

## Preface

People have always been impressed with biology. However, biology has a very attractive offspring, microbiology, which grew into full maturity only in the last century, becoming able to conduct research, educate and practice microbiology knowledge in the field of food, health, environment and biotechnology.

Microbiology became part of human research very late, because for a long time we were not able to see microbes in their natural environment. We started to observe microbes 400 years ago, but that was more curiosity than real research. Thus, microbiology as a profession and also as a study and research field was recognised comprehensively only in the last century. With this special issue we intend to recall roughly 150 years of intensive research and discoveries made in microbiology. It is noteworthy to mention that the importance of culture collections, not only for biodiversity studies, but also for economy and sustainability issues, has been recognized only in the last decades, although they have been in the existence already for 100 years. Moreover, education needs to be mentioned in this context, as a tool for active implementation of microbiology knowledge and skills into society. There are a few universities in the world that offered microbiology courses very early in the last century, mainly connected to medical and health topics. Slowly courses on industrial, particularly food and environmental, as well as soil microbiology topics were introduced. This opened a new dimension to microbiology and the most brave and visionary universities coined microbiology as a separate study programme. Later on, many of them were among the first who offered lectures in technical microbiology, transforming it to industrial microbiology, from which biotechnology was generated. Medical and sanitary microbiology remained close to medicine and veterinary studies. Interestingly enough, food microbiology was somehow in between all the time. This was good, but it also had some very negative consequences. Food safety, as a new discipline, was at first studied from the point of view of more traditional branches, such as medicine and veterinary medicine, without considering microbiological threats. However, with the occurrence of devastating outbreaks of e.g. bovine spongiform encephalopathy (BSE), severe acute respiratory syndrome (SARS) or *Escherichia coli* towards the end of last century, the importance of food safety as an individual discipline has come to light.

We faced many challenges in the last century, which had a major impact on the inception of microbiology education. The schools of microbiology were established with different backgrounds. They started as part of traditional applied studies such as agronomy, medicine, veterinary medicine, but also of biology, chemistry and, interestingly enough, of food studies, pharmaceutical and/or sanitary studies. In Slovenia, the success of forty years of postgraduate studies and twenty years of undergraduate education is clearly reflected in highly educated and well trained microbiologists who grew from the country's universities. The basic platform was established at the triangle Biotechnical Faculty, Medical Faculty and Veterinary Faculty; but only the first two remain very active in programme realisation. Migration of microbiology students to international environment is one of key characteristics of this study. It is the most frequent during doctoral and postdoctoral work, and as a consequence it has improved our visibility internationally and the highly profiled microbiologists from Ljubljana School are well respected. It is important to mark our anniversary within pedagogical frame, but it is also relevant to demonstrate research achievements in this respect. More detailed description of the historical development of microbiology studies in Slovenia is given in ten reviews by Slovenian research groups published in 2013 in: *Microbiology for Knowledge and Advancements: 20 Years of University Studies in Microbiology, Ljubljana*.

More importantly, this special issue aims to deliver recent research. It portrays well the current state of research among Slovenian groups. This is why it is entitled: *Food, Health, Environment and Biotechnology*. The issue delivers 14 papers, including seven minireviews, one review, four original scientific papers and one of each preliminary communication and a scientific note. The manuscripts cover the topics of microbial ecophysiology, social interactions, biofilm formation and prokaryotic genomic diversity. Within the field of environmental microbiology, contributions on microbial community in peat soils and in the marine environments are presented. They cover halotolerant and halophilic microbes in their natural environments but also microbial communities connected to the contamination of seafood chain. Furthermore,

this special issue includes reports on microbes of animal origin, like rumen bacteria, or of human origin, like cultivable bacteria from breast-feeding mothers' milk, or more immunologically oriented studies on human digestive tract contaminants. In the area of food and industrial microbiology, interesting research was conducted on probiotic properties of lactic acid bacteria in cheese, and on interactions between industrial yeasts and contaminants in grape and wine. In the area of food and sanitary microbiology, antimicrobial and resistance modulatory activities of plant essential oils as natural antimicrobial food additives are presented as well as characterization of classical contaminants in different foods. This extensive research in Slovenia in the last decade is reasonably well funded by national and international project grants. Large majority of research groups in the field of microbiology is presented in this special issue, but unfortunately, not all research areas are covered in depth, due to technical constraints. The long-lasting cooperation of Slovenian Microbiological Society with the University of Ljubljana and Faculty of Food Technology and Biotechnology, University of Zagreb, made this special issue of *Food Technology and Biotechnology* possible, which is very much appreciated by the Slovenian microbiologists.

Microbiology is strongly characterised by diversity. It is expected that microbiology will be delivering novelties to humans for a long time in the future. And microbiologists will be forced to cope with all these issues. I wish good luck and good imagination to all scientists who seek to find new methods and techniques to cope with these challenges.



Prof. Dr. Peter Raspov, Dr. h.c. mult.  
Ex Head of the Study of microbiology  
Guest Editor