# Genotoxic Effects Of Zinc Oxide Nanoparticles

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In Vitro Toxicity Assays for Small Molecule Development*Everything Matters | Titanium | Ron Hipschman and Dr. Stuart Goodman | Exploratorium Dr. David Sinclair on Informational Theory of Aging, Nicotinamide Mononucleotide, Resveratrol \u0026 More Mod-01 Lec-01 Lecture-01-Introduction to Biomaterials* **Genotoxic Effects Of Zinc Oxide**
In summary, genotoxic and cytotoxic effects of ZnO-NP to hMSC were demonstrated in long-term and repetitive exposure. A protective effect was seen after one week of MSC differentiation into osteogenic and adipogenic lineages. Observations over a total of six weeks indicate a persisting intracellular accumulation of ZnO-NP and an ongoing toxic effect.

**Time-Dependent Toxic and Genotoxic Effects of Zinc Oxide ...**
Here we have reported cytogenetic and genotoxic effects of ZnO NPs on the root cells of A. cepa. The effects of ZnO NPs on the mitotic index (MI), micronuclei index (MN index), chromosomal aberration index, and lipid peroxidation were determined through the hydroponic culturing of A. cepa. A. cepa roots were treated with the dispersions of ZnO NPs at four different concentrations (25, 50, 75, and 100 ?g ml (-1)).

**Cytogenetic and genotoxic effects of zinc oxide ...**
Genotoxic effects of Zinc oxide nanoparticles. April 2015; Nanoscale 7(19) DOI: 10.1039/C5NR01167A. ... Zinc oxide (ZnO) quantum dot (QD) is a promising inexpensive inorganic nanomaterials, of ...

**(PDF) Genotoxic effects of Zinc oxide nanoparticles**
Nanoparticular zinc oxide (ZnO) may be internalised through ambient air or the topical application of cosmetics, only to name a few, with unpredictable health effects. Therefore, we analysed the determinants of ZnO nanoparticle (NP) genotoxicity.

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**Genotoxic effects of zinc oxide nanoparticles - Nanoscale ...**
The adsorption of dissolved zinc ions onto TiO 2-NPs is discussed as the major antagonistic mechanism. The combination of both metal oxide nanoparticles interferes with the genotoxicity of ZnO-NPs and should be discussed as a reasonable and safe alternative to the sole use of ZnO-NPs in consumer products.

**Genotoxic effects of zinc oxide nanoparticles in nasal ...**
The results of the study indicated cytotoxic effects of ZnO-NP beginning at high concentrations of 50 ?g/mL and genotoxic effects in hMSC exposed to 1 and 10 ?g/mL ZnO-NP. Repetitive exposure enhanced cyto- but not genotoxicity. Intracellular NP accumulation was observed up to 6 weeks. The results suggest cytotoxic and genotoxic potential of ZnO-NP.

**Time-Dependent Toxic and Genotoxic Effects of Zinc Oxide ...**
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**Cytogenetic and genotoxic effects of zinc oxide ...**
Other cellular responses may be induced and give rise to genotoxicity, such as oxidative stress induction, inflammatory response, and aberrant signaling responses (Figure 3).1,35,97Moreover, putative mechanisms underlying the detrimental effects of ZnO and silica NPs are proposed (Figure 4). Figure 3.

**Current investigations into the genotoxicity of zinc oxide ...**
To our knowledge, this is the first study evaluating toxic properties of ZnO-NPs in human nasal mucosa cells. Beside cyto- and genotoxic effects, a dose-dependent release of pro-inflammatory IL-8 could be demonstrated. Our results suggest that ZnO-NPs are capable to induce DNA damage and inflammation even in low concentrations.

**Cytotoxic, genotoxic and pro-inflammatory effects of zinc ...**
Genotoxic effects of zinc oxide and titanium dioxide nanoparticles on root meristem cells of Allium cepa by comet assay E?ref DEM?R, Nuray KAYA*, Bülent KAYA Department of Biology, Faculty of Sciences, Akdeniz University, Antalya, Turkey * Correspondence: nkaya@akdeniz.edu.tr 1. Introduction Industrial applications of nanotechnology are rapidly

**Genotoxic effects of zinc oxide and titanium dioxide ...**
The overall data suggest that the potential genotoxicity of ZnONP in Drosophila can be considered weak according to the lack of mutagenic and recombinogenic effects and the induction of primary DNA damage only at high toxic doses of ZnONP.

**Genotoxic and oxidative stress potential of nanosized and ...**
In this study, possible genotoxic effects of zinc oxide (ZnO) nanoparticles were investigated in cultured human peripheral lymphocytes by using chromosome aberrations and micronucleus assays (MN). For this purpose, the cells were treated with ZnO (1, 2, 5, 10, 15 and 20 ?g/mL) for 24 and 48 h. In this research, four types of chromosome aberrations were observed as chromatid and chromosome breaks, fragment and dicentric chromosomes.

**In vitro genotoxic effects of ZnO nanomaterials in human ...**
Zinc-Oxide Nanoparticles Exhibit Genotoxic, Clastogenic, Cytotoxic and Actin Depolymerization Effects by Inducing Oxidative Stress Responses in Macrophages and Adult Mice Rashmirekha Pati , Rashmirekha Pati

**Zinc-Oxide Nanoparticles Exhibit Genotoxic, Clastogenic ...**
Genotoxic effects of zinc oxide and titanium dioxide nanoparticles on root meristem cells of Allium cepa by comet assay E?ref DEM?R, Nuray KAYA*, Bülent KAYA Department of Biology, Faculty of Sciences, Akdeniz University, Antalya, Turkey * Correspondence: nkaya@akdenizedutr 1 Introduction Industrial applications of nanotechnology are rapidly ...

**[EPUB] Genotoxic Effects Of Zinc Oxide Nanoparticles**
Zinc oxide (ZnO) NPs are being used worldwide in consumer products and industrial applications. Based on predefined pathways, this study synthesized and characterized the nanostructures of ZnO NPs. The genotoxic effects of these nanomaterials were evaluated using a short-term in vivo bioassay, the somatic mutation and recombination test (SMART) in Drosophila melanogaster .

**Genotoxicity of zinc oxide nanoparticles: an in vivo and ...**
Bai et al revealed mitochondrial dysfunction leading to an increased ROS generation and consecutive DNA damage and cell death. 53 Another study indicated a stimulation of ROS production via the upregulation of lipoxygenases in neuroblastoma cells. 54 It has been suggested that the dissolution of ZnO NPs into Zn 2+ ions and consecutive ROS generation after incorporation may be responsible for the genotoxic effects. 50,55 This seems to be all the more likely since zinc serves as a component of ...

**[Full text] Effects of Zinc Oxide Nanoparticles in HUVEC ...**
(2006) Clastogenicity, photo-clastogenicity or pseudo-photo-clastogenicity: genotoxic effects of zinc oxide in the dark, in pre-irradiated or simultaneously irradiated Chinese hamster ovary cells. Mutation Research/Genetic Toxicology and Environmental Mutagenesis 607(2): 215 – 224 .

Ever increasing applications of nanomaterials (materials with one or more dimensionless than 100 nm) has raised awareness of their potential genotoxicity. They have unique physico-chemical properties and so could have unpredictable effects. Zinc oxide(ZnO) and titanium dioxide (TiO2) are widely used in a number of commercial products. There are published studies indicating that some forms of these compounds may be photo-clastogenic in mammalian cells. What has not been investigated before is the effect of nanoparticles from these compounds in human germ cells. Thus the present study has examined their effects in the presence and absence of UV light in human sperm and compared responses to those obtained with human lymphocytes using the Comet assay to measure DNA damage. The effect of nanoparticles (40-70nm range) was studied in human sperm and lymphocytes in the dark, after pre-irradiation with UV and simultaneous irradiation with UV. The studies do provide some evidence that there are photo-genotoxic events in sperm and lymphocytes in the absence of overt toxicity. The cytotoxic and genotoxic potentials of ZnO and TiO2 as well as their effect on phosphotyrosine expression, were examined in the human epithelial cervical carcinoma cells (Hela cells). This was done to try and determine the underlying molecular events resulting from their exposure to ZnO and TiO2 nanoparticles occurring at the same time as DNA is damaged. Concentration- and time-dependent cytotoxicity, and an increase in DNA and cytogenetic damage with increasing nanoparticle concentrations were reported in this study. Mainly for zinc oxide, genotoxicity was clearly associated with an increase in tyrosine phosphorylation. Nanotechnology has raced ahead of nanotoxicology and little is known of the effects of nanoparticles in human systems, let alone in diseased individuals. Therefore, the effects of TiO2 nanoparticles in peripheral blood lymphocytes from patients with respiratory diseases (lung cancer, chronic obstructive pulmonary disease (COPD) and asthma) were compared with those in healthy individuals using genotoxic end points to determine whether there are any differences in sensitivity to nano-chemical insult between the patient and control groups. The results have shown concentration dependent genotoxic effects of TiO2 in both respiratory patient and control groups in the Comet assay and an increasing pattern of cytogenetic damage measured in the micronucleus assay without being statistically significant except when compared with the untreated controls of healthy individuals. Furthermore, modulation of ras p21 expression was investigated. Regardless of TiO2 treatment, only lung cancer and COPD patients expressed measurable ras p21 levels that showed modulation as the result of nanoparticle treatment. Results have suggested that both ZnO and TiO2 nanoparticles can be genotoxic over a range of concentrations without either photo-activation or being cytotoxic.

This book is a printed edition of the Special Issue "Zinc Oxide Nanostructures: Synthesis and Characterization" that was published in Materials

This edited book, Toxicology - New Aspects to This Scientific Conundrum, is intended to provide an overview on the different xenobiotics employed every day in our anthropogenic activities. We hope that this book will continue to meet the expectations and needs of all interested in the implications for the living species of known and new toxicants and to guide them in the future investigations.

This Special Issue presents studies on the genotoxicity of nanomaterials. Although nanomaterials provide multiple benefits in a wide range of applications, challenges remain in addressing strong concerns about their risks to the environment and human health. As a result of inconsistencies among published results and diverging conclusions, the understanding of nanomaterial exposure and toxicity remains unclear. Determining whether these materials cause DNA damage—the first step in carcinogenesis—must be a priority in testing. In this book, readers will find recent publications on the genotoxic response to a broad range of nanomaterials, the impact of physico-chemical characteristics, safe-by-design and new developed tools.

This monograph summarizes the current knowledge on potential health hazards induced by nanomaterials from different sources and sort such as food, drugs and silver nanoparticles. Methods to assess toxicity as well as known effects on the genome, neuronal and respiratory system are discussed. Besides the impact on human and animal life the books also addresses aquatic toxicity.

Adverse Effects of Engineered Nanomaterials: Exposure, Toxicology, and Impact on Human Health, Second Edition, provides a systematic evaluation of representative engineered nanomaterials (ENM) of high volume production and their high economic importance. Each class of nanomaterials discussed includes information on what scientists, industry, regulatory agencies, and the general public need to know about nanosafety. Written by leading international experts in nanotoxicology and nanomedicine, this book gives a comprehensive view of the health impact of ENM, focusing on their potential adverse effects in exposed workers, consumers, and patients. All chapters have been updated with new sections on the endocrine system and other organ systems. In addition, other newly added sections include introductory chapters on the physio-chemical characterization of nanomaterials and interactions between nanomaterials and biological systems, as well as a new chapter that explores risk assessment and management of nanomaterials. This book fills an important need in terms of bridging the gap between experimental findings and human exposure to ENM, also detailing the clinical and pathological consequences of such exposure in the human population. Uses a schematic, non-exhaustive approach to summarizes the most important research data in this field Discusses the health implications of experimental data in nanotoxicology Presents a completely revised edition that focuses on the human health impacts of engineered nanomaterials, including many organ-specific chapters

As the application of nanotechnology in the myriad disciplines of science and engineering--from agriculture, pharmaceuticals, material science, and biotechnology to sensors, electronics, and mechanical and electrical engineering--brings benefits it also can produce serious threats to human health and the environment that must be evaluated. The unique properties of nanomaterials make them different from their bulk counterparts. In addition to such unique properties, the nanometric size of nanomaterials can invite some detrimental effects on the health and well-being of living organisms and the environment. Thus, it is important to distinguish nanomaterials with such ill effects from nanomaterials with no or minimum toxicity. Nanotoxicology: Toxicity Evaluation, Risk Assessment and Management covers issues such as the basic principles of nanotoxicity, methods used for nanotoxicity evaluation, risk assessment and its management for nanomaterial toxicity with a focus on current trends, limitations, challenges, and future directions of nanotoxicity evaluation. Various experts from different countries discuss these issues in detail in this book. This will be helpful to researchers, educators, and students who are interested in research opportunities for avoiding the environmental and health hazards of nanomaterials. This book will also be useful for industrial practitioners, policy makers, and other professionals in the fields of toxicology, medicine, pharmacology, food, drugs, and other regulatory sciences.

The population of the world continues to increase at an alarming rate. The trouble linked with overpopulation ranges from food and water scarcity to inadequacy of space for organisms. Overpopulation is also linked with several other demographic hazards, for instance, population blooming will not only result in exhaustion of natural repositories, but it will also induce intense pressure on the world economy. Today nanotechnology is often discussed as a key discipline of research but it has positive and negative aspects. Also, due to industrialization and ever-increasing population, nano-pollution has been an emerging topic among scientists for investigation and debate. Nanotechnology measures any substance on a macromolecular scale, molecular scale, and even atomic scale. More importantly, nanotechnology deals with the manipulation and control of any matter at the dimension of a single nanometer. Nanotechnology and nanoparticles (NPs) play important roles in sustainable development and environmental challenges as well. NPs possess both harmful and beneficial effects on the environment and its harboring components, such as microbes, plants, and humans. There are many beneficial impacts exerted by nanoparticles, however, including their role in the management of waste water and soil treatment, cosmetics, food packaging, agriculture, biomedicines, pharmaceuticals, renewable energies, and environmental remedies. Conversely, NPs also show some toxic effects on microbes, plants, as well as human beings. It has been reported that use of nanotechnological products leads to the more accumulation of NPs in soil and aquatic ecosystems, which may be detrimental for living organisms. Further, toxic effects of NPs on microbes, invertebrates, and aquatic organisms including algae, has been measured. Scientists have also reported on the negative impact of NPs on plants by discussing the delivery of NPs in plants. Additionally, scientists have also showed that NPs interact with plant cells, which results in alterations in growth, biological function, gene expression, and development. Thus, there has been much investigated and reported on NPs and plant interactions in the last decade. This book discusses the most recent work on NPs and plant interaction, which should be useful for scientists working in nanotechnology across a wide variety of disciplines.

Zinc-Based Nanostructures for Environmental and Agricultural Applications shows how zinc nanostructures are being used in agriculture, food and the environment. The book has been divided into two parts: Part I deals with the synthesis and characterization of zinc-based nanostructures such as biogenic, plant, microbial, and actinobacteria mediated synthesis of zinc nanoparticles, Part II is focused on agri-food applications such as antibacterial, antifungal, antimicrobial, plant disease management, controlling post-harvest diseases, pesticide sensing and degradations, plant promotions, ZnO nanostructure for food packaging application, safe animal food and feed supplement, elimination of mycotoxins, and veterinary applications. Part III reviews technological developments in environmental applications such as risks and benefits for aquatic organisms and

the marine environment, antiseptic activity and toxicity mechanisms, wastewater treatment, and zinc oxide-based nanomaterials for photocatalytic degradation of environmental and agricultural pollutants. The book discusses various aspects, including the application of zinc-based nanostructures to enhance plant health and growth, the effect on soil microbial activity, antimicrobial mechanism, phytotoxicity and accumulation in plants, the possible impact of zinc-based nanostructures in the agricultural sector as nanofertilizer, enhancing crop productivity, and other possible antimicrobial mechanisms of ZnO nanomaterials. Explores the impact of a large variety of zinc-based nanostructures on agri-food and environment sectors Outlines how the properties of zinc-based nanostructures mean they are particularly efficient in environmental and agricultural application areas Assesses the major challenges of synthesizing and processing zinc-based nanostructured materials

Handbook of Nanosafety: Measurement, Exposure and Toxicology, written by leading international experts in nanosafety, provides a comprehensive understanding of engineered nanomaterials (ENM), current international nanosafety regulation, and how ENM can be safely handled in the workplace. Increasingly, the importance of safety needs to be considered when promoting the use of novel technologies like ENM. With its use of case studies and exposure scenarios, Handbook of Nanosafety demonstrates techniques to assess exposure and risks and how these assessments can be applied to improve workers' safety. Topics covered include the effects of ENM on human health, characterization of ENM, aerosol dynamics and measurement, exposure and risk assessment, and safe handling of ENM. Based on outcomes from the NANODEVICE initiative, this is an essential resource for those who need to apply current nanotoxicological thinking in the workplace and anyone who advises on nanosafety, such as professionals in toxicology, occupational safety and risk assessment. Multi-authored book, written by leading researchers in the field of nanotoxicology and nanosafety Features state-of-the-art physical and chemical characterization of engineered nanomaterials (ENM) Develops strategies for exposure assessment, risk assessment and risk management Includes practical case studies and exposure scenarios to demonstrate how you can safely use ENM in the workplace