

## Role of Nanomaterials in Inducing Cellular Stress and Influencing Cellular Response

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Cell is the structural and functional unit of acellular, unicellular and multicellular biosystems. These units respond to all the changes in their ambient environment, body fluids and clearance of the intra and extra cellular biomolecules. Cellular response to any type of stress is quite complex process. These units of biosystem are among the prime sites of bearing the impacts of these changes. Nanotechnology and nanoscience and their versatile products – the nanomaterials are applied in most of the fields ranging from varied industries to biomedical, biochemical, food technology, pharmacokinetics, theranostics etc.

The interactions between cells and these nanomaterials are based on their ability to get fabricated and/or engineered, designed with special features to attain specific set targets. These nanomaterials are of multifaceted applications as drug carriers, as imaging agents and remedial agents of environmental aspects, biotechnological and biomedical processes, implants, biosensors etc. The implications of these wonder materials in any biosystems, industrial processes and products etc ensure their interactions with cells. Cellular stress induced by nanomaterials is likely to be of varying degree depending on the dose, exposure time, type of cell and nanomaterials and the modifications of surface of these materials administered in biosystem. The cellular responses can be physical, biochemical, physiological or derogative etc. There are numerous biomolecules and the cellular processes that are involved in intra and intercellular communications. These are likely to exhibit fluctuations. The cellular communication is the prime functional aspect for cell survival. The interactions between the cells and the nanomaterials are likely to influence this cellular communications and other cellular processes. These features affect cellular responses. Cellular responses are protective and/or rendering the affected cells prone to necrosis or cellular death. Various nanomaterials with different reactive affinities are bound to influence the cellular responses with respect to the stress. This reflects on the needs to evaluate and understand the mechanism involved during the process of cellular stress and the related cellular behavior.

**Keywords:** Cellular Stress; Cellular Responses; Cellular Communication; Bionanointerface, Biochemical Impacts; Biophysical Impacts; Necrosis; Cell death

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He has authored three books on toxicology and 35 research papers, 16 review articles and one chapter on graphene as drug carrier. His research fields include Toxicological studies encompassing histological, enzymatic, redox reaction, lipid and protein oxidation, overall biochemical aspects; Nanotoxicological studies includes redox reactions, lipid oxidation, histological impacts, interaction with erythrocytes, chromosomal fluctuations and cellular aspects including cytoskeleton and extracellular matrix. Hematological studies in birds, digestive enzymes in birds, metabolic marker enzymes in millipede, influence of hormones, some of the chemicals, heavy metals and toxicants on the enzyme activities in fish, mollusk and crustaceans; Meiofauna of Mumbai coast; Nanomaterials in food toxicity, phytoremediation and environmental sciences; Review on nanotoxic topics.