

Safe Weighing of Toxic Powders



Overview

Exposure to toxic powders can result in acute or chronic health effects, including death. Exposure can cause adverse effects such as irritation, cancer, reproductive issues, and sensitizations, or pose physical hazards from self-heating, shock sensitivity, or ignition in contact with air. Common toxic powders used in the lab include acrylamide, ethidium bromide, sodium hydroxide, sodium azide, trypan blue, and many hazardous drugs.

Weighing powders can suspend them in the air, which may result in inhalation. It can also contaminate equipment and work surfaces, which can lead to skin contact and ingestion. This Update highlights best practices to prevent exposures during toxic powder weighing.

Applicability

This document applies to all WMC laboratory students, faculty, staff, and visitors weighing toxic powders.

Responsibilities

Principal Investigators (PIs) must:

- Identify toxic powders and consider substitution for less hazardous materials.
- Implement High Hazard Operation Procedures (HHOPs) for toxic powders that are High Hazard Substances (see Reference 1).
- Ensure that all laboratory personnel have reviewed and understand the hazards and controls of working with toxic powders.


Laboratory Personnel needs to:

- Read the Safety Data Sheet and be familiar with the hazards and appropriate techniques for weighing toxic powders.
- Review the HHOP if applicable.
- Complete annual laboratory safety training.

Environmental Health and Safety (EHS) provides assistance with the identification of hazardous powders as well as the development and implementation of High Hazard Operating Procedures and associated exposure control strategies.

Hazard identification

Refer to the product label and Safety Data Sheet (SDS) for physical hazard and toxicity information. Hazards are typically identified by:

- Pictograms such as 
- Hazard warnings such as **DANGER** and **WARNING**.
- Hazard statements such as “harmful if swallowed,” “fatal in contact with skin,” and “suspected of causing genetic defects.”

Below is a list of GHS H codes and hazard statements from SDSs. Although not exhaustive, it mentions some of the main health hazard ratings potentially associated with laboratory powder reagents that signal a need for special handling.

H300	Fatal if swallowed
H301	Toxic if swallowed
H310	Fatal in contact with skin
H311	Toxic in contact with skin
H330	Fatal if inhaled
H331	Toxic if inhaled
H304	May be fatal if swallowed & enters airways
H305	May be fatal if swallowed & enters airways

H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H317	May cause an allergic skin reaction
H318	Causes serious eye damage
H319	Causes serious eye irritation
H320	Causes eye irritation
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
H340	May cause genetic defects
H341	Suspected of causing genetic defects

H350	May cause cancer
H351	Suspected of causing cancer
H360	May damage fertility or the unborn child
H361	Suspected of damaging fertility or the unborn child
H370	Causes damage to organs
H371	May cause damage to organs
H372	Causes damage to organs through prolonged or repeated exposure
H373	May cause damage to organs through prolonged or repeated exposure



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Procedures

The following guidelines must be considered when handling toxic powders.

1. Purchasing

- Purchase solid chemicals in pre-mixed liquid solutions when possible to avoid handling powders.
- Purchase powders in pre-weighed volumes and/or sealed vials with a septum that allows for adding the solvent directly to the container.
- Purchase toxic powders in the smallest quantity available to complete the work.

2. Weighing

- Weigh toxic powders in a chemical fume hood when possible. If airflow or vibration issues prohibit it, consider utilizing:
 - Alternative ventilation controls such as a HEPA-filtered ventilated balance enclosure (Figure 1),
 - Glove bag (e.g., Atmos bags, Figure 2) or glove box (Figure 3),
 - An enclosed balance (Figure 4),
 - The Tare Method (see below),
- Designate and label a specific location within the lab where toxic powders are used (e.g., toxic powder work zone).
- Never handle toxic powders near desks or computer workstations.
- Avoid areas of high traffic such as along aisles or near doors.
- Use disposable items such as spatulas and weigh paper and dispose of them immediately after use.

3. Tare Method

- Place an empty container with a lid on the balance and press tare (the mass should read zero).
- Take the container to the fume hood, add the powder to the container and close the lid.
- Go to the balance and weigh the powder.
- Return to the fume hood for weight corrections, dilutions, or manipulations.

4. Electrostatic charging

- Electrostatic charging of equipment (e.g., plastic tare vessels) is common and can cause powders to be scattered over a large area. Minimize powders becoming airborne (i.e., small size or statically charged) by utilizing anti-static weigh vessels or an anti-static bar or gun. See options at [Sigma Aldrich Anti-Static Devices](#).

Personal Protective Equipment (PPE)

- Standard laboratory PPE: fastened lab coat, clothing that covers the legs, closed-toe shoes, safety glasses, and gloves.
- Remove gloves after weighing and wash hands immediately. Launder lab coats regularly.
- If the chemical has a label with the code H310, "*fatal in contact with skin*," wear two pairs of gloves.

Decontamination

1. Work areas and non-disposable equipment should be cleaned after each use with toxic powder by wiping all equipment and work surfaces with a towel wetted with a solvent in which the powder is soluble.
2. Never use a brush to clean balances or hard surfaces as this will generate dust and spread contamination.

References

[WMC Laboratory Chemical Hygiene Plan Section 13.0 High Hazard Operating Procedure](#)

[OSHA 1910.1450 App A Section E 2. Nanoparticles and Nanomaterials](#)

[Duke University Occupational & Environmental Safety Office, Guidelines Toxic Powders](#)

[The University of Arizona Risk Management and Safety, Weighing Hazardous Powders in the Laboratory](#)



Figure 1. HEPA-filtered balance enclosure.



Figure 2. Glove Bag.



Figure 3. Glove Box.

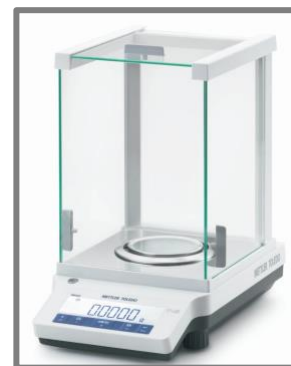


Figure 4. Enclosed analytical balance box.