Taking the stress out of cortisol measurements

The Health Psychology Lab at Brandeis University in the USA is using gold standard luminescence assays to monitor cortisol and other salivary biomarkers of stress. In addition to its own research projects, the Health Psychology Lab offers assay services and technical advice for non-profit and government institutions, from sample collection through to data analysis.

For years, clinical biomarker research relied on the analysis of blood, urine or cerebrospinal fluid and, while this works well for most studies, the invasive sampling processes involved could potentially skew results in investigations into biomarkers of acute or chronic stress conditions, such as cortisol. Not surprisingly, this led to the development of non-invasive saliva-based tests, including immunoassays.

In the late 1990s, Dr Jutta Wolf and Dr Nicolas Rohleder, now joint principal investigators of the Health Psychology Lab at Brandeis University, were working in Germany in the laboratory of Professor Clemens Kirschbaum, who played a major role in developing salivary cortisol assays. The experience they gained there in performing cortisol assays to support academic researchers worldwide served them well when, after postdocs in Canada, they moved to Brandeis in 2008 and set up the Health Psychology Lab. Jutta explained: "When we came to Brandeis, the university helped us to set up a lab to analyze blood and saliva samples for our own biological psychology research. However, we were not using the equipment all the time, and we felt that we could do more with it."

Jutta continued: "Saliva testing had captured the interest of researchers keen to avoid drawing blood samples for biomarker studies, as it is an easily collectable medium. However, academic researchers are not always in a position to run these assays and often rely on the services of other laboratories, even sending samples abroad for analysis. We thought that it would be a good idea to share our equipment and expertise in measuring salivary biomarkers of stress with the scientific community in the USA and, with the university's support, we set up a non-profit business that we run in parallel with our own teaching and research programs."

Nicolas took up the story: "Over the couple of decades since saliva assays were introduced, the use of cortisol as a biomarker – and the number of publications on the subject – has grown exponentially. Previously, acute stress testing was typically performed in a laboratory setting, taking blood samples via a catheter to monitor cortisol levels. Not only is this invasive, but it is not possible to monitor chronic stress by collecting samples for cortisol analysis over several days in people's homes. The development of saliva assays was a big

Dr Nicolas Rohleder and Dr Jutta Wolf, who set up the Health Psychology Lab at Brandeis University

step forward. Samples can be collected at home, stored at room temperature or in the fridge and then mailed to the lab, where they are frozen for as long as necessary prior to analysis; cortisol is a very stable marker and the measurements will still be valid. That's a huge advantage compared to blood samples, which very often require immediate processing and therefore on-site access to laboratory equipment, such as centrifuges and ultra-low temperature freezers."

"Saliva testing has allowed researchers to learn a lot about the circadian rhythms of cortisol and other steroids, as well as stress markers such as salivary α-amylase," he continued. "It enables monitoring of changes in circadian rhythms and gives an indication of chronic stress exposure and its effects, for example, in clinical conditions like depression or post-traumatic stress disorder. That's a huge transformation that has come about because of the development of saliva-based cortisol assays."

The Brandeis lab performs cortisol measurements using Tecan's Cortisol Saliva Luminescence Immunoassay and an Infinite® 200 PRO multimode reader. "We've used these saliva cortisol assays for many years, long before we came to Brandeis," said Jutta. "A lot of companies offer assay kits for cortisol or other stress hormones in blood or saliva. The assays we use have the advantage of being very stable, reliable and economical. We find the luminescence assay superior to traditional ELISAs; it has fewer steps – reducing the possibility of human errors – and offers better resolution and sensitivity. Bulk kits are available too, which is very convenient."

Nicolas continued: "We installed an Infinite 200 PRO multimode reader in the lab to allow us to measure luminescence, complementing our existing ELISA reader, a Tecan Sunrise™. As we were already familiar with the company's software, it was very easy to set up and run the cortisol luminescence assay, and straightforward to transfer our existing methods for DHEA, DHEAS, testosterone, estrogen and progesterone onto the Infinite. We also run α-amylase assays, which we measure using the Sunrise absorbance reader." Jutta added: "One of the biggest advantages of the new multimode reader is its speed. Previously, it took two or three minutes to measure a plate, which was a rate limiting factor with the potential to cause sample backlogs and restrict throughput. With the Infinite, we can read a plate in under a minute."

> "One of the biggest advantages of the new multimode reader is its speed. Previously, it took two or three minutes to measure a plate... With the Infinite, we can read a plate in under a minute."

The combination of these kits and the Infinite reader provides a complete laboratory solution that delivers high quality results, which the lab backs up with support for everything from sample collection and analysis to advice on sample-specific aspects for institutional review boards and research grant proposals. Nicolas explained: "Most of our customers are psychologists and psychiatrists working in biobehavioral research, and we analyze a lot of adolescent or infant and child samples for developmental psychology studies. Often, customers ask us for advice and, as researchers ourselves, we are in a good position to help with anything, from the best way to collect samples to how to analyze and interpret the data that is generated, which is the difference between our lab and others offering similar services."

Jutta concluded: "Tecan is very accommodating and responsive; the support we receive from the company helps us to achieve the fast turnaround times that our customers need and that is really appreciated."

To find out more about Tecan's range of saliva diagnostic kits, visit www.tecan.com/saliva-diagnostics-feature

To learn more about the Health Psychology Lab at Brandeis University and its assay service, go to www.bio.brandeis.edu/healthpsych