Drug and Gene Delivery to the Central Nervous System for Neuroprotection

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Preface

Recent advances in nanotechnology suggest its involvement in health, environment, drug development, diagnostic purposes, industries affecting almost every aspect of household items, automobile engineering to body parts or tissue implants influencing every sphere of life. However, on the one hand nanotechnologies have advanced medical care, health improvement and drug delivery; on the other hand, their adverse effects on the environment, biological material, food and water intoxication, industrial waste, air pollution affecting human biospheres and other health factors cannot be ignored. Thus, use of nanotechnologies is still a matter of debate in relation to their beneficial vs. adverse effects on human health factors.

One of the important challenging tasks of nanotechnology is to deliver drugs to the central nervous system (CNS) for treating diseases afflicting brain. Since access of drugs to the CNS is very limited due to the presence of an effective blood–brain barrier (BBB), there is an urgent need to explore possible ways using nanotechnologies to deliver drugs or therapeutic agents across the BBB to induce neuroprotection and/or to enhance neuroregeneration.

This volume for the first time highlights nanodelivery of drugs and genes to the CNS for inducing neuroprotection and enhancing neuroregeneration in different diseases in a concise manner. The book is a reviewed collection of invited reviews from leading experts across the world. One of the key highlights of the book deals with enhanced capacity of nanodelivery of drugs in CNS pathology often associated with co-morbidity factors, e.g., hypertension, diabetes or heat exposure. Our military personnel are often exposed to various kinds of nanoparticles in the battlefield emanating from gun powder explosion, missile injury and other environmental nanomaterials, e.g., silica dust. All these factors could induce greater degree of brain pathology following any CNS insults. Under such situations, normal drug delivery may not be able to thwart brain pathology. However, experimental evidences indicate that nanodelivery of multimodal compounds may have better therapeutic efficacy. This suggests that nanodelivery of drugs and genes requires further exploration and explorations of our knowledge to provide effective therapeutic measures in future strategies to treat CNS injuries.

Another important aspect of nanodelivery of drugs is to choose suitable nanomaterials for effective delivery. This aspect is also discussed using various techniques of nanodelivery, e.g., nanowired drug delivery, viral vector gene delivery, or other nanocarriers for enhanced penetration into the CNS.

We feel that this book will open new vistas for study and research on the novel aspects of nanodelivery of drugs and genes into the CNS using various approaches for better therapeutic approaches in future. The book will be highly useful for policy makers, medical practitioners, health care givers, researchers, students, neuropharmacologists, neurologists, neurosurgeons and neuroscientists alike.

We hope that the book will be used as a novel basis for further research in the field for the benefit of mankind.

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