ENVIRONMENTAL HEALTH AND SAFETY
University of Nebraska-Lincoln

Safe Operating Procedure

(**Revised 12/22**)

ACRYLAMIDE

This SOP provides specialized information for the use, handling, and storage of acrylamide, a neurotoxin and probable human carcinogen.in a laboratory setting. **As with any chemical, please read the Safety Data Sheet (SDS) before use.**

Background

Acrylamide is a common research laboratory chemical. It is used as a cross linking (polymerizing) agent during gel chromatography and electrophoresis. Polymerized acrylamide is not toxic, but the monomer can cause peripheral neuropathy and is a probable human carcinogen.

Symptoms of acrylamide exposure may include irritation at the contact site; ataxia (loss of muscle coordination), numb limbs, paresthesia (tingling); muscle weakness; absent deep tendon reflex; hand sweating; lassitude (weakness, exhaustion), drowsiness; and reproductive effects.

Routes of Exposure

Symptoms of exposure to acrylamide appear to be the same regardless of the route of exposure. Avoid inhalation, ingestion, or absorption via contact with skin or mucous membranes.

Acute Versus Chronic Effects

In many cases, chemicals express both acute (short-term) and chronic (long-term) effects based upon the type of exposure. Current guidance from the Agency for Toxic Substances and Disease Registry indicates that the exact time between acute exposure and acute effects in humans is not known. Toxicological studies report the onset of symptoms to vary from four weeks to periods exceeding 24 months.

This makes the risk of overexposure to acrylamide particularly hazardous because an acute exposure may not yield symptoms of toxicity for several days to weeks, during which time there may be continued exposure. Determining whether the resulting symptoms of poisoning are due to acute or chronic exposures is difficult, since the symptoms of acute exposure parallel those of chronic exposure for many if not most symptoms.

Carcinogenicity

Acrylamide is classified as a probable human carcinogen. Animal studies suggest acrylamide exposure can result in tumors of the lungs, skin, brain, testes, thyroid, and adrenal glands. Epidemiologic studies in humans have found no consistent evidence of acrylamide exposure being associated with the risk of any type of cancer, but precautions should be taken when handling the compound to avoid any potential risk.

Methods to Control Exposure

Acrylamide is commercially available in pre-mixed aqueous solutions or in powder form. In the powder form, acrylamide is odorless and white in color. In its powder form, the monomer is extremely dangerous because the dust can easily become airborne and enter the respiratory system. In this regard, pre-mixed acrylamide solutions are safer to use. Un-polymerized acrylamide is of primary concern.

While laboratory personnel are strongly encouraged to purchase aqueous stock solutions or pre-made gels, the following procedures are recommended if it is necessary to use acrylamide in powder form.

Measuring Acrylamide Powders

- Wear nitrile gloves, a lab coat, and goggles during measuring, weighing, and mixing operations. If gloves become contaminated, remove and don clean gloves.
- While working in a chemical fume hood, take an aliquot from the bulk supply that closely approximates the amount needed. Place the aliquot in a closable container. It is best to tare the container prior to use and then make final weight adjustments at the balance.
- Conduct final weighing transfers carefully to avoid creating airborne dusts.
- Wash hands and forearms thoroughly after removing gloves.
- Clean fume hood, bench, and balance. Surfaces to be cleaned should be initially wiped with a water dampened paper towel, followed up with a mild soap and water solution. Rinse surfaces as appropriate to remove soap residue.
- Solids generated from clean-up and contaminated materials should be collected and disposed of via EHS.

Pouring Gels

- Avoid splashes. Replace gloves if they become contaminated.
- After the gel is poured, allow residual acrylamide to polymerize in the flask.
- Polymerized gel can be loosened from the flask with a spatula then disposed of in the designated collection container for pickup by EHS.
- Areas where gels are poured should be protected with a lab bench cover. Bench covers should be disposed via EHS upon contamination from spilling or after prolonged usage.

Post-electrophoresis

- Wear appropriate PPE (gloves, eye protection, lab coats) when dismantling electrophoresis apparatus.
- Gels that are stained with Coomassie blue, and then rinsed in a solution containing less than 10% methanol, may be placed in a collection container to dry. When the container is full, the container should be tagged for EHS disposal.
- It is permissible to use the same collection container for acrylamide and agarose gels, however, if gels are silver stained, they must be collected separately for EHS disposal.

Spill Response

- Depending on the size and nature of the spill, clean-up by lab staff may not be prudent or safe. Review and follow guidance provided for chemical spill response available on the EHS website to determine suitable response. *See EHS SOP:* **PRE-PLANNING FOR AND RESPONDING TO CHEMICAL SPILLS**
- Spills of solid acrylamide in its powdered form require additional caution due to the inhalation hazard from it readily becoming airborne. Liquid acrylamide spills, while not immediately hazardous, should be addressed promptly to minimize any risk of exposure.
- For solids:
  - Cover the spilled powder with paper towels and dampen with water.
  - Wipe up the powder with the damp paper towels.
  - Repeat until all spilled solids have been collected.
  - Collect clean-up materials in a durable container for disposal.
- For liquids:
  - Use a chemically inert absorbent material to collect the spilled liquid.
  - If using an absorbent pad or similar, wipe up the spill until all the liquid has been collected.
  - If using a powder absorbent or similar, cover the liquid, mix well, and scoop up the saturated absorbent.
  - Collect clean-up materials in a durable container for disposal.
- After clean-up, contaminated surfaces should be wiped down with a 1.6% potassium persulfate solution, followed by a 1.6% sodium metabisulfite to polymerize any left-over residues. If this cannot be done, the area should be cleaned with soap and water.
- All acrylamide contaminated materials and clean-up debris must be collected for disposal by EHS. For detailed instructions for disposal see EHS SOP: **HAZARDOUS/RADIOACTIVE MATERIAL COLLECTION PROCEDURES.**

References: Information contained in this SOP was gathered from the following sources: Harvard University, the Agency for Toxic Substances and Disease Registry, and the National Cancer Institute.