The Faculty of Biotechnology and Food Engineering

Seminar

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Mechanisms of pathogen expansion in the gut

Abstract

The gut microbiota can effectively inhibit colonization and overgrowth by invading microbes, a phenomenon called 'colonization resistance'. Enteric pathogens use their virulence factors to attach to or enter host cells, modulate the host's immune responses, and dramatically change the intestinal environment. We reason that the goal of the pathogen is not merely to elicit symptoms of disease, but to overcome colonization resistance, expand and transmit to the next host. By studying how virulence factors promote pathogen expansion in the gut, we wish to understand the molecular mechanisms underlying colonization resistance.

We showed that endogenous Enterobacteriaceae, such as commensal E. coli, compete with Salmonella for oxygen that supports growth by aerobic respiration. In addition, the Clostridia-derived metabolite butyrate promotes colonization resistance by preserving epithelial hypoxia thereby limiting the pathogen's access to epithelial-derived oxygen. We demonstrated that neither Enterobacteriaceae nor Clostridia alone are sufficient to confer colonization resistance, but germ-free mice associated with a mixture of both taxa acquire colonization resistance. Furthermore, we showed that another virulence factor, the Shiga toxin, enhanced pathogen colonization by providing access to iron, a limiting micronutrient in the inflamed intestinal environment.

Determining how virulence factors allow pathogens to overcome colonization resistance promotes our understanding of what constitutes a healthy microbiome and illuminate how a specific taxa composition supports the benefit that the microbiota provides.

Wednesday, 8/1/2020, 14:00 – 15:00, Room 300

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