Extended Abstract

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Microbial metabolism of yeast mannans, a symbiosis that spans from humans to domesticated livestock

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Yeasts, which have been a component of the human diet for at least 7,000 years, possess an elaborate cell wall α-mannan. The influence of yeast mannan (i.e. α-mannan) and other cell wall carbohydrates on the ecology of the human distal gut microbiota remains unclear. Here we show that α-mannan is a viable food source for the Gram-negative bacterium Bacteroides thetaiotaomicron, a dominant member of intestinal microbiome. Detailed biochemical analysis and targeted gene disruption studies support a model whereby limited cleavage of α-mannan on the surface generates large oligosaccharides that are subsequently depolymerized to mannose by the action of periplasmic enzymes. Co-culturing studies showed that metabolism of α-mannan by B. thetaiotaomicron presents a 'selfish' model for the catabolism of this difficult to breakdown polysaccharide (see Figure). Genomic comparison with B. thetaiotaomicron in conjunction with cell culture studies show that a cohort of highly successful members of the microbiota has evolved to consume sterically-restricted yeast glycans, an adaptation that may reflect the incorporation of eukaryotic microorganisms into the human diet. Harnessing knowledge of dietary carbohydrate interactions provides a promising road forward for intestinal health and livestock production.

Biography:

Wade Abbott has been investigating the structure-function relationship of CAZymes for over 10 years. In first PDF with Alisdair Boraston (UVIC, 2005-2008), he focused on protein-carbohydrate interactions involved in host-pathogen relationships. In his second PDF with Harry Gilbert (UGA-CCRC, 2008-2010), he studied carbohydrate utilization pathways in Bacteroides. In 2011, he joined Agriculture and Agri-food Canada as a Research Scientist. His program currently focuses on enzyme discovery and engineering for carbohydrate-based applications in animal health and performance.

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