Special issue: The Human Intestinal Microbiota

Harry J. Flint,1 Paul W. O’Toole2 and Alan W. Walker3

1Microbial Ecology Group, Rowett Institute of Nutrition and Health, University of Aberdeen, Bucksburn, Aberdeen AB21 9SB, UK
2Department of Microbiology and the Alimentary Pharmabiotic Centre, University College Cork, Ireland
3Pathogen Genomics Group, Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Hinxton, Cambridgeshire CB10 1SA, UK

The human intestine is home to very large numbers of micro-organisms, with bacterial cells exceeding $10^{11}$ ml$^{-1}$ in the colon. This impact that this complex community has upon the host is increasingly recognized not only as a potential source of infection but also as a contributor to nutrient and energy supply, gut development and immune homeostasis. Recent evidence has indicated links between gut microbial activities and the aetiology of disorders such as inflammatory bowel disease and colorectal cancer, and also conditions such as heart disease, diabetes and metabolic syndrome. All this makes a special issue devoted to the human intestinal microbiota timely. This topic necessarily depends heavily on microbial ecology, a discipline that has not always been natural territory for the journal, notwithstanding some important contributions to human intestinal microbiology (e.g. Macfarlane et al., 1986). Molecular methodologies have done much to accelerate recent progress by allowing the rapid analysis of this complex community, culminating in the application of in-depth metagenomics (Qin et al., 2010). Nevertheless, the commonly perceived wisdom that most human intestinal bacteria are inherently unculturable may not be entirely accurate, since many of the most common intestinal bacteria found by molecular methods in faecal samples correspond to cultured species of obligate anaerobes (Walker et al., 2010). The future, in which the journal can play an important role, will surely require a combination of genomics, microbial ecology and studies of single cultured organisms.

Four reviews in this special issue deal with the role of the human gut microbiota in irritable bowel syndrome (Salonen et al., 2010), the metabolism of dietary phytochemicals (Kemperman et al., 2010), interactions of probiotic bacteria with the gut mucosa (Sánchez et al., 2010) and the impact of long-term antibiotic use on the gut microbial community (Jernberg et al., 2010). The impact of a new antibiotic upon the intestinal community of Clostridium difficile-infected patients is reported by Tannock et al. (2010). The diversity of the intestinal community is explored by Roger & McCartney (2010) and by Roger et al. (2010) in infants, by Rajilić-Stojanović et al. (2010) in an in vitro intestinal model system and by Contreras et al. (2010) in the oral cavity of Amerindians. Interactions of intestinal bacteria with the mammalian immune system are considered by Knoch et al. (2010) for the microbial community of the caeca of interleukin-10 gene-deficient mice, and by Donato et al. (2010) for a probiotic strain of Lactobacillus rhamnosus. Probiotic and prebiotic approaches are of course aimed at manipulating the intestinal microbial community and host responses to achieve health benefits. Penders et al. (2010) explore the possible relationship between lactobacilli and allergy, while O’Flaherty & Klaenhammer (2010) report on a Lactobacillus acidophilus surface protein, and MacKenzie et al. (2010) on mucin-binding proteins of Lactobacillus reuteri. Bifidobacteria are most commonly chosen as targets for prebiotics, and understanding of this group is advanced by a comparative genomic study by Bottacini et al. (2010). An informative study using an in vitro fermenter model (Zihler et al., 2010), however, illustrates the difficulty of predicting the impact of prebiotics and probiotics on complex microbial communities. Finally, one paper focuses on an obligate anaerobe, examining the capsular polysaccharides of Bacteroides fragilis (Patrick et al., 2010).

We would like to thank all the authors who responded to the call for manuscripts to be considered for this special issue, and to all the reviewers and editors involved in processing these papers. This has resulted in a valuable and varied set of contributions that provide a snapshot of the rapid progress taking place in this topical field. We firmly believe that Microbiology can make an increasingly valuable contribution to this field in the future by publishing quality papers on the ecology, physiology and genetics of micro-organisms that inhabit the human intestinal tract.

REFERENCES

Comparative genomics of the genus *Bifidobacterium*. *Microbiology* 156, 3243–3254.


