6th International Symposium on Nanotechnology, Occupational and Environmental Health

The aim of the symposium is to provide a scientific forum for researchers and practitioners to present and discuss the latest researches on occupational and environmental health issues of nanotechnology.

Date: **October 28 (Mon) → 31 (Thu), 2013**

Place: **Nagoya, Japan**

Venue: **Nagoya Congress Center**

Topics

- **Nanomaterial processing and characterization**
- **Health effects and toxicity (in vivo, in vitro)** of manufactured nanomaterials
- **ADME** (Absorption, distribution, metabolism and excretion) and methodology for **kinetic study** of manufactured nanomaterials
- **Environmental toxicity** of manufactured nanomaterials
- **Exposure assessment** in the workplaces producing or handling manufactured nanomaterials
- **Risk assessment** of manufactured nanomaterials
- **Risk management** of manufactured nanomaterials
- **Outreach** for occupational and environmental health in nanotechnology
- **Epidemiology** on the workers exposed to manufactured nanomaterials
- **Worker protection**: Identifying and training the nanomaterial workforce

Organizers

Japan Committee for the 6th International Symposium on Nanotechnology, Occupational and Environmental Health / Planning Committee for the International Symposium on Nanotechnology, Occupational and Environmental Health

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O-29-A-09 A novel human exposure system for nanoparticle tracking and oxidative stress assessment

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Inhaled NPs can affect health by direct interaction with lung cells and through transfer to other organs. Negative effects are expected from catalytically active NPs that can generate oxidative stress, which can damage cells and launch a cascade of effects, contributing to acute and chronic diseases. The aims of our current study are 1) to better understand the extent inhaled NPs translocate into the circulation and are excreted into urine and 2) the potential of these NPs to induce oxidative stress markers in the lung lining fluid, followed by an increase in such markers in circulation and urine. We will use an open label, controlled, randomized human volunteer study. Subjects will be assigned to one of two exposure groups, each consisting of 10 healthy volunteers. Volunteers will inhale, during 40 minute exposure durations, either aerosolized medical-grade superparamagnetic iron oxide nanoparticles (SPIONs), or reactive tobacco-smoke NPs as a positive control for the oxidative stress response. Each volunteer will participate in three experiments; each at a different exposure level. Biological liquids (exhaled breath condensate, blood and urine) will be collected at several time points before after the exposure. This study will be the first ever controlled human inhalation study to aerosolized medical iron oxide nanoparticles. Due to the uncertainty that remains in regards to the kinetics of oxidative stress response of inhaled iron oxide nanoparticles, matched with widespread occupational exposure to these particles, this study will provide salient safety information for workers worldwide. The developed methodology will further allow for a non-invasive evaluation of the inhaled NPs target dose and will assess the pathways for circulatory translocation of inhaled NPs.

O-29-A-10 Preparation of nano-sized aerosol particles by a spray-drying technique with breaking up of droplets

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Inhalation experiments for the risk assessment of nanoparticles require preparation of airborne test particles at a designated mass concentration. Spray-drying is a useful technique that can aerosolize existing nanoparticles to be tested by generating and drying the droplets of an aqueous suspension of them. However, the aerosol particles prepared with this technique are usually agglomerates which tend to become larger as a higher aerosol concentration is targeted. Since this is due to the one-droplet-to-one-particle mechanism, a high concentration and a small size can be attained at the same time if the size of the droplets are decreased. We considered that breaking up of a droplet into many smaller ones by the Coulomb explosion would be effective. In our experiments, sprayed droplets were electrically charged by airborne unipolar ions. When the droplets reach the Rayleigh limit as they shrink due to evaporation, they are expected to undergo the Coulomb explosion to release smaller droplets. The effectiveness of this method was examined by measuring the size distribution of the obtained aerosol particles. Agglomerates of 100-200 nm in airborne size were prepared from a suspension of metal oxide nanoparticles of about 10-30 nm in the absence of the droplet charging. In contrast, aerosol particles below 100 nm were prepared in the presence of charging. The particles consisted partially of single nanoparticles.