

Iodination Safety Precautions

The following radiological safety procedures should be adhered to during iodination procedures in all University of Michigan iodination facilities.

1.0 Pre-Iodination Considerations

1.1 Equipment Necessary Prior to Starting Iodinations:

- Lab coat and disposable plastic surgeon gloves (2 pairs)
 - Safety glasses or goggles (recommended)
 - Film badge and finger ring dosimeters
 - Appropriate survey meter (low-energy NaI probe recommended)
 - Solution of sodium thiosulfate (0.1M NaI, 0.1M NaOH and 0.1M Na₂S₂O₃)
 - Sheets of lead (1/16" or 1/8") or a leaded-acrylic shield
 - Small lead transfer pig
 - Radioactive waste containers (waste drum & jug)
 - Radioactive material tape or labels
 - Absorbent pads or diapers-(to line hood base and work surfaces)
 - Plastic bags (approximately 8" x 10")
 - Transfer mechanism (tray, bucket, box, other)
 - Disposable syringes (1, 3 or 5cc) filled with activated charcoal (approximately 3)
 - Contamination smear survey filter paper or cotton swabs
 - Rubber septum-sealed vials or other RSS-approved closed reaction and/or sample vial
 - Tissue paper or cotton balls (absorbent material)
 - Screw-cap centrifuge tube (50cc) or small plastic bottle with cap of syringe needles
 - Serum bottle (40cc). with rubber septum lid & 10cc sodium thiosulfate (for liquid waste)
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1. All individuals must be approved by Radiation Safety Service (RSS) prior to performing initial iodination, and each iodinator must be observed by an RSS health physicist during initial iodination.
 2. All iodimators should schedule and receive a base-line thyroid bioassay at RSS prior to initial iodination.
 3. Perform all iodination procedures in an RSS-approved exhaust hood.
 4. Perform all iodinations in a closed system set-up.
 - a. Use rubber septum-sealed vials and syringes (instead of pipettes); open vials and pipettes are unacceptable .
 5. Use low specific activity stock solutions of 1-125 (<100 MCi/ml) to perform iodinations.
 6. Practice initial iodinations using "cold" or "dummy" runs to eliminate problems.
 7. Maintain a solution of sodium thiosulfate (approx, 50cc) near an iodination exhaust hood at all times.
 8. [25g sodium thiosulfate (0.1M Na₂S₂O₃) + 2g sodium iodide (0.1M NaI) + 1.0 liter sodium hydroxide (0.1M NaOH)]
 9. Avoid ACIDIC (low pH) solutions.

10. Low pH enhances volatility of 1-25; maintain a neutral or above neutral reaction pH.
 - a. Ensure your reconstitution or distilled water pH is > 7.0.
11. Store radioiodines at room temperature or slightly chilled.
 - a. DO NOT freeze NaI solutions; freezing enhances volatilization of NaI solutions.
12. Ensure good exhaust airflow prior to the start of the iodination process. Ideal hood flow is > 100 lfm.
13. Tape a thin strand of tissue or ribbon to the hood sash.
 - a. Do not raise hood sash higher than necessary during iodinations (maximize hood airflow by lowering or closing during iodinations).
 - b. Lower hood sash to closed position when iodination is completed
 - c. Ensure secondary glove box blower fan is turned on prior to start of iodinations (if applicable).
14. Ensure 4-liter RSS waste jugs contain a small quantity of sodium thiosulfate solution to bind all free iodine.
 - a. Waste jugs should remain inside exhaust hoods and capped when not in use. Never uncapped a waste jug outside an exhaust hood.
 - b. Use only waste containers supplied by RSS.

2.0 Considerations During Iodinations

1. Store 1-125 stock solutions in a small lead pig. Place the lead pig in a sealed plastic bag or capped plastic bottle (preferably with a small quantity of activated charcoal) and store in the exhaust hood.
2. Wear double sets of disposable surgeon gloves during iodinations. Monitor gloved hands frequently using a survey meter. Contaminated gloves should be removed and discarded in yellow solid radwaste drums.
 - a. Monitor fingertips and palms very slowly in front of survey meter probe (> 2 sec/area).
3. Equalize vapor pressure in stock, reaction and waste vials by inserting charcoal-filled syringes (plugged with cotton) into vials prior to withdrawing or inserting iodine-contaminated solutions.

NOTE: Use two charcoal-filled syringes ("piggy-back" style) during initial reconstitution or withdrawal of radioactive NaI from stock vials.

4. Remove potentially contaminated syringe needles from rubber septums through an absorbent material (tissue, cotton balls, etc.) to reduce the "aerosol" or localized "plate-out" effect onto vials or hood surfaces.
5. Dampen a tissue or other absorbent material with sodium thiosulfate and clean the rubber septums of all vials prior to storing or removing vials from exhaust hoods. Discard the absorbent material as solid waste.
6. Discard all contaminated solid materials (except needles) in a sealed plastic bag. Discard a sealed bag of waste into a designated RSS radwaste drum.
7. Erect sheets of lead (1/16" or 1/8") or a leaded-acrylic shield to reduce the exposure rate from 1-125 photons; thicker shielding (approximately 1/2" lead or more) for 1-131.
8. Rinse all disposable syringes/syringe needles, reaction vials, fraction collecting vials and other potentially contaminated equipment with a small quantity (< 50 ml) of sodium thiosulfate.

WARNING: Rinse reusable Hamilton syringes with distilled water, acetone or other desirable solutions. Sodium thiosulfate may crystallize in Hamilton syringes causing blockage. Discard rinse and excess iodine solutions into a 40cc serum vial containing approximately 10cc sodium thiosulfate. Discard the 1-125 waste solution in the 40cc serum vial into the 4-liter waste jug provided by RSS.

9. Discard disposable syringe needles or other sharp objects (after rinsing) in a secondary solid-walled container approved by RSS (ex: 50cc centrifuge tube or 500cc plastic capped bottle).



- a. Store capped container in exhaust hood or discard if full. NEVER discard needles into yellow radwaste drums unless in a sealed container.
- 10. Seal contaminated materials (syringes, pigs, etc.) in plastic bags prior to removing them from the exhaust hood.
 - a. Reusable syringes (ex: Hamilton type) should be rinsed several times using appropriate cleansing solution, then with distilled water, placed in its protective sheath, labeled with radioactive material tape and sealed in a plastic bag prior to storage or transfer to another room.
- 11. Minimize your hand exposure to 1-125 by limiting your handling time of stock solutions, using remote handling tools and employing the use of lead shielding.
- 12. Never force long thin-gauged syringe needles (Hamilton type) into rubber septums.
 - a. Firm the needle using two fingers prior to inserting into the septum; monitor hands slowly after this step (1" per second).

3.0 Post-Iodination Considerations

- 1. Label and securely tape transfer pigs prior to storing or transferring radioiodine solutions from the iodination lab.
- 2. Perform a contamination survey at the completion of each iodination and record the results in a logbook for RSS review.
 - a. At a minimum, smear surveys should be conducted in the following locations: hood ledge, floor and bench tops.
 - b. Smear results > 3x-background indicate slight contamination.
 - c. Contact an RSS health physicist (734) 647-1143 if the contamination exceeds 20x background after an initial decontamination of the area.
- 3. Wash your hands with soap & water and monitor your bare hands with an appropriate survey meter prior to leaving the iodination facility.
- 4. Schedule a thyroid count with RSS (734) 647-1143 within 10 days after handling solutions of 1-125 in excess of 1.0 mCi.
- 5. Contact RSS if you intend to change your iodination techniques or procedures.