientists have identified that the internet of things (IoT) has the power to become the internet of human health.

Examples including sensors on penguins, dolphins, turtles, sea lions and other terrestrial mammals that informed diet and feeding behavior, sensors on the leopard tortoise—whose self-righting shell informed a new method of insulin delivery—and birds, whose activities enabled the recording of movement, flight and foraging activity.

"For over 60 years scientists have been tracking the movement and behavior of animals to infer their state while doing so with humans was ethically unacceptable. Yet, the advent of the mobile phone and wearable technology is unleashing multiple and massive streams of data that may encapsulate information allowing individual health state to be assessed," continued Dr. Duarte.

The information gathered has not only inspired new medical techniques but has also given scientists ideas for the development of new health monitoring devices that could clip onto clothing to inform us of our eating habits, social interactions, respiration, sleep cycles, heart rate and oxygen levels.

When combined with data from our cell phones, environmental data and medical history data—the risk of asthma attacks and heart attacks could be quantified, the most vulnerable populations identified, and preventative interventions could be implemented earlier to improve outcomes and minimize the cost of treatment.

Combining these [data sets](#) and sifting through the

person specific data collected by worn sensors and individual smart phones will prove to be a future challenge for machine learning. Further advances in [sensors](#) such as glucose monitors and other such biomarker information presents a combined challenge for biollogging engineers and chemosensor communities.

"This paper demonstrates the power of interdisciplinary collaboration, which characterizes the KAUST Sensor Initiative, to resolve problems, with marine scientists, engineers and chemists working together to develop new approaches, and devices, to infer human condition as a basis for personalized medicine," added Dr. Duarte.

These findings by experts in medicine and marine biollogging from the KAUST Sensor Initiative make it clear that the discoveries gained from the scientific biollogging of animals have clear implications for human health monitoring. They suggest that through collaboration at the machine, organism interface there may be future [health](#) benefits for all.

More information: Michael A. Lee et al. Can Fish and Cell Phones Teach Us about Our Health?, *ACS Sensors* (2019). DOI: [10.1021/acssensors.9b00947](https://doi.org/10.1021/acssensors.9b00947)

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