

Nanoparticles are particles that have at least one dimension between 1 and 100 nanometers in size and are often combined into a larger matrix known as a nanomaterial. They can be naturally occurring, such as volcanic ash, ocean spray, or biological matter (e.g. viruses). Or, may be produced incidentally as byproducts, such as car emissions, smoke from a fire, or large-scale mining operations. Nanoparticles are also man-made and engineered for industrial applications, scientific research, medical procedures, and even food additives.

Because nanoparticles have more surface area to volume than larger particles, they often have different properties than larger particles of the same composition. This makes them of interest to researchers and of potential benefit to society. Nanoparticles can be spheres, rods, tubes, and other geometric shapes and these small particles may be bound to surfaces or substrates, put into solution or suspension, attached to a polymer, or in a few cases, handled as a dry powder.

**Exposure Guidelines**

Various organizations, like the Center for Disease Control (CDC) and the National Institute for Occupational Safety and Health (NIOSH) have been studying the health effects of exposure to various nanoparticles. Toxicity data is limited, but safety precautions for the use and handling of nanoparticles in laboratory research are generally the same for handling chemicals of unknown toxicity. These conservatively protective handling precautions are intended to mitigate risk to researchers regardless of the specific nature of the nanoparticle core of the materials that they may be used to deliver.

**General Safety**

Basic good chemical hygiene practices should be used when working with or around nanoparticles to avoid accidental exposure. These practices can be found in the [UTHSC Chemical Hygiene Plan](https://www.uthsc.edu/research/safety/documents/rs001-chemical-hygiene-plan.pdf), but the following practices provide a general guideline for safe lab practices.

* Read and follow the Safety Data Sheet (SDS) that accompanies the nanomaterial. Maintain the SDS readily available for employee awareness or in case of accidental contact or spillage.
* Eating and drinking are not permitted in labs and is only permissible in designated areas where chemicals or nanoparticles are not used.
* When there is the potential for aerosol generation or exposure via inhalation nanomaterials should be handled using a chemical fumehood, biological safety cabinet or other engineering controls. Ensure your environmental control equipment, e.g. chemical fume hoods or biological safety cabinets, are evaluated and working properly before handling the nanomaterial.
* Wear the proper PPE prescribed for the use of the particular nanomaterial with which you are working. This includes gloves and other PPE necessary to cover exposed skin that may come in contact with nanomaterials (e.g. lab coat, sleeve covers). If there is the potential for aerosol creation or inhalation exposure that is not adequately contained through the use of engineering controls the use of a respirator may be appropriate. (Contact the Office of Research Safety or visit the respiratory protection webpage for additional information pertaining to the compliant use of respirators.)
* Equipment to contain and clean a nanomaterial spill should be readily available in or near each laboratory working with these materials. These materials should be appropriate for the types of nanomaterials handled in your lab.
* All waste engineered nanoparticles should be treated as unwanted hazardous “toxic” materials unless it is known to be non-hazardous. [Hazardous waste labels](https://www.uthsc.edu/research/safety/documents/haz-waste-labels-2015.pdf) are available here and waste pickup requests can be submitted by emailing labsafety@uthsc.edu.

**Training**

Lab supervisors must incorporate safety training into their new employee onboarding training to communicate to their staff the hazards they will encounter in their specific job responsibilities before they begin work. Additional training in nanoparticle safety should be included in their hazard communication training if they will be working with or around nanoparticles. This additional training should include:

* Potential hazards of exposure to nanoparticles and proper lab practices to prevent exposure.
* Location and proper use of PPE recommended for use when working with nanomaterial.
* Appropriate nanomaterial handling and storage procedures.
* Cleaning of contaminated surfaces or clothing and proper disposal of nanomaterials or nanomaterial-contaminated objects
* What does an employee do in the event of accidental exposure or injury?

**Labeling and Storage**

Under the OSHA Hazard Communication Standard, 29 CFR 1910.1200, employers are required to label all hazardous chemicals in the workplace. Nanomaterials should be stored in labeled containers that indicate their chemical content and form. Liquids or dry particles should always be stored in unbreakable, tightly sealed containers. Secondary containment should be used when appropriate. Appropriate signage indicating the name of the nanomaterial and the hazards associated with it should be posted legibly on the original or secondary storage containers. PPE requirements and any other pertinent information should be posted at entry points to areas where nanomaterials and other hazardous compounds are handled or stored.

**Supervisor Responsibilities**

Supervisors of labs using nanoparticles in their research must do the following:

* Provide safety training for employees working with or around nanoparticles covering the topics listed above.
* Train employees on the location and use of personal protective equipment to be used while working with or around nanoparticles.
* Supervise employee work practices to the degree necessary to avoid the hazards associated with nanoparticles.
* Contact the CorVel nurse triage line at 1-866-245-8588 to report any accidental exposure to nanoparticles and to coordinate any medical care if needed.

**Additional Information**

Ensure you receive safety training from your supervisor and, for a more detailed resource for nanoparticle safety for which this safety guideline was based on, see [General Safe Practices for Working with Engineered Nanomaterials in Research Laboratories](https://www.cdc.gov/niosh/docs/2012-147/pdfs/2012-147.pdf) published by the National Institute for Occupational Safety and Health (NIOSH).

In case of accidental exposure or injury from exposure to nanoparticles, call CorVel at 1-866-245-8588. Or, for more information on nanoparticle safety, contact your supervisor or the Office of Research Safety at (901)448-6114 or email labsafety@uthsc.edu.