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# Noninvasive Tear Stress Sensors

Chronic stress has been widely implicated in a plethora of lethal and life-altering diseases including diabetes, heart attacks, depression, Alzheimer's and osteoporosis. Thus, there is great interest in monitoring stress levels in the population. Stress has both biochemical and physiological effects on the body that can be quantified in bodily fluids. Currently, blood is the standard diagnostic testing fluid, but tears, saliva, and serum are being investigated as possible alternatives due to the problems associated with drawing blood. However, the stress hormones that are currently measured in blood, such as glucocorticoids and catecholamines, do not have high enough physiological concentration in these alternative fluids, making precise measurements a technical challenge.

Researchers at Arizona State University have developed a screen printed electrochemical sensor that can obtain a tear sample via a novel microfluidic capture system. This system can detect stress/trauma biomarkers that are present in tears, such as cortisol, with femtomolar sensitivity. Mesoporous carbon inks encapsulate the recognition elements for the stress/trauma biomarkers, blocking interferents and providing better rest results. This system has been tested with cortisol, and the assay is highly reproducible and can detect very low levels.

This sensor enables a highly reproducible and ultralow level of detection in a label-free and rapid response configuration. And, by utilizing tears, this novel device provides a simple and painless means for detecting stress biomarkers levels in the body.

Potential Applications

- Non-invasive monitoring of stress/trauma biomarkers (cortisol, glucose, lactate, lactoferrin, IgE, catecholamines, S100beta, neuron specific enolase, etc.):
  - Sports medicine
  - Military
  - Law enforcement
  - Emergency personnel

Benefits and Advantages

- Rapid monitoring - 90 second detection
- Femtomolar sensitivity
- Label-free
- Noninvasive
- Point of care
- Highly reproducible
- Minimal background interference
- Quantitative measurements

For more information about the inventor(s) and their research, please see Dr. La Belle's laboratory webpage