Research SKETCHES

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Saliva contains a novel molecule for measuring stress

A newly discovered protein in human saliva may help to predict and manage stress-related conditions.

Primary Researchers

EDUARDO REYES-SERRATOS

Department of Medicine
University of Alberta

DEAN BEFUS

Department of Medicine
University of Alberta

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Ritz T, Rosenfield D, St. Laurent CD, Trueba AF, Werchan CA, Vogel PD, Auchus RJ, Reyes-Serratos E, Befus AD. A novel biomarker associated with distress in humans: calcium-binding protein, spermatid-specific 1 (CABS1). *American Journal of Physiology - Regulatory, Integrative and Comparative Physiology* 312: R1004–R1016, 2017.

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saliva, acute and chronic stress, negative affect, anti-inflammatory activity

What is this research about?

Have you ever been stressed? Most people report that they have—and the resulting physical and economic costs can be enormous. In 2014, Statistics Canada reported that 6.7 million Canadians felt most days were stressful. In the US, the cost of workplace stress tops $300 billion every year, according to the American Psychological Association.

Our bodies respond to stress by releasing a variety of molecules into blood and saliva. Scientists learn about stress by studying the psychological and physiological effects of these molecules. The more we understand about the way stress works, the better we can manage its negative health effects.

Researchers have discovered that a salivary protein called "Calcium-binding protein spermatid-specific 1," or CABS1, has the potential to be a reliable, accurate marker of stress. What's more, levels of CABS1 may change depending on the kinds of stress we experience.

What did the researchers do?

The researchers collaborated with a psychologist to conduct stress experiments on university student volunteers. Both immediate (acute) and prolonged (chronic) psychological stress were measured. The team collected participants' saliva and asked them questions about their mood, anxiety, levels of stress, and depression in three separate studies.

In the first study, researchers measured baseline CABS1 concentrations in participants' saliva over a five-week period.

In the second study, designed to mimic immediate (acute) stress, volunteers were given five minutes to prepare an important speech designed to obtain a senior position at a major company. After delivering their speeches, participants were assigned an unexpected and challenging mental arithmetic test. Researchers collected saliva from participants throughout the experiment.

In the third study, designed to mimic prolonged (chronic) stress, researchers collected saliva from participants during the middle of the university term (a low stress point) and during final exams at the end of the academic term (a high stress point).

The researchers then analyzed the presence of CABS1 in saliva and checked for associations between levels of CABS1 and the participants' responses to the stress questionnaires across the three studies.

What did the researchers find?

CABS1 levels increase significantly after acute stress.

- CABS1 levels were relatively consistent in participants' saliva over a five-week period.
- However, CABS1 levels increased immediately after participants were subjected to acute psychological stress.

CABS1 proteins are present in different molecular sizes: a CABS1 variant measuring 27 kDa is associated with increased stress.

- CABS1 proteins are measured in kilodaltons (kDa). Each study participant had a 27 kDa CABS1 variant in their saliva; some participants had other sizes of CABS1 proteins present as well.
- Participants who experienced an increase in the levels of the 27 kDa CABS1 variant after being subjected to acute stress reported an increase in emotional distress and depressive mood.

Smaller CABS1 variants (less than 27 kDa) may indicate resistance to stress.

- Participants with smaller CABS1 variants (less than 27 kDa) in their saliva reported experiencing little stress during the studies.

How can this research be used?

These findings suggest that the CABS1 salivary protein may be a reliable biological marker to measure acute stress and that smaller forms of CABS1 may be associated with resistance to stress.

Ongoing studies of CABS1 may help with the development of a screening tool to assist employers in identifying stress-resilient candidates better suited for high-stress occupations. Psychological tests could be used, alongside molecular analysis, to predict and measure an individual's susceptibility to stress.

Stress is linked to the majority of patient visits to physicians and is a contributing factor in conditions such as cancer, stroke, and respiratory and heart diseases. Being able to accurately measure stress levels may allow for improved prevention, intervention and management of stress-associated mental and physiological disorders.

Further studies are needed to determine if a change in salivary CABS1 levels is also associated with chronic, or prolonged, stress.

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Contact Us:

info@allergen-nce.ca

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