FOR IMMEDIATE RELEASE

New Zealand-led research shows global solutions to reduce methane emissions from ruminant animals are feasible, because the microbes causing the emissions are similar around the world.

The "Global Rumen Census" project analysed the microbes responsible for methane emissions from a wide range of ruminant animals around the world. Collaborating with 140 researchers from 73 institutions, the New Zealand-led project found similar bacteria and methanogens dominate in nearly all rumens across a wide variety of species and animal diets. This means that new technologies that seek to reduce methane emissions by influencing rumen microbes should have global applications.

The results of the Global Rumen Census have been released on 9 October 2015 in the open-access journal *Scientific Reports*.

The main part of the study was funded by the New Zealand Government via the Ministry for Primary Industries as part of its support for the Global Research Alliance on Agricultural Greenhouse Gases.

The international collaborators worked alongside six main AgResearch authors, led by Gemma Henderson and Peter Janssen of AgResearch Grasslands, Palmerston North.

"It was an honour to be involved with such a successful international collaboration," says Henderson, who has a microbiology degree from the University of Dundee in Scotland and completed a PhD at the German Institute of Human Nutrition. She has been working at AgResearch for eight years on projects related to methane mitigation and the Global Rumen Census project.

"One of the most exciting things for me was the enthusiasm generated internationally with so many people being interested in what we were doing and wanting to contribute. That was very rewarding."

Samples for the census were collected over two years.

"We initially thought it would attract about 200 samples but the international interest was immediate and quite large. The sample pool grew to over 900 and we selected 742 of those samples to include in the project."

There was a real mixture of samples, including some from the Slovenian mountains and remote islands off the Chilean coast. As well as the expected samples from sheep, cattle, deer and goats, there were also some from buffalo and giraffes.

The rumen is the modified foregut of these animals. Feed is fermented by the microbes in the rumen, allowing the animal to extract energy from feed such as grasses that otherwise could not be digested. These microbes are therefore essential for ruminant productivity. Unfortunately, one of the by-products of this fermentation is the greenhouse gas, methane. This is produced by microbes called methanogens. The microbial survey involved extracting DNA from all the samples and sequencing diagnostic marker genes that allow the identification of different bacteria and methanogens.

"The rumen methanogens turned out to be highly similar species in all rumens across the world. So, only a few species appear to be responsible for all the methane produced by ruminants everywhere, which means mitigation strategies can be developed to target the few dominant methanogens," says Peter Janssen, who leads part of AgResearch's methane mitigation research. Janssen has a biological sciences degree from the University of Waikato and worked as a research microbiologist in Germany before becoming an Associate Professor at the University of Melbourne for 10 years. He has been with AgResearch for eight years.

The initial hypothesis was that rumen microbes would be similar to some extent across the world, but they wanted to see if diets or other factors made a difference.

"When you have a large dataset like that you're never really sure what is going to come out of it. There are so many different variables – where the animals are, what they ate, what species they are – all these things can have an impact and you have to attack the exercise systematically to figure out what the data mean. To do this, we engaged people with specific skills – an animal nutritionist, a statistician - and we started exploring the data."

Once the data had "revealed the story", the findings were checked back with the Global Rumen Census collaborators around the world.

"They thought what we had done was right and added their own insights to the interpretations. In the end that made a really nice story out of it. That's how science works. You have to be able to tell a story from your results or no one can understand what you've done."

Janssen says the rumen microbes ended up being more similar than they had expected. Mostly they were the same in all samples, but some microbes were more strongly associated with certain hosts and some with certain diets.

"Even more interesting from a New Zealand perspective, was the finding that the methane-producing microbes, the methanogens, are the same everywhere. That's interesting from a methane mitigation stand point because that means the technology that's developed in one place will be applicable everywhere. The same methane-producing microbes are everywhere."

The Global Rumen Census complements New Zealand's large domestic research programme focused on methane-mitigation technology, particularly vaccines or inhibitors to suppress methanogens. This domestic work is funded jointly by the Pastoral Greenhouse Gas Research Consortium, an industry-led initiative that receives 50% of its funding from the Government, and the fully government-funded New Zealand Agricultural Greenhouse Gas Research Centre.

Harry Clark, Director of the New Zealand Agricultural Greenhouse Gas Research Centre and co-chair of the Livestock Research Group of the Global Research Alliance on Agricultural Greenhouse Gases, says this study shows the real power of international research collaboration.

"This study has provided knowledge that no country could have delivered on its own, and the benefits are also global.

"The Global Rumen Census shows that new mitigation technologies that tackle the microbes responsible for methane production in ruminants can make a real difference at the global scale. Modifying the rumen is an enormous challenge, but collectively we have a chance to get there."

For more information please contact:

Peter Janssen	Ph: (06) 351 8300	peter.janssen@agresearch.co.nz
Gemma Henderson	Ph: (06) 3518099	gemma.henderson@agresearch.co.nz
Harry Clark	Ph: (0064 29) 351 8111	harry.clark@nzagrc.org.nz

Ends

Examples of species that were sampled in the Global Rumen Census. The central image shows rumen contents, with methanogen cells showing in blue. © AgResearch and Wikimedia Commons.