

How stressed are you?

Psychologists at Anglia Ruskin University, UK, are using a Tecan liquid handling platform to automate ELISA-based analysis of cortisol and IgA levels in their investigations into the relationship between different types of stress and the immune response.

Researchers in the Department of Psychology at Anglia Ruskin University, UK, are exploring the relationship between stress and responses of the human body, particularly the immune system, using specific examples to look at the differences between chronic and acute stress. Dr Matt Bristow, Senior Lecturer in Biological Psychology, explained: "We are concentrating on various groups of individuals, effectively trying to model stress in a controlled environment and looking closely at the immune responses of those individuals. For example, one of the most recent projects was a collaborative study into the experiences of carers – usually husbands, wives or partners – of patients with frontal temple dementia, a type of dementia similar to Alzheimer's disease but with an earlier average age of onset of 55 years. Our initial study found that carers who reported long-term chronic stress tended to have higher levels of immunoglobulin A (IgA) rather than the lower levels we expected. These surprising findings may indicate that the immune systems of carers are reacting to the challenges of their day with large increases, or alternatively that IgA levels

are not suppressed by chronic stress as was previously thought. This on-going research reveals the potential for salivary biomarkers to help us understand the health implications of real-life stressful situations."

"At the other extreme, we followed a number of volunteers through their first tandem parachute jump, and mapped the response of the immune system to this kind of acute stress. There were progressively huge increases in cortisol in their saliva at each step, starting with the day before the event, arriving at the parachuting centre, going onto the aircraft and lastly, the actual jump from the aircraft at 10,000 feet. A large, transient increase in their immune responses, measured by levels of IgA, the most abundant antibody type in saliva, follows the rise in cortisol. This is consistent with previous literature; in response to a brief challenging event such as acute stress, the immune system reacts by releasing natural killer cells, IgA and proteins. The levels of these drop off extremely quickly, with IgA levels returning to normal within 40 minutes, but cortisol is still high hours after the jump."

"In another study, we discovered that, in a 10-day period, stressed undergraduates tend to have very volatile IgA levels, whereas their non-stressed counterparts have steady IgA levels, giving a flat profile. It is clear from this and other examples, that studying an immune profile over several days gives a much better indicator of stress levels compared to taking just a single measurement. We need to have a thorough understanding of variability in immune responses and therefore collect saliva samples several times a day for up to two weeks, creating thousands of samples that would be impossible to handle manually."

Matt continued: "We have used a Tecan platform to automate our ELISAs since 2006 and our daily throughput has increased considerably, from 70 to 100 samples manually to over 600 on the Tecan

system. We have purposefully restricted ourselves to handling only saliva samples, as they are so much easier to collect than blood, and indeed can be collected by participants themselves, with far fewer worries about storage and health and safety. There are also now so many more biomarkers of interest detectable in saliva, including antibodies, DHEA, testosterone and C-reactive protein, a marker in heart disease. The system includes a PosID™ scanner for barcode recognition and AIS LIMS software for tracking, integration with databases and data printing so, once the samples are loaded and the assays start, we can just leave it running. We are required by Human Tissue Act legalization to track all human tissue samples through the laboratory and barcoding gives us complete certainty that no sample mix-up or mislabeling has occurred. In all, the system

eliminates human errors, schedules assays dynamically and very effectively to increase throughput, and gives us much more reliable data than before, in a far shorter time. I am very pleased that we managed to get a fully automated system that has delivered considerably more than our initial expectations."

"The Tecan platform has given us extra capabilities and we are not yet running it at maximum capacity," Matt concluded. "We have already built up several academic collaborations with other research teams and units using the equipment. This consultancy service brings in more capital for the university and our department, allowing us to continue our research without worrying too much about funding, and the high capacity of the system means we still have room to deal with any studies that come our way."