

Continuous cytokine monitoring by particle mobility sensing

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In healthcare, real-time, precise and reliable data are essential for patient monitoring, treatment and coaching. Sensors for monitoring physical parameters such as body temperature, blood pressure, or heart rate are broadly available. However, commercially available biochemical sensors are lacking, aside from devices for the continuous monitoring of glucose; however, the enzyme-based electrochemical principle for sensing glucose is unsuited for sensing other biomarkers such as proteins, hormones, pharmaceutical drugs, or nucleic acids.

Here, we report a continuous cytokine monitoring biosensor based on particle mobility sensing with single-molecule resolution (Visser et al., Nature Communications 2018). Particles are functionalized with anti-cytokine antibodies and tethered via a flexible dsDNA linker to a surface with other anti-cytokine antibodies. In the presence of cytokine analyte, the antibody sandwich formation leads to particle binding to the sensor surface, causing changes in the particle mobility that are optically detected. The reversibility of this interaction allows the continuous monitoring of cytokine levels, which we demonstrate for interleukin 6 (IL-6) and tumor necrosis factor alpha (TNF α). These biomarkers are important in the field of immunology and immuno-therapy, for example to monitor patients who are at risk of developing cytokine release syndrome or neutropenic fever.