Overview of project

Title of dataset: Lung toxicity and gene expression changes in response to whole-body inhalation exposure to cellulose nanocrystal in rats

Introduction: Nanomaterials represent a new class of materials with numerous industrial applications. Considering the projected increase in the production and use of nanomaterials, a corresponding increase in occupational exposure to nanomaterials and their resulting adverse health effects should be anticipated among workers. There is substantial evidence in the literature, based on cell culture and animal studies, supporting the potential toxicity and detrimental health effects associated with exposure to nanomaterials. Intervention and/or prevention of adverse health effects associated with occupational exposure to toxic nanomaterials will be a major concern for health providers and regulatory and non-regulatory government agencies as the use of nanomaterials expand. A key element in the intervention and/or prevention of the adverse health effects associated with occupational exposure to toxic nanomaterials is a clear understanding of the molecular mechanisms underlying the pulmonary toxicity induced by nanomaterials.

Due to its physicochemical and mechanical properties, nanocellulose has found many applications in manufactured goods in the paper and food industry, cosmetics, biomedicine, and pharmaceuticals. There is potential for human exposure to nanocellulose or products that contain nanocellulose both during the production and use of the materials that contain nanocellulose. The objectives of the current study were to determine lung toxicity potential of crystalline nanocellulose (CNC) and the molecular mechanisms underlying the toxicity. A rat inhalation exposure model was employed to determine the lung toxicity potential of CNC. Global gene expression profile in the lung and bioinformatic analysis of the gene expression data were conducted to determine the molecular mechanisms underlying the CNC-induced lung toxicity.

Methods collection: The studies were conducted by employing a rat inhalation exposure and toxicity model. Rats were exposed to air or crystalline nanocellulose (CNC) and lung toxicity and gene expression profile were determined. Lung toxicity parameters analyzed included bronchoalveolar lavage (BAL) LDH activity, counts of total cells, alveolar macrophages (AM), binucleated macrophages, polymorphonuclear leukocytes (PMN), and cytokine levels, lung histology, and gene expression profile and bioinformatic analysis of the differentially expressed genes. Blood collected from the rats were also analyzed for various hematology parameters.

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Authors

1. Pius Joseph, Toxicology and Molecular Biology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: pcj5@cdc.gov
2. Tina Sager, Toxicology and Molecular Biology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: sst2@cdc.gov
3. Christina Umbright, Toxicology and Molecular Biology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: cfo3@cdc.gov
4. Jenny Roberts, Allergy and Clinical Immunology Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: jur6@cdc.gov
5. Walter McKinney, Physical Effects Research Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: wdm9@cdc.gov
6. Marlene Orandle, Pathology and Physiology Research Branch, Health Effects Laboratory Division, National Institute for Occupational Safety and Health (NIOSH), E-mail: yjj6@cdc.gov

Contact point for further information

Toxicology and Molecular Biology Branch,
Health Effects Laboratory Division,
National Institute for Occupational Safety and Health,
1000 Frederick Lane,
Morgantown, WV 26508
(304)285-6240 (Tel)