**Preface**

The presence of micro and nanoplastics in our environment has emerged as one of the most pressing challenges of the 21st century, posing severe ecological and health threats. While their ubiquitous nature has become a focal point for global environmental discussions, the intricate ways these tiny particles interact with human systems, particularly the genome, remain underexplored. This book, *"Micro and Nanoplastics - Macro Implausible Effect in Human Genome,"* aims to bridge the gap in understanding the multifaceted impacts of these pervasive pollutants.

The book is structured to provide a comprehensive journey through the lifecycle of micro and nanoplastics, from their introduction and persistence in the environment to their deleterious effects on the human body. We begin with a foundational understanding of micro and nanoplastics, discussing their sources, properties, and pathways into ecological and human systems. The subsequent chapters delve deeper into their interference in ecosystems, food chains, and their potential to disrupt human health at cellular and molecular levels. Through meticulous reviews of scientific literature, critical analyses, and explorations of epigenetic and genomic interactions, this book unveils the molecular mechanisms by which micro and nanoplastics contribute to genetic mutations, cytotoxicity, and chromosomal instability. We also examine the emerging methodologies for detecting and studying these particles within biological systems, alongside innovative strategies to mitigate their impact and prevent their ingress.

The work highlights not only the dangers posed by micro and nanoplastics but also the opportunities for research and innovation. Chapters dedicated to global collaborative efforts, research gaps, and cutting-edge technological interventions aim to inspire the scientific community, policymakers, and stakeholders to forge unified efforts against this global threat. The topics addressed in this book are the culmination of contributions from leading researchers, industry experts, and environmental advocates.

By presenting a blend of theoretical knowledge, empirical studies, and actionable strategies, it serves as a critical resource for scientists, educators, healthcare professionals, and environmentalists striving to understand and combat the insidious effects of micro and nanoplastics. It is our hope that this book not only deepens your understanding of the subject but also ignites your passion to act in the face of this ecological and genetic crisis. The path ahead is complex, but through innovation, awareness, and collaboration, we can envision a future resilient to the challenges posed by these microscopic pollutants.

Kushbu R., Dr. Madhu Malleshappa, Dr. Ashok D  
*Authors*  
November 2024

**Acknowledgement**

I owe my sincerest thanks for the guidance and unwavering belief in my abilities made this work possible.My heartfelt thanks go to **Rev. Fr. Augustine George**, Principal, Kristu Jayanti College, and the entire management team for their unwavering support and invaluable opportunities. I extend my sincere gratitude to **Dr. Joseph V.G**, Chancellor of Garden City University, for his mentorship and invaluable guidance.

I am deeply indebted to my co-authors, **Dr. Madhu Malleshappa and Dr. Ashok D.**, for their continuous supervision and thoughtful insights, which have been pivotal in bringing this work to life.

A special note of appreciation to:

* **Fr. Deepu Joy Parayil**, Member of the Management, Kristu Jayanti College.
* **Dr. Calistus Jude AL**, Dean of Sciences, Kristu Jayanti College.
* **Dr. Vijayanand.S,** Head, Department of Life Sciences, Kristu Jayanti College**.**
* **Dr. Preethi Rajesh**, Head, Department of Life Sciences, Garden City University.
* **Dr. Sheeja M.S**, Dean of RIC, Garden City University.

Their encouragement and support have been instrumental in achieving this milestone.

**- Ms. Kushbu R.**

Faculty, Kristu Jayanti College, Bangalore-560077.

Research Scholar, Garden City University, Bangalore- 560049.

**INDEX**

|  |  |  |
| --- | --- | --- |
| **No. Of Chapter** | **Title of the Chapter** | **Page Number** |
| CHAPTER 1 | Introduction To Micro And Nano Plastics | 1-10 |
| CHAPTER 2 | Advances And Challenges In Plastic Biodegradation: A Comprehensive Review | 11- 23 |
| CHAPTER 3 | A Plot On Nano Plastics And Its Toxic Interference Into Ecology – A Critical Review | .24-30 |
| CHAPTER 4 | Micro/Nano Plastics In Daily Life Parallel To Health Complications | 31- 44 |
| CHAPTER 5 | Interference Of Micro And Nano Plastics To Depreciate Ecosystem And Food Chain | 45- 63 |
| CHAPTER 6 | Microplastic And Nanoplastic Scavenging Into Human Genome | 64-80 |
| CHAPTER 7 | **Introduction To Epigenetics And Tumorigenesis** | **81-95.** |
| CHAPTER 8 | Molecular Mechanisms Of Micro/Nanoplastic-Induced Mutations | 96-105 |
| CHAPTER 9 | Chromosomal Instability And Cytotoxicity Of Nanoplastics | 106- 116 |
| **CHAPTER 10** | **Diagnostic Methodologies To Detect Microplastic Intervention In The Human Body** | **117-124** |
| **CHAPTER 12** | **Strategies To Eliminate Microplastics From Human Genome** | **125- 131** |
| CHAPTER 13 | Phycological Effects Caused By Microplastics | 132-138 |
| CHAPTER 14 | In Vivoand In Vitro Studies On Plastics | 139- 159 |
| CHAPTER 15 | Transgenerational Effects | 160-165 |
| CHAPTER 16 | Strategies for Preventing Microplastics and Nanoplastics Contamination | : 166-167 |
| CHAPTER 17 | Research innovation, Technological Innovations and Global Collaborative Efforts for Prevention | 180-197 |
| **CHAPTER 18** | **Scientific Research and Development: Gaps and Opportunities** | **198-211** |
|  | **References** | 212-224 |