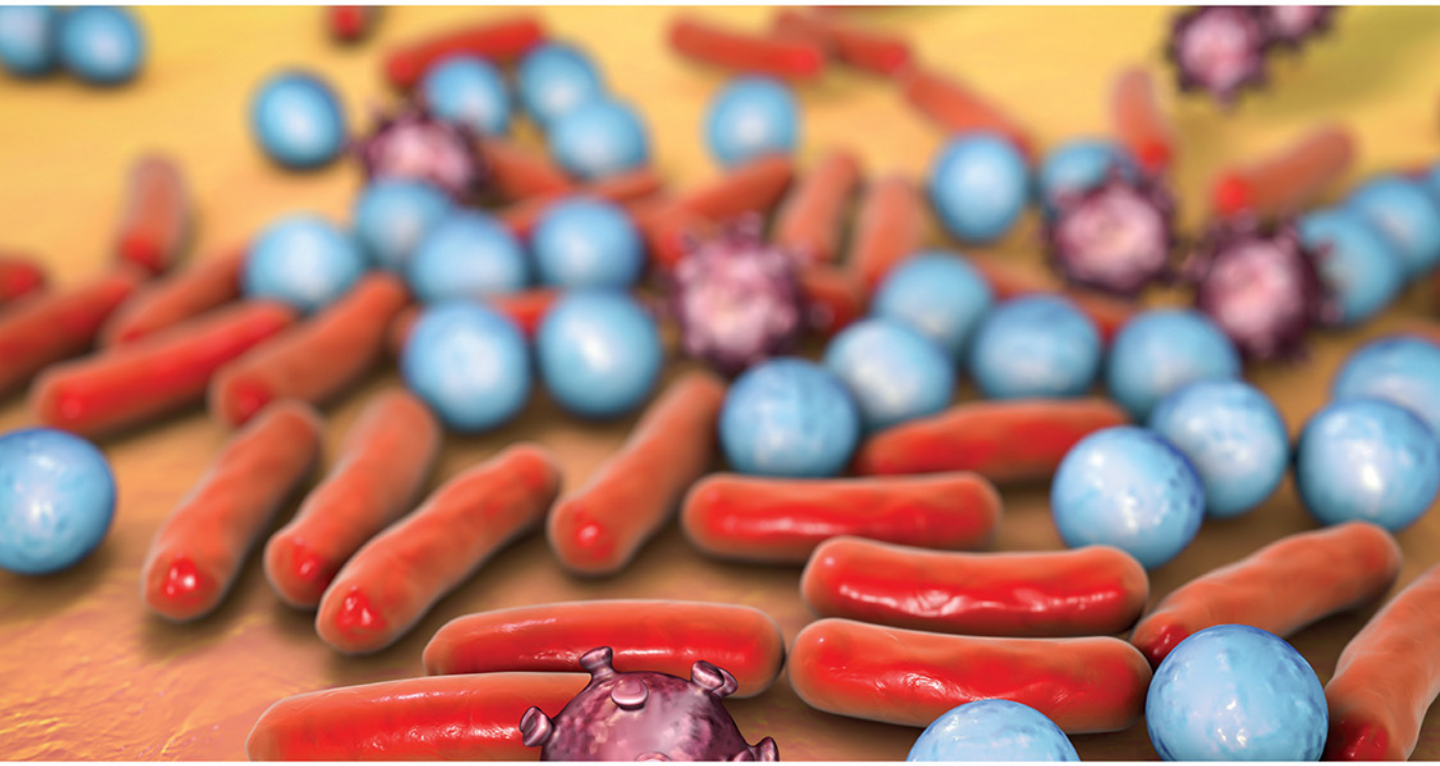
APPLICATIONS OF METAGENOMICS

AGRICULTURE, ENVIRONMENT, AND HEALTH



Edited by
Hrudayanath Thatoi
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Agriculture, Environment, and Health

Edited by

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Dedication

Hrudayanath Thatoi dedicates this book to his parents and wife.

Sukanta Kumar Pradhan dedicates this book to his late parents and wife Mrs. Sonali Pradhan.

Upendra Kumar dedicates this book to his parents, wife, and students.

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Preface

Microbes are ubiquitous in nature, present everywhere in both biotic and abiotic environment. Because of their complexities, majorities of these microbes are still unexplored as well as uncharacterized and act as reservoir of genetic and metabolic diversity. The transformation from classical microbiology to modern metagenomics studies requires the development of advanced techniques, new branches of knowledge and specialization. Next-generation sequencing (NGS) techniques allow large-scale analysis of unculturable microbes present in the environment by performing comparative metagenomics, metatranscriptomics, and metaproteomics. The correlation and interpretation of the comprehensive datasets derived from these approaches with varied parameters of environment, agriculture, and health help to decipher the complex functions of microbial communities of that system. High-performance computing technologies have empowered scientists to collect, process, and extract useful novel biological information from a variety of samples and complex datasets. Metagenomics study requires the integration of advanced computational techniques and enrichment of reference databases so that comprehensive analyses of diverse metagenomic datasets are possible.

Soil microorganisms play a vital role in provoking the growth, stress, and defense responses in plants. Exploring the relationship between the huge microbial diversities available in the soil environment and plants using metagenomics techniques is helpful in designing the crop systems. Soil metagenomics study gives insights into the soil nutrient status and reduces the dependence on inorganic fertilizers. Beneficial microorganisms of agricultural importance are crucial for sustainable agricultural production. Metagenomics analysis helps in finding out the microbial community structure of those agriculturally important microorganisms.

Clinical microbiology involves diagnostic as well as identification of pathogens from the patient samples to supervise the management and treatment strategies and surveillance and monitoring of infectious disease outbreaks in the community. The clinical metagenomic mNGS analysis of microbiome and host genetic material isolated from patient samples is rapidly moving from research to clinical laboratories to understand the host – gene – microbial interactions.

The proposed book will highlight the various metagenomics methods and its application in soil, polluted environment sites, agriculture production system as well as in health care. Special attention will be given to biotechnological exploitation of novel microbial resources for social welfare. Besides various methods and applications, the