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Engineered metal oxide nanoparticles, nano-bio interaction and toxicology

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Metal oxide nanoparticles (NPs) are commonly used nanomaterials. The nano-level size offer these metal oxides potential of novel properties ensuing not only in high end technologies but also in consumer oriented applications. Nanotechnology is latest endeavor, which has advanced tremendously in last few years, but it still lacks well laid guidelines and in-depth toxicological studies. How these metal oxide NPs and there ionic form will react in varying biological interface and long term effects are not well defined? In our research we have made an attempt to study the acute and chronic effects of the commonly used metal oxide nanoparticles, Al_2O_3 NPs and ZnO NPs in *Drosophila melanogaster.* The exposure dose includes 0.1- 1mM NPs in Drosophila diet and flies were exposed throughout their lifespan. Toxicological effects post exposure was evaluated on various parameters like: climbing ability, fecundity, lifespan, oxidative stress, apoptosis and incidence of aberrant phenotype in subsequent generations. Significant decline in climbing ability was observed in parent flies on seven days exposure to these NPs. Significant increase in reactive oxidative species and apoptotic cells was observed in larvae hemocytes via DCF-DA and TUNEL assay. Distinctive aberrant phenotypic changes like deformed segmented thorax, loss of wing, deformed body symmetry was observed in subsequent generation on ZnO NPs exposure. Chronic exposure of Al_2O_3 NPs resulted in flies with pigmented and segmented thorax and deformed legs. Our observations clearly depicted that these nanoparticles can cause detrimental effects to subsequent generations.

Biography

Avnika Singh Anand is gold medal awardee from SHAITS, U.P., India in M. Tech Biotechnology. Currently, she is pursing PhD. at Defence Institute of Physiology & Allied Sciences (DIPAS), New Delhi, India. Our current research at Neurobiology Division, involves the studies to unravel the molecular basis of nanomaterial toxicity. I am also currently involved in the new field of Toxicoproteomics which integrates different interdisciplinary areas. Toxicoproteomics involves traditional toxicology and pathology, differential protein and gene expression analysis and systems biology. This field is uniquely positioned for better understanding of the diseases process, early diagnosis, timely intervention and promotes public health. Our lab is focused on development of a wide spectrum of promising nanoscale materials & novel drug targeting (nanotechnology based) strategies to control the protein modifications and subsequent control of disease process and progression.

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