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Targeted Delivery of Pesticides Using Biodegradable Polymeric Nanoparticles

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Dedicated to
late Professor Larry Grossman,
Distinguished Professor and ex-Chairman,
Department of Biochemistry,
School of Hygiene and Public Health,
Johns Hopkins University

Preface

Pesticides have revolutionized life on this planet; however, they have also proven to be toxic for human health and environment. Indeed, the extent and severity of the toxicity was declared at the Stockholm Convention on Persistent Organic Pollutants where 9 of the 12 most dangerous and toxic organic chemicals were found to be pesticides. Traditionally, pesticides have been directed at a specific pest's life cycle as this required less pesticide and was considered to be more eco-friendly. However, this would not prevent pesticides from drifting away and potentially posing grave risks to the environment. In this book, we describe recent developments of controlled release nanoparticulate formulation of pesticides using biodegradable polymers as carrier. Technologies focusing on controlled-release of pesticide have two advantages: the pesticides are intact until sprayed and targets only the plants the pesticides are meant to protect. We have generalized the concepts to make the book useful in the post-graduate classes taught in our university and for advanced professionals alike.

While nanoparticles have revolutionized drug delivery effectively chaperoning the drug to target organs, delivery of pesticides to its intended site of action is still in the process of initial exploration. Additionally, there lies the concern of environmental safety of the fate of the pesticide-carrier. Consequently, while there have been books written on drug delivery, there are almost no available books on the topic of pesticide-delivery.

This book (a result of collaboration between scientists from Columbia University, City College of New York, and University of Delhi, India) is the first to focus exclusively on environmentally benign delivery of pesticides (controlled-release nanoparticulate formulation of pesticides using biodegradable polymers as carriers).

Acknowledgments

Some of the work embodied in this book, especially the one dealing with the role of microemulsions in synthesizing nanoparticles and using them for preparing nano-formulations of agrochemicals, has been carried out in my laboratory at the Department of Chemistry, University of Delhi. The idea of working in this field was introduced by Dr. P. K. Patanjali of IPFT, Gurgaon and his students Dr. Amit Saxena and Dr. Pooja Saxena. The funds for this work were provided by the Department of Biotechnology, Government of India and I personally thank D.B.T. and the Scientific Advisors Dr. R. R. Sinha and Dr. Dhananjay Tiwari for giving us proper encouragement for doing this work. I would also like to express my gratitude to my current Head of the Department, Professor S. M. S. Chauhan for providing us with the necessary infrastructure for setting up a laboratory where this work could be carried out. My students (both postgraduate and undergraduate) deserve a special mention, as it is their untiring effort that has resulted in this work. All of us would like to sincerely thank Mr. Sushil Mishra for helping us with all the data and also meticulously typing the entire manuscript. I also take the opportunity to thank my wife, Mrs. Jayati Mozumdar and my sons, Deepto and Aaloke, for providing me with a proper ambience and all the emotional support for writing this work. Finally, I must thank my parents Dr. Monojit Mozumdar and Dr. (Mrs.) Anjali Mozumdar for inculcating the right values in me. I decided to dedicate this book in the memory of my postdoctoral mentor, late Professor Larry Grossman. He taught me the art of doing Science and the spirit of never to give up before a goal is reached.

Subho Mozumdar

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