

Advances in Experimental Medicine and Biology 1048

Quaiser Saquib
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Cellular and Molecular Toxicology of Nanoparticles

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Preface

We are pleased to introduce the book entitled *Cellular and Molecular Toxicology of Nanoparticles* in the Advances in Experimental Medicine and Biology series. This body of work is the melding of a number of ideas and perspectives. Hence, we must thank all the contributors who wholeheartedly welcomed our invitation and agreed to contribute chapters to embellish toxicological information on nanoparticles (NPs). We express our special thanks to King Saud University for all the support. NPs research within the last decade has received tremendous attention due to their unique properties in optics, physical, chemical, and biological processes. Larger NPs surface area and more surface atoms endow them with high chemical reactivity and intrinsic toxicity. As a result, NPs have been adopted in medical biology as an antibacterial agent, DNA structure probes, biosensors in drug and delivery formulations, tissue engineering, and cancer therapy to eliminate tumors through hyperthermia. Notwithstanding the benefits, several *in vitro* and *in vivo* studies have demonstrated that NPs exposure can provoke inflammatory responses, oxidative stress, myocardial infarction, and thrombosis. They can also alter the permeability of blood-brain barrier and re-translocate from the site of deposition to other parts of the body via circulatory or lymphatic system. A majority of NPs get internalized in cells through phagocytosis, macropinocytosis, receptor-mediated endocytosis, and passive penetration. Undeniably, NPs due to their high biological reactivity promote preferential toxicity toward genetic material. Therefore, the importance of their toxicological impact and of the development of early indicators for detection of possible adverse health effects arising from nanomaterial exposure is strongly realized. For these grounds, nano-genotoxicology and nanotoxicology are expanding as novel fields that are looking for the potential risk and mechanism of toxicity in various assay systems. Despite the above hazards, comprehensive information on NPs interaction with biological macromolecules (DNA and protein) is lacking. Especially, the toxicogenomic responses altering the normal cellular functioning and link with molecular pathways to trigger cell death and carcinogenesis have not been compiled. Therefore, the purpose of this book is to gather up-to-date and state-of-the-art toxicological effects of NPs in different *in vivo* and *in vitro* test models. The chapters have been organized to provide a crisp information on the cellular and molecular toxicity of different types of NPs. Special attention has been given to explore the mechanism of NPs toxicity which can lead to cell death. In addition, transcriptomic approach has also been provided to explain a clear picture on NPs

effects on global gene expression and its connection to alter the varying pathways, vital for cell survival. The book has been designed for scientists engaged in NPs toxicity research. Nonetheless, it should be of interest to a variety of scientific disciplines including marine biologist, environmentalists, genetics, pharmacology, medicine, drug and food material sciences, and consumer products. Also, the compilations will be of interest to the environmental watchdogs, federal regulators, risk assessors, and the policy makers.

Riyadh, Saudi Arabia

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