

# Preface

Symbioses between microorganisms and animals and plants have been studied for more than 100 years. Until recently, these studies have concentrated on a primary symbiont and its host, e.g., *Rhizobia* species and their respective legumes, *Buchnera* and aphids, and *Vibrio fischeri* and squid. With the advent of molecular (culture-independent) techniques in microbiology during the last 15 years, it is now clear that all animals and plants contain hundreds or thousands of different microbial symbionts. In many cases the number of symbiotic microorganisms and their combined genetic information far exceed that of their hosts. For example, it has been estimated that the diverse bacterial symbionts in the human gut contain 200 fold more unique genes than the human host.

The diverse types of symbioses between microorganisms and eukaryotes have received growing attention in the last few years with regard to many different features of their complex interactions, such as the diversity and abundance of the symbionts, the type of advantage (or harm) the partners experience, how the interaction is initiated and maintained, and in recent years the role of the microorganisms in the evolution of the holobiont (host plus symbionts). These points taken together suggest that the genetic wealth of diverse microbial symbionts can play an important role both in adaptation and in evolution of higher organisms.

It is now clear that it is impossible to understand the health of plants, animals, and man without taking into consideration their microbiota. For example, it has recently been shown that the diverse symbionts in the human gut play a major role in obesity, priming the immune system, resistance to pathogenic bacteria, angiogenesis, fiber breakdown, and vitamin synthesis. There are also recent data on the importance of diverse symbionts in plant productivity, salt tolerance and mineral uptake, and the health of animals as diverse as sponges, corals, insects, and mammals. There is clearly a potential to combat diseases in animals, plants, and man by manipulating symbionts, i.e., by using probiotics (introduction of beneficial microorganisms) and prebiotics (alteration of the diet, or other environmental conditions, to encourage beneficial microorganisms). The success of these therapeutic approaches will depend upon a fundamental understanding of host–microbiota interactions – the major theme of this book.

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