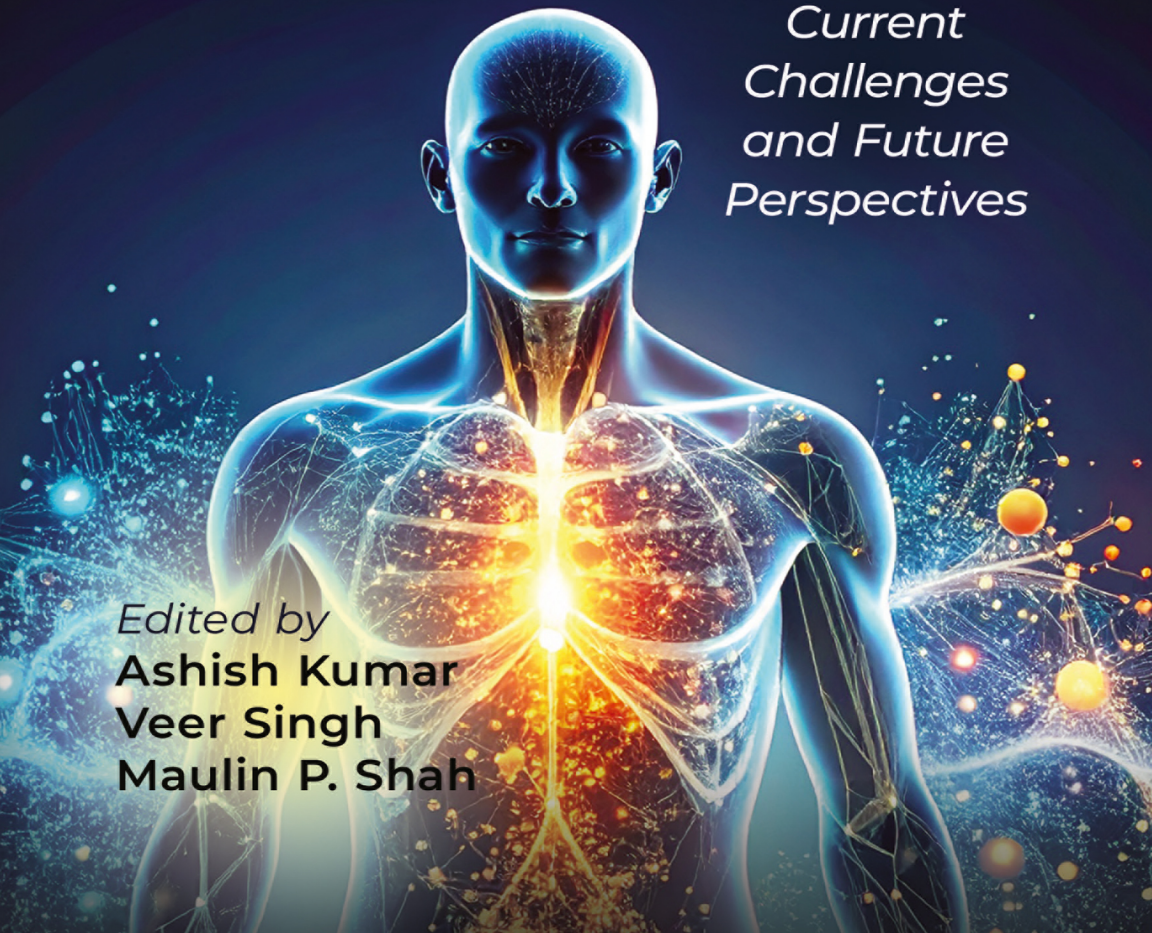
ENVIRONMENTAL TOXICOLOGY AND HUMAN HEALTH

Current Challenges and Future Perspectives



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Dedication

To my family: For their unwavering love and belief in my dreams.
To my mentors and colleagues, for inspiring and guiding me through this journey of discovery.
And to all those striving for a healthier, cleaner world: may this work contribute in some small way to your mission.

Contents

Preface

The rapid progress of industrialization, urbanization, and technology over the past century has elevated human life to unprecedented levels. However, this transformation has also brought significant human and environmental costs. This book, *Environmental Toxicology and Human Health: Current Challenges and Future Perspectives*, addresses the environmental contamination, understanding, and addressing the complex challenges posed by environmental contamination to both human and ecosystem health. This book also explores innovative, eco-friendly solutions.

The release of hazardous substances–including heavy metals, persistent organic pollutants, industrial effluents, agricultural runoffs, and pharmaceutical residues–into the environment has led to widespread contamination of air, water, and soil. These pollutants pose significant risks not only to ecosystem health but also to human populations, contributing to a range of chronic and acute health conditions. The intricate relationship between environmental pollutants and public health necessitates an interdisciplinary and collaborative approach, integrating scientific research, technological innovation, and policy development.

This book has been conceived to provide a comprehensive overview of the key issues, emerging trends, and innovative strategies related to environmental toxicology. It brings together contributions from leading researchers, scientists, and practitioners working at the intersection of environmental science, toxicology, microbiology, public health, and remediation technologies.

The chapters presented in this volume cover a wide range of topics, including the toxicological effects of heavy metals and emerging contaminants, advanced biosorption and bioremediation techniques, microbial responses to pollutants, and the valorization of waste materials for sustainable environmental management. Particular emphasis is placed on recent advances in green technologies, low-cost adsorbents, and microbial systems that offer promising solutions for the remediation of contaminated environments.

This book not only reflects the maturity and evolution of environmental toxicology as a scientific discipline but also highlights the urgent need for sustainable solutions to mitigate pollution and safeguard public health. It is intended to serve as a valuable resource for researchers, students, policy-makers, and environmental professionals who are striving to understand and address the multifaceted challenges of environmental contamination.

We believe that this volume will foster a deeper understanding of environmental toxicology and stimulate future research and innovation aimed at creating a cleaner, healthier, and more resilient world.

We extend our sincere gratitude to all contributing authors, editors, reviewers, publishing team members, and supporters who have made this book possible. Their dedication, insight, and collaborative spirit are the foundation of this work.

Acknowledgement

It gives us immense pleasure to acknowledge Manipal University Jaipur, Rajasthan, India. Dr. Veer Singh would also like to acknowledge the Department of Health Research (DHR), Ministry of Health and Family Welfare, Govt. of India, for support through the Young Scientist award (File No. R.12014/37/2022-HR). Dr. Ashish Kumar would like to acknowledge the Indian Council of Medical Research (ICMR) for necessary research support. Dr. Maulin P. Shah would like to acknowledge Enviro Technology Limited, India. It is also our great pleasure to acknowledge and express our enormous debt to all the contributors who have provided their quality material to prepare this book. We are grateful to our beloved family members, who joyfully supported and stood with us for many hours of our absence to finish this book project. We are also grateful to our friends and colleagues who offered their support and encouragement throughout the writing process. We would also like to acknowledge the Scrivener Publishing team for their professionalism, enthusiasm, and belief in this project. Their expertise in design, production, and marketing has been essential in bringing this book to life.

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Chapter 15

Pesticide Contamination in Soil and Water

Type of Pesticide, Route of Expose, and Its Toxic Impacts

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Summary

One important concept in the sphere of agricultural development is pesticides. Consequently, the use of pesticides results in both acute and chronic toxicities in humans, and their detrimental impacts on the environment along with human health continue to be major concerns in the modern world. Therefore, there needs to be discussion about the methods for applying pesticides, the routes *via* which they are exposed to them, and the health hazards connected to their use. The health dangers posed by pesticide applications and exposure in developing countries are among the primary concerns. In addition to being physically exposed to pesticides through their work in agriculture and the home, along with other industries, people were also exposed indirectly to them through environmental media, for example, food, trash, and soil. The pesticides were administered to humans orally, respiratorily, and topically. Humans who are indirectly or directly exposed to pesticides may contract the effects of acute toxicity as well as chronic diseases.

References

Abubakar , Y. , Tijjani , H. , Egbuna , C. , Adetunji , C.O. , Kala , S. , Kryeziu , T.L. , Ifemeje , J.C. , Patrick-Iwuanyanwu , K.C. , Pesticides, history, and classification , in: *Natural Remedies for Pest, Disease and Weed Control* , pp. 29 – 42 , Academic Press , 2020 .

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