

Present Status and Future of Microbial Ecology

Kazuhiro Kogure

Ocean Research Institute, The University of Tokyo, Japan

Microbiology has unique history that is different from any other fields of biology. First, it started without description of organisms in nature, i.e., what kind of microorganisms are present in what kind of environments. Second, for long time, it had been dependent solely on culture technique. Such uniqueness has made microbiology be oriented to human-related research field. For instance, medical microbiology has been the major discipline of microbiology. Although they succeeded to dramatically reduce the number of patients by describing the pathogen and introducing antibiotic substances, the research on the distribution and behaviors of pathogens in the environments has been quite limited. Therefore, it has been difficult to figure out the key factors that induce emergence of diseases or reemergence of “old diseases”. In addition, the isolation and culture of the pathogen is prerequisite to initiate any research on the pathogen. Similar situation can be seen also in other fields of microbiology.

In the last two decades, microbial ecology has changed dramatically since the introduction of molecular techniques. It is now technically possible to detect certain microorganisms without culturing them. It is also possible to show community structures by analyzing the nucleic acids extracted directly from the environments. Simultaneously, some new approaches for the isolation appeared and many previously unknown microorganisms are now cultured. Recent investigations have uncovered so many unexpected microbial behaviors, processes, functions and new species. Those findings have made this scientific field one of the most exciting research area.

For long time, microbial ecology has been a discipline sharing only a minor portion of microbiology. However, microbial ecology should become the major discipline because of the following reasons. First, the knowledge on the microbial processes should lead to establishments of new theory or concept. For instance, species concept has been the central issue in microbiology. Ecological view points and actual data are indispensable for this issue. Second, microbial ecology is the basis for all fields of microbiology. Any microorganisms have their unique distribution and life style somewhere on the planet. Such information should offer essential knowledge for all kinds of further research including application.

Some recent findings by the researchers especially in Korea and Japan will be introduced and its significance, future directions will be discussed.