INTRODUCTION TO SPECIAL ISSUE

Sugars, bugs and us

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Glycan-mediated host–microbe interactions are critical to colonization by and maintenance of our helpful commensal microbiota, as well as to recognition and control of pathogenic microbes that can do us harm. This is a rapidly expanding field of research, so we are delighted that our first collection of themed reviews in Glycobiology is on this topic.

The first article, by Bergstrom and Xia, describes the features of intestinal mucins, including the structures and synthesis of the O-glycans that are essential for the function of mucins as a physical barrier between microbes and intestinal epithelium. This review also discusses the disease states, such as inflammatory bowel disease, that occur when the mucin barrier is disrupted by loss of expression of specific glycosyltransferases that create the O-glycans on mucins.

However, the intestinal mucin barrier is not simply a Maginot line against invading pathogens. The mucin layer is important for colonization by and maintenance of the commensal microbiota that help us digest food, provide nutrients and regulate immune homeostasis. As described in the second article by Sonnenburg and colleagues, intestinal mucus is more than a carbon source for beneficial microbes. The presence of mucins with specific types of glycans decorations helps guide microbes to the appropriate habitat within the gut. This article describes roles for specific glycosyltransferases in establishing the composition of the intestinal microbial communities. As the authors say, “while it may seem that these nuances are only of interest to a few expert glycobiologists around the world, countless microbes that inhabit each person’s bowel share this appreciation”.

The third article, by Ma and Underhill, addresses a novel function of the C-type lectin Dectin-1 in defense against fungal pathogens. It is well described that recognition of β-glucans on yeast by Dectin-1 on innate immune cells such as dendritic cells and macrophages triggers inflammation, with production of cytokines and reactive oxygen species and subsequent extracellular fungal killing. The current review highlights the role of Dectin-1 in phagocytosis and autophagy of yeast that have been ingested by the host cell.

Additional recent reviews in Glycobiology touch on related aspects of this topic. These include reviews of human milk oligosaccharides, important for colonization of the newborn gut by microbiota (Bode 2012), and the roles of glycans in infection, inflammation and microbial evasion of the immune response (Kreisman and Cobb 2012), and a comprehensive review of the enzymes that initiate mucin type O-glycosylation (Bennett et al. 2012). We plan to make collections of themed reviews in Glycobiology a regular feature, and this first group is an exciting start.

Conflict of interest
None declared.

References

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