



## Editorial

## How Does the Microbiota Affect Human Health?

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Given the progress that has occurred in molecular biology, metagenomics, metabolomics, and proteomics in recent decades, microecology has made great strides forward. Increasing evidence indicates that the human microbiota plays an important role in health and disease. Today's spectrum of diseases has greatly changed over time with the progress of human civilization and medical technology. In addition, the aging population is increasing worldwide. Aging people have a relatively low immune function,

which is often accompanied by one or more underlying diseases, such as hypertension, diabetes, chronic kidney disease, and so forth. With the wide use of antibiotics, immunosuppressants, radiochemotherapy, organ transplants, and interventional therapy, the lives of critically ill patients can be prolonged. However, drug-resistant strains, and particularly multi-drug resistant strains, are prevalent throughout the world. Although these strains may be normal flora for healthy people, they can lead to severe or even fatal infections in the aging population. The research and development of new antibiotics are far from being able to meet the needs of clinical practice, and antibiotics alone cannot solve this problem. Therefore, the prevention and treatment of such diseases have become a major issue in this century. To deal with this situation, microecology research is greatly needed and will help us to know more about our own bodies—which is the first step in addressing human diseases.

The field of microecology first began at the end of the 19th century. Since the 1970s, developments in gnotobiology, anaerobic culture techniques, electron microscopy techniques, and cellular molecular biology have greatly promoted the development of microecology. Within the past 10 years, human microecology research has gained extensive attention in China and around the world. Studies have shown that the microecological system is like a human organ with physiological functions, and that microecological flora play an important role in the body's immune system, metabolism, and nutrition, and especially in the prevention and occurrence of infections. More and more researchers believe that ignoring our microbial system is equivalent to ignoring an important contributor to

human health and biology.

Findings from Chinese scientists in this field have received commendations from scientists worldwide. As a Chinese scientist, I have been selected as the chairman of the 5th International Human Microbiome Consortium (IHMC) Congress. Based on progress in microecology research, we have learned more about the role of the microbiota in both human health and disease. Furthermore, we have developed the infectious microecology theory and have thereby enriched the clinical application of the theory of infectious diseases.

With the support of the President of the Chinese Academy of Engineering, and together with famous academicians and scientists from Canada, China, England, France, Luxembourg, the US, and other countries, we provide an update on the theories of microecology, along with current knowledge and techniques in the field. Here, I review recent progress in microecology and in our understanding of the role of the microecological system in human health and disease. I believe that microecology research is indeed necessary, and that therapy targeting the microecological system is an effective weapon in the prevention and treatment of bacterial infection. Professor Paul Wilmes and coworkers give a new perspective on engineering solutions for representative models of the gastrointestinal human-microbe interface; and Professors Rob Knight, Jian Xu, and coworkers present a new perspective on emerging trends in microbiome analysis. Professor Yulan Wang and coworkers cover comprehensive aspects of gut microbes and their relationship with various diseases. Professor Jun Yu and coworkers provide novel views that contribute to a better understanding of the association between the gut microbiota and colorectal cancer (CRC) progression. Taking a new perspective, Professors Dominique Angèle Vuitton and Jean-Charles Dalphin provide an introduction to the association between lifestyle changes and the emergence of allergic diseases. Professor Hongyang Wang and coworkers provide a unique picture of the involvement of the gut microbiota in the progress of tumorigenesis in the liver. Finally, Professor Liang Liu and coworkers describe the results of a meta-analysis of rheumatoid arthritis (RA) studies that examined the effects of a variety of probiotics on various clinical outcomes in RA patients. We thank all these authors for their support, and we hope that this special column will provide our readers with updated information. Further studies are needed in order to better understand the interactions between our microecological system and human health.