Genomic Insights Into Host-Associated Microbial Communities in Health and Disease

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Abstract
The communities of microbes that colonise the human body (“the human microbiota”) are important contributors to host health and disease. Altering the composition and/or activities of the microbiota is therefore an attractive therapeutic aim. Potential therapeutic approaches include antimicrobial treatment, changes in host diet or inoculation with beneficial microbial strains. Unfortunately, microbiota research is hampered by the fact that host-associated microbes can be difficult to culture in the laboratory. Genomic methods allow insights into uncultured microbes but supporting fundamental microbiological research is often lacking, meaning there is a limit to what can be learned from sequence data. Synergising genomic analyses with rigorous anaerobic culture experiments therefore offers the best approach to characterise the role that the microbiota plays in health and disease. Host diet is a potentially important microbiota-modulating factor. I will therefore discuss our recent research that aims to better characterise the response of the microbiota to dietary manipulation and that has identified key bacterial groups that appear to be involved in insoluble substrate degradation. Recent years have also seen novel insights into the previously underappreciated role the microbiota can play in preventing and suppressing disease caused by gastrointestinal pathogens. I will therefore describe ways to restore gut bacterial diversity in order to clear pathogens such as Salmonella spp. and Clostridium difficile and bring about tangible therapeutic benefits.

List of key references