University of Lethbridge News Release

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Improving animal nutrition and food safety at heart of research study published in Nature Microbiology

As the world grapples with the big problem of feeding 7.6 billion people, University of Lethbridge adjunct professor Dr. Wade Abbott of Agriculture and Agri-Food Canada and his team have detailed the smallest of metabolic reactions with the goal of improving food security, food safety and animal nutrition.

Abbott and his group, which includes the Institute for Cell and Molecular Biosciences at Newcastle University, UK, Dr. Steve Mosimann of the U of L's Department of Chemistry & Biochemistry and a trio of former U of L students, have been looking at prominent bacteria (Bacteroides) that thrive in the human gut microbiome, and detailing what glycans (carbohydrates) they eat on our behalf and how these processes take place, step-by-step. Understanding this, Abbott says, creates opportunities to manipulate the microbiome and possibly enhance food digestibility.

"It's not enough to know what genes are present in the microbiome, we need to know what these genes do," he says.

His group's latest paper on this subject was recently published in the prestigious journal Nature Microbiology.

"Understanding how different glycans are put together and then how they are taken apart is really what we are trying to get at with this study. And while there have been several papers written about similar processes in recent years, usually they are dealing with one sugar, one pathway, and trying to understand how that pathway works. This paper looks at how different pathways work together to digest a very complex network of plant cell wall sugars called pectin."

Nature is the world's most cited interdisciplinary science journal. Abbott was part of a group of researchers who made headlines in 2015 by discovering a strain of bacteria in the human gut that had evolved to the point where it could break down complex carbohydrates found in yeast. One of his students at the time, Richard McLean (BSc '14, MSc '17), also contributed to this latest paper that appears in the sister journal Nature Microbiology, along with Benjamin Farnell (MSc '14) and Kaitlyn Shearer (BSc).

“We’re looking at how we can help animals digest feedstocks better, how we can improve their performance by using agricultural residues for growth promotion, and how we can improve food safety,” says Abbott. “It’s looking at ways to try to release more nutrition from complex glycans now that we know what bacteria and enzymes are required to do that.”

Farnell took the lead in mapping out one of the four complex pathways detailed in the paper, following enzymes as they catalyze reactions along the way and how they work together.

“When he started, we believed this pathway was involved but didn’t know what any of the proteins did,” says Abbott. “He systematically went through and looked at each protein independently and then put them all together, recreating the pathway. It was quite a nice piece of research and thesis that he contributed.”

Abbott says that with a renewed interest in environmental sustainability, a great challenge is trying to improve food productivity through natural processes. Harnessing the work done by bacteria in the gut in a manner that will improve animal nutrition is one way to approach the problem.

“Finding sustainable alternatives that really optimize how the microbiome works would be a great advance,” he says.

By mapping the pathways and better understanding the role of proteins and how they interact with one another in the microbiome, researchers are that much closer to enhancing food security and safety for an ever-growing population.

To view online: http://www.uleth.ca/unews/article/improving-animal-nutrition-and-food-safety-heart-research-study-published-nature

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Contact:

Trevor Kenney, News & Information Manager
403-329-2710
403-360-7639 (cell)
trevor.kenney@uleth.ca

Dr. Wade Abbott, Agriculture and Agri-Food Canada
403-317-3443
wade.abbott@agr.gc.ca