

Harnessing the power of RF antennas for use as passive biosensors

Beibhinn O'Donoghue
Tufts University, USA

Dehydration is a physiological side-effect that affects everyone to some degree and can be remedied easily. However, when the rate of dehydration is not monitored appropriately, serious physical consequences can occur. Studies have shown that sweat loss amounting to 2-3% of body weight leads to impaired thermoregulation and increased muscle fatigue, while at 5-6% can lead to heat stroke and even coma. The development of a real-time biosensor to monitor the conditions on the skin's surface and relay that information to a qualified physician is tantamount to effectively monitoring dehydration. Current work employs the use of both silkworm silk and RF antennas to realize the application of a real-time hydration biosensor. By exploiting and measuring the electrical characteristics of the RF antenna, changes in the environment will cause changes in the antenna's response. These include changes in both the dielectric and conductivity of the material in contact with the antenna. This is particularly useful for monitoring the hydration level of the skin, as both the amount of liquid and salt content of the sweat vary as dehydration occurs. Silkworm silk can be purified and manipulated to form a porous sponge-like form factor that acts as an absorbing layer. This silk layer is incorporated with the RF antenna to absorb sweat at the skin's surface and bring it in contact with the interrogating antenna. Initial tests show that changes in physiologically relevant sweat concentrations can be detected by the RF antenna, showing great promise for this biocompatible real-time hydration monitoring biosensor.

Biography

Beibhinn O'Donoghue is pursuing a Master's in Biomedical Engineering at Tufts University as a member of Dr. Fiorenzo Omenetto's group. Prior to her master's work she was employed as an IT consultant at Accenture, after completing a Bachelor's in Electrical Engineering at Tufts University.

beibhinn.o_donoghue@tufts.edu