

Hi - I'm Julie Dalziel, a Scientist in the Food Nutrition and Health Team at AgResearch in New Zealand. I want to tell you about our research published in the American Journal of Physiology.

Stress associated functional gastrointestinal disorders affect many people worldwide and are the subject of much research on digestion and gut motility. This is where movement of contents through the gut is not working normally yet there is no physical blockage or a clear physiological cause. Animal examples have been helpful to understand the mechanisms that underlie such conditions. The Wistar Kyoto rat is particularly sensitive to stress so studying these animals helps us to understand the link between stress susceptibility and intestinal function, so that treatments might be found in the future.

Our study investigated the relationship between transit of gut contents, the gut microbiota and blood metabolites. We compared this in the stress prone Wistar Kyoto rat with the more resilient Sprague Dawley strain.

### X-RAY TRANSIT SLIDE

One of our experimental methods is tracking the transit of contents through the rat intestine. Plain food is hard to see, so we feed small steel pellets that can be easily monitored by x-ray. By taking a sequence of images we can track movement of the pellets along the intestinal tract.

Over 12 hours we saw that transit was slower in the stress prone rats and that this was due to delayed stomach emptying (gastroparesis). When this effect was accounted for, small intestine transit was in fact faster in stress prone than the resilient animals.

Gastroparesis in humans is a complex and chronic digestive condition. There is virtually no metabolomic or microbiota information available on this in humans, so differences in an animal model might provide insights to this condition in humans.

### MICROBIOTA DATA SLIDE

The gut microbiome is the dynamic ecosystem of microbes that help to digest food and produce a wide range of signaling metabolites that can influence intestinal function. When we compared the microbiota of stress prone and resilient rats we found some distinct differences. In the stress prone animals *Ruminococcus*, *Roseburia*, and a group of unclassified *Lachnospiraceae* (sea-A) were less abundant, and *Turicibacter* and *Lactobacillus*, were more abundant. These are known to respond to high fat diets, and *Lactobacillus* are also known to express bile salt hydrolyases, which are important for fat digestion.

### METABOLOMIC DATA SLIDE

The blood chemistry revealed that in stress prone rats: most diglyceride and triglyceride lipids were lower, whereas cholesterol esters were higher, and some bile acids were consistently elevated.

Our results for the gut microbiota and blood metabolites - together - paint a picture that lipid metabolism and the response to dietary fat are likely to be altered in these stress prone animals. We know that increased levels of bile acids can result in delayed gastric emptying in rats which would be consistent with the gastroparesis phenotype we found.

So overall, our findings suggest, that the Wistar Kyoto rat may be a useful model for gastroparesis in humans and suggest that bile acid metabolism needs to be more thoroughly investigated to better understand and treat this condition.