

Use of Nanoparticles

Purpose:

To provide guidance for the use of nanoparticles in the laboratory and animal facility environment. According to the American Society of Testing Materials (ASTM) Committee on Nanotechnology, a nanoparticle is a particle with lengths in two or three dimensions between 1-100 nanometers (nm).

The field of nanotechnology is an emerging field, and the risks associated with the use and exposure to nanoparticles are not yet clearly understood. The use of nanotechnology makes it possible to form new materials, structures and devices, which exploit the unique physical and chemical properties associated with nanoscale structures.

Nanoparticles are used at UW-Madison in animal research for a variety of research applications. There is little known about the effects of nanoparticles, therefore, an ultra-conservative approach should be taken when handling the material. Due to their size, nanoparticles have the greatest potential to enter the body through the respiratory system if they are airborne, through the skin, or through ingestion. Additionally, the ability for nanoparticles to cross the blood-brain barrier poses a concern for handling and exposure within the laboratory environment.

Definitions:

- Nanoparticle (also known as nano-object): a particle with lengths in two or three dimensions between 1-100 nanometers (nm)
- Ultrafine particle: airborne particles smaller than 100 nm in diameter. These have not typically been intentionally produced, but are related to incidental products of processes involving combustion or vaporization (ie. welding fumes or diesel exhaust). Also known as incidental nanoparticles.
- Engineered nanoparticles: intentionally produced particles that are not classified as ultrafine particles. These particles are engineered specifically for specific properties or compositions (ie. shape, size, surface properties, and chemistry).
- Nanoaerosol: Collection of nanoparticles suspended in a gas, which may include nano-objects, agglomerates, and aggregates.

Precautions:

The following information can be used to complete the Safety section of your animal protocol.

1. Containment preparation – (Containment equipment required for the preparation of the chemical): (Select one of the following)
 - Fume Hood
 - Ducted Biosafety Cabinet (BSC)
2. Containment animals – (Containment equipment required for chemical administration and handling animals after exposure to the chemical): (Select one of the following)

- Fume Hood
- Ducted Biosafety Cabinet (BSC)

For Rodents: Microisolators containment caging is required.

3. PPE needed - (for handling live animals, carcasses or animal waste/dirty bedding):
(Select all of the following)

- Exam gloves – nitrile
- Safety glasses/goggles
- Lab coat or disposable gown
- Other and add in “Coat with cuffs or Tyvek sleeves in addition to regular lab coat”

4. Waste Disposal: (Select both options and include additional information for Other)

- Bag animal waste/dirty bedding and place sealed bag in secondary container and place secondary container in regular trash.
- Other: Signage is required on each individual cage containing the biohazard symbol and “Agent, End date and Disposal method”. Signs are removed when special handling time has ended. *Cage signage available at www.ehs.wisc.edu

5. Carcass disposal: (Select the following)

- No special precautions needed for disposal use facility standard method.

6. Chemical human risk: (Add the following statement):

Material may be irritating to mucous membranes and upper respiratory tract, may be harmful if inhaled, swallowed, absorbed through skin, and may cause skin or eye irritation. Exposure should be kept as low as reasonably achievable. This includes, but is not limited to: minimizing volume, the number of individuals exposed, and the duration of exposure. In addition, if possible, utilizing closed systems or handling the material in liquid form (ie. wet/damp).

References:

American Society for Testing and Materials (ASTM) E2456-06 (2012), “Standard Terminology Relating to Nanotechnology”.

National Institute for Occupational Safety and Health (2009). Approaches to Safe Nanotechnology. Managing the Health and Safety Concern Associated with Engineered Nanomaterials. Cincinnati, OH: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.
<http://www.cdc.gov/niosh/docs/2009-125/pdfs/2009-125.pdf>.