Sweat Biomarkers as an indication of physiological conditions

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Technology description

Invention

Inventors at the University of Arizona have devised a means by which cortisol isomer ratios in human sweat can be measured and used to evaluate the physiological or psychological state of the patient. Certain cortisol isomer ratios are associated with particular conditions or disorders (high blood pressure, sleep disruption, and others). Other ratios are associated with states of stress or relaxation.

Background

Researchers at the University of Arizona have identified that there are different isomers of cortisol found in human sweat, and that the concentration ratios between standard cortisol and its isomers are different among different individuals. Prolonged cortisol secretion and elevated or depressed levels of cortisol production are associated with a variety of physiological and psychological conditions including elevated stress, depression, and psychosis. Measuring and flagging these abnormal cortisol levels provides early warnings or indications of such mental and physical conditions being present.

Application area

Diagnosing and understanding physiological/psychological conditions. By generating profiles of cortisol ratios in patients suffering from specific physiological or psychological conditions, it is possible to analyze patients' sweat in order to aid in the diagnosis of various diseases or conditions.

Studying the function of cortisol in human physiological/psychological activity. Because this sweat-based cortisol detection method is the most accurate of all cortisol measurement methods, it would be very useful for conducting studies on the relationship between cortisol levels and other factors.

Real-time monitoring of stress levels in combatants and athletes. Biosensors could be developed which measure cortisol isomer ratios (and stress levels by association) to ensure that individuals in stressful situations are able to cope. In other cases, individuals could monitor their own stress levels using a smartphone app which would then guide them through relaxing exercises to return stress levels to normal.

Treatment of adrenal insufficiency syndromes. The inventors have proposed a system that makes use of a pump that administers hydrocortisone when biosensors detect certain cortisol levels or cortisol isomer ratios to treat steroid-resistant asthma or other stress-related illnesses in real time.

Lie detection/interrogation via biosensors. Because of the association between cortisol isomer ratios and stress/relaxation, it may be possible to supplement interrogations with sweat analysis (via biosensors) to determine levels of truth or falsehood in responses in real time.

Advantages

Fewer false positives. Compared to cortisol immunoassays, this sweat-based detection method has lower rates of false positive results.

Non-invasive. Cortisol has been measured using blood and interstitial fluids in the past. These methods are considerably more invasive than the new method, which only requires the collection of sweat. This also makes the method promising for the development of biosensors for real-time measurement of stress levels.

More reliable. Cortisol can also be measured by collection of urine or saliva (which are non-invasive methods), but they have potential reliability problems. The new method does not suffer this weakness. More accurate cortisol measurements. Measurements that rely on interstitial fluid or bone collection can be compromised due to the stressful nature of the collection method. When patients are stressed, this can introduce artifacts into the measurements. Since the sweat-based method does not require needles, patients are considerably less stressed, leading to uncompromised measurements.

Institution

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