In John Donne’s famous words, no man is an island. Rather, all organisms, including humans, exist within a sea of microorganisms. A select few microbes cause great harm, but most are benign, some essential. In fact, many aspects of normal plant and animal development require benign microbial colonization and the establishment of specific relationships that have probably co-evolved since the origins of life.

Perhaps not surprisingly, the human genes masterminding the selection of symbiotic microbes are largely those involved in immune regulation and barrier defense. In turn, the microbes that colonize mucosal tissues after birth play a pivotal role in shaping the development of the host immune system. Consequently, the effectiveness of early microbial colonization may have long-term effects on susceptibility to inflammatory diseases, such as allergy and autoimmunity.

Maintaining a healthy microbiota is no easy task. Diet, severe disease, and medications can all wreak havoc on the microbiota. Our current understanding of how this happens and what the long-term consequences might be is very limited. Nevertheless, the list of commensal bacterial species with remarkable protective effects continues to grow, and the exploitation of the microbiota is increasingly big business. However, the probiotic industry currently faces huge challenges. These range from exaggerated health claims to the difficulties of developing rigorous testing protocols within existing regulatory frameworks. All the same, probiotic development shows great promise for rebuilding microbiotas and restoring health, certainly for some individuals.

Capsules being prepared for fecal transplantation therapy, which is used, often successfully, to treat intractable gut disorders such as Clostridium difficile infection.