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Identifying Turicibacter-Lipid Metabolite Interactions to Characterize Their Effect on the Gut

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Dietary nutrients such as carbohydrates and lipids play a major role in shaping the intestinal microbiome. In turn, the structure and interactions between microbes and dietary elements determine the stability and health of the host. While many correlation studies suggest direct connections between diet, microbiota, and host health, there is limited research on the physiological mechanism of their interactions and how that affects their function. Using a lipid-modulating small intestine-residing gut bacterium named *Turicibacter sanguinis*, we will characterize these interactions. Despite a relatively small abundance compared to other gut bacteria, studies in human and non-human animal models have demonstrated its pivotal role in metabolic pathways such as systemic lipid metabolism and serotonin regulation. Additionally, abundance of *T. sanguinis* negatively correlates with dietary fat and other nutrients, suggesting a role in mediating relationships between diet and the host. Using a photoactivable alkyne lipid probe, click chemistry, and mass spectrometry, we will visualize, label, and identify lipid-interactive proteins from *Turicibacter* cells. Additionally, to better understand localization of these proteins in vivo, we will use similar approaches along with fluorescence microscopy to label *Turicibacter*-derived lipid metabolites in tissue culture, intestinal organoid, and animal models. These studies will provide insight into how *T. sanguinis* may influence lipid availability and signaling in the host. Future work will reveal more details about how *Turicibacter* changes to dietary lipids affect specific host cells. By directly labeling and assaying these pathways, we will better understand how small intestinal bacteria mediate relationships between dietary lipid and host health.