Fall 2020 Joint Colloquium
Materials Department & Materials Research Laboratory

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Friday, November 6th, 2020
11:00 am via Zoom

Finding a Niche: Microbial Colonization of Host Mucosal Barriers

Mucus is a biological gel that lines all wet epithelia in the body, including the mouth, lungs, and digestive tracts, and has evolved to protect us from pathogenic invasion. Microbial pathogenesis in these mucosal systems, however, is often studied in mucus- free environments, which lack the geometric constraints and microbial interactions that are found in natural, three- dimensional mucus gels. To bridge this gap, my laboratory has developed model test systems based on purified mucin polymers, the major gel-forming constituents of the mucus barrier, and their glycans. We use this model to understand how the mucus barrier influences microbial virulence, and moreover, to elucidate strategies used by microbes to overcome the normal protective mucus barrier. I will discuss data showing that the mucin polymers, and specifically their associated glycans, have a significant impact on the physiological behavior of microbes, including surface attachment, quorum sensing, the expression of virulence genes, and biofilm formation. The picture is emerging that mucins are key host players in the regulation of microbial virulence and can guide the fabrication of advanced polymers to regulate host-microbe interactions.

Bio

Prof. Ribbeck obtained her Bachelor's degree and her PhD in Biology from the University of Heidelberg, Germany. She continued her postdoctoral research at the European Molecular Biology Laboratory, Heidelberg, Germany, and the Department of Systems Biology, Harvard Medical School. Katharina Ribbeck established her independent research group as a Bauer Fellow at the FAS Center for Systems Biology, Harvard University in 2007, and joined the Department of Biological Engineering at MIT as an Assistant Professor in 2010.

Her research is focused on mucus, the gel that lines all wet epithelia in the body, and other gels that occur in Nature. Biological gels such as mucus represent a whole class of molecular assemblies that are understudied, with many fascinating and important structure-function problems to investigate and medical/engineering applications to invent. Her focus is on basic mechanisms by which mucus barriers exclude, or allow passage of different molecules and pathogens, and the mechanisms pathogens have evolved to penetrate mucus barriers. One exciting mission of her lab is to implement the lessons learned from nature and create synthetic mucus gels that mimic the basic selective properties of the biological material.

https://biogels.mit.edu/

Hosted by Angela Pitenis.