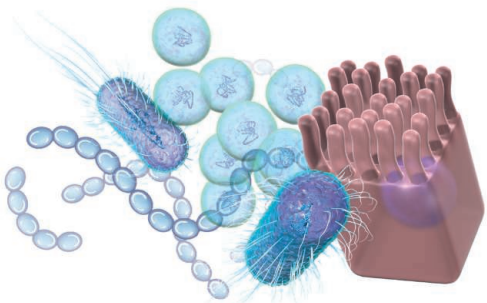

INTRODUCTION

The Gut Microbiota

WE ARE ON THE THRESHOLD OF MAKING PROFOUND DISCOVERIES ABOUT THE microorganisms with which we share our bodies, indeed whose cell count vastly outnumbers our own. In *Science*'s 2005 special section *Gut: The Inner Tube of Life*, we saw hints of the important relationships we have with the microbial inhabitants of our guts. Since then, next-generation DNA sequencing and functional studies have begun to reveal how crucial these inhabitants are for our evolution, development, metabolism, immune defense, and susceptibility to a multiplicity of infectious and noncommunicable diseases.

Science and *Science Translational Medicine* have joined forces to resume the exploration of our inner tube and its microbiota. As Gordon points out (p. 1251), investigations into gut microbiota draw from many fields: ecology, genomics, metabolomics, immunology, and public health. A gathering of diverse minds and ideas will drive the development of new therapies for treating intractable infections, scourges of the developing world such as malnutrition (*Sci. Transl. Med.* **4**, 137ps12), and lifelong inflammatory diseases, such as Crohn's disease and colitis, as well as offering options for relieving the burden of metabolic diseases, including obesity and type II diabetes.

A new appreciation of the diversity and interactions among our microbiota has prompted Costello *et al.* (p. 1255) to turn to ecological theory to gain an understanding of the dynamics at work in gut communities. Functional studies have shown us that disruptions to the community caused by diet and medication can be detrimental to health. In a companion Review, Lemon *et al*. (*Sci. Transl. Med.* **4**, 137rv5) use ecology to gain insights into the disruptions caused by antibiotic therapy and remediation using probiotics. Nicholson *et al.* (p. 1262) explain how the gut microbiota is a major contributor to host metabolism through nutrient release, and how microbial metabolites boost fitness. Haiser and Turnbaugh (p. 1253) take up the theme of microbial metabolic activities and discuss their influence on drug metabolism. A related Review by Holmes *et al.* (*Sci. Transl. Med*. **4**, 137rv6) discusses the interplay between host and microbial metabolisms, which is providing new therapeutic opportunities for treating human disease.

From birth, the microbiota intimately shapes the development and function of the human immune system. Hooper *et al.* (p. 1268) review the mechanisms by which the immune system regulates the microbiota and vice versa to maintain intestinal homeostasis. And Blumberg and Powrie (*Sci. Transl. Med*. **4**, 137rv7) discuss how disruptions to this homeostasis can lead to severe diseases such as cancer and Crohn's disease. Some of these insights have come from dedicated programs in microbiome research, as discussed in a news article by Balter (p. 1246). A profile by Hvistendahl (p. 1248) highlights the efforts of Zhao Liping to fight the developing obesity epidemic in China with prebiotics.

These joint special sections in *Science* and *Science Translational Medicine* still provide only a distant view of our inner world. The next decade will see a revolution in understanding our microbial symbionts and how they can be manipulated for therapeutic benefits that will bring true inner world peace.

– KRISTEN MUELLER, CAROLINE ASH, ELIZABETH PENNISI, ORLA SMITH

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