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How sweet are our gut beneficial microbes?

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Glycosylation is the most common post translational modification of proteins in nature and is essential to various biological and physical processes. Protein glycosylation in prokaryotes and especially pathogens has attracted much attention in recent years due to its role in adhesion, colonisation or virulence. In contrast, and despite the increasing interest in gut microbiota, not much is known on protein glycosylation in commensal bacteria. Adhesion of gut commensals to the host tissue is the first step to successful colonisation and is mediated by bacterial surface proteins called adhesins. Recent studies established *Lactobacillus reuteri* as a model organism to study the evolution and host specialisation of gut symbionts. *L. reuteri* colonises the gut of various vertebrates and expresses cell-surface adhesins mediating the interaction of the strains to their specific host. Using a combination of lectin affinity studies, gas chromatography and mass spectrometry (MALDI-ToF, ESI-MS), we have obtained evidence that the main *L. reuteri* adhesins are glycosylated. These include mucus-binding proteins from human and pig strains, serine-rich-repeat proteins (SRRs) from pig and rodent isolates and muramidase from human strains. Our preliminary data suggest that *L. reuteri* glycosylates proteins using short, neutral glycan chains. We are also investigating by mutagenesis the molecular pathways leading to SRR glycosylation via the acceessory secretion system (SecA2/Y2) gene cluster. Taken together our data suggest that the *L. reuteri* SecA2/Y2 cluster is dedicated to the glycosylation of SRRs, and there is at least one additional glycosylation system responsible for the glycosylation of other adhesins.

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Globotriaosylceramide: From Shiga toxin toxicity to therapeutic agent to B cell development

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Globotriaosylceramide (Gb3) has been well-characterized in the etiology of hemolytic uremic syndrome due to its interaction with Shiga toxin (STX) as the most common toxin receptor on human cells. This research has had led to the development of therapeutic applications extending beyond the area of bacterial pathogenesis and has implications, as well, for research into basic cellular glycolsphingolipid functions. Translational research includes use of STX for treatment of several types of Gb3-positive cancers. Additionally, artificial Gb3-related glycol-conjugates have potential therapeutic uses in preventing HIV infection. This STX-based research has also led to advances in our understanding of the role of Gb3 in adaptive immunity. Germinal center stage B cells are often defined, in part, by their expression of Gb3 (aka CD77). Burkitt's lymphoma cells are often used as *in vitro* models for studies of germinal center B cell functions. Using these cells as models, roles for Gb3 have been identified in interferon type I signal transduction and CD19-mediated adhesion mechanisms and a potential Gb3-binding site on the extracellular region of CD19 has been identified. Additional roles for Gb3 in MHC class II-mediated antigen presentation and in apoptosis-related signal transduction pathways are further implicated by research in this area. Evidence regarding the importance of Gb3 in B cell development has progressed far beyond the use of Gb3 as a simple marker for germinal center stages.

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