Newly discovered bacteria can break down biomass

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Newly discovered bacteria in stomachs of ruminants could hold a key to creating more efficient and environmentally friendly biofuels and waste management processes. Credit: Environmental Molecular Sciences Laboratory

Despite decades of research, how ruminants deconstruct plant biomass in their stomachs is still something of a mystery. Now, an international team of scientists has identified a previously unknown family of bacteria and complex enzymes that break down plant biomass and appear to be critical for ruminants to be herbivorous.

Studying the digestive systems of ruminants like cows, sheep, and even reindeer may help scientists uncover more efficient and environmentally friendly ways to process waste and generate energy, as well as improve

our understanding of ruminant nutrition. The previously unknown family of bacteria discovered in this study appears to actively degrade plant biomass in the stomachs of ruminants using complex enzymes that are different from those that are already well known to scientists. Understanding these bacteria could help scientists design animal feeding strategies and commercial systems for biofuels and waste management.

Using detailed information about the molecular biology of switchgrass and corn stover—both widely used to create biofuels—the scientists identified a previously unknown family of bacteria found in both cows and sheep. Team members included researchers from the Norwegian University of Life Sciences; the Ohio State University; EMSL, the Environmental Molecular Sciences Laboratory, a DOE Office of Science user facility; Germany's Helmholtz Centre for Infection Research; the University of Illinois, Urbana-Champaign; University of Michigan Medical School; and University of California, Davis.

The team described a family representative found in the rumen of two cows. Data gathered using EMSL's Orbitrap mass spectrometer helped scientists realize the population of bacteria was metabolically active in the rumen. In both the feedstock and the cows, the bacteria secreted multi-modular enzymes believed to be very powerful in biomass conversion. The metabolism and abundance of these bacteria indicate they may play an important role in allowing ruminants, and commercial processes, to deconstruct biomass.

More information: A. E. Naas et al. "Candidatus Paraporphyromonas polyenzymogenes" encodes multi-modular cellulases linked to the type IX secretion system, *Microbiome* (2018). DOI: 10.1186/s40168-018-0421-8

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