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Now is an exciting time to study the microbes that are associated with the body — the human microbiota. Although the beneficial effects of some of these microbes have been documented for more than a century, only with recent technological advances can the composition of the diverse microbial communities be described and compared within and between individuals. Two major funding initiatives — the US Human Microbiome Project and the European Metagenomics of the Human Intestinal Tract — are well under way, and with the contributions of individual pioneer research groups, we are beginning to understand what constitutes a healthy microbiota and how changes in its structure correlate with and affect health and disease. The more we learn about these microbes, the more we realize that they are influencing many aspects of our physiology.

This Insight focuses on the gut — the body site that is most densely populated with microbes. The greatest challenge in microbiota research is the number and diversity of species in the intestine. Rob Knight and colleagues provide a view on intestinal microbiota using principles derived from macroecology, and discuss how these principles can help to unravel the factors that shape microbial communities and may offer ways to target the microbiota for clinical intervention. Casey Weaver and colleagues review the interplay between the microbiota and the immune system by discussing the mechanisms that maintain a healthy balance, as well as the pathological consequences following perturbation. One of the main functions of gut microbes is to aid nutrient acquisition from otherwise indigestible fibres. Valentina Tremaroli and Fredrik Bäckhed explore the interactions between microbes and metabolic processes, and describe how these exchanges can lead to either a healthy equilibrium or metabolic disease. Much of the research would not have been possible without advances in sequencing technology and analysis of the microbial community genome — the microbiome. George Weinstock reviews the genomic tools that researchers can use to analyse the microbiota.

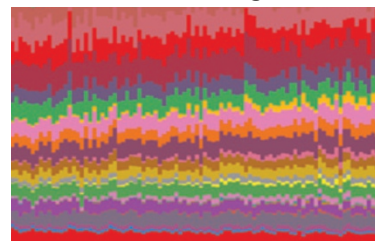
We hope that these Reviews capture some of the most exciting insights into microbiota research. We are pleased to acknowledge the financial support of Yakult Honsha in producing this Insight. As always, *Nature* carries sole responsibility for all editorial content.

Claudia Lupp, Magdalena Skipper & Ursula Weiss
Senior Editors

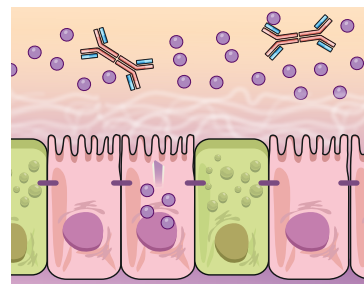
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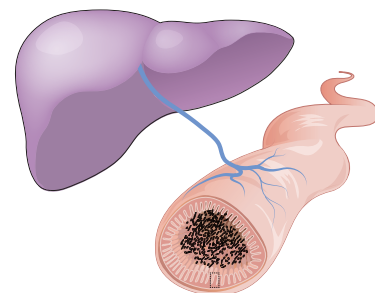
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