Safe Weighing of Toxic Powders

Overview
Exposure to hazardous chemicals can occur in numerous ways, including the weighing and manipulation of powders and particulates. Distributing and weighing of powder is a regular practice in many laboratories and improper techniques can result in exposure to laboratory personnel. The powder(s) being weighed vary in physical characteristics. Toxicity and exposure can occur either by (1) particles that become temporarily suspended in air during weighing, which can be inhaled or may settle on exposed skin; or (2) contamination of equipment and work surfaces. Exposure to even small levels of acutely toxic chemicals may result in adverse health effects. Proper handling techniques and housekeeping are required when working with acutely toxic powders.

Applicability
This Update provides general safety precaution information to users of toxic powders. All laboratory personnel who work with or otherwise handle these chemicals must be familiar with these guidelines. In addition, all laboratories that weigh or manipulate acutely toxic powders must develop High Hazard Operating Procedures that, at a minimum, incorporate the guidelines listed in this Update. Acutely toxic powders are those that have a toxicity level of ≤ 50 mg/kg oral, ≤ 200 mg/kg dermal, or ≤ 0.5 mg/l inhalation (as described in the Medical College’s Laboratory Chemical Hygiene Plan).

Responsibilities
Environmental Health and Safety (EHS) provides assistance with the development and implementation of High Hazard Operating Procedures, and with associated exposure control strategies for the use of highly hazardous substances.

Laboratory Personnel who handle toxic powders must be familiar with the hazards associated with these materials, as well as with the appropriate techniques for their safe handling and use.

Principal Investigators (PIs) are responsible for identifying highly hazardous substances present in their laboratories. They are also responsible for implementing High Hazard Operation Procedures (HHOPs) for the safe handling and use of these materials including safe powder weighing techniques. PIs must ensure all laboratory personnel handling these chemicals have reviewed and are familiar with the HHOPs.

Personal Protective Equipment (PPE)
1. Wear appropriate Personal Protective Equipment (PPE) such as: lab coats, clothes that cover the legs, closed-toed shoes, and gloves.
2. Remove/change gloves and wash hands immediately after handling toxic materials.
3. Launder lab coats regularly.
4. Consult EHS prior to utilizing a dust mask or respirator. Improper use or selection of respirators may lead to an unsafe condition.

Procedures
The following guidelines must be considered when handling acutely toxic materials:

1. Alternatives to Powder Weighing:
   ▪ Where feasible, purchase solid chemicals in pre-mixed solutions in order to avoid powder handling.
   ▪ When available, purchase powders in pre-weighed volumes and/or in sealed vials with a septum so that diluting agent can be added directly to the container.

2. If either of the previous alternatives are not feasible, the following guidelines must be followed:
   ▪ Always handle toxic powders in a chemical fume hood whenever possible. If airflow or vibration issues prohibit use within a hood, consider utilizing alternative ventilation controls such as a HEPA filtered ventilated balance enclosure.
   ▪ Never handle toxic powders near desks or computer work-stations.
   ▪ Designate a specific location within the lab where handling of acutely toxic powders is performed and limit its use to that area. Avoid areas of high traffic such as along aisles or near doors.
3. **Use disposable items**, when possible, such as spatulas and weigh paper and dispose of them immediately after use.
4. **Electrostatic charging of equipment** (e.g. plastic tare vessels) is common and can cause powders to be scattered over a larger area. Minimize contamination by powders likely to become airborne (i.e. small size or statically charged) by utilizing anti-static weigh vessels or an anti-static bar or gun.

**Decontamination**

Contamination of work surfaces and equipment is a recurrent source of potential exposure. Work areas and non-disposable equipment should be cleaned after each use employing the following guidelines:

1. Never use a brush to clean scales or hard surfaces as this will spread contamination.
2. Wipe all equipment and work surfaces with a towel that is wetted with an appropriate solvent in which the powder is soluble.

**References**

*Duke University*, Occupational Hygiene and Safety Division, “Working Safely with Toxic Powders”

*The University of Arizona*, Risk Management and Safety, “Weighing Hazardous Powders in the Laboratory”

Anti-Static Devices