



Handling Precautions:

Sulfur-35

Half-life	:87.2 days
Type of Emitter	:Beta
Beta Energy	:0.167 MeV
Travel Distance in Air	:25.4 cm or 10.2 inches
Travel Distance in Plexiglas/Lucite	:0.025 cm or 0.01 inches
Annual Intake Limits	
Inhalation	:2 mCi
Ingestion	:6 mCi

CONCERNS

Some ³⁵S labeled compounds may migrate through gloves and skin. ³⁵S compounds should be handled with gloved hands, and in some cases, with double gloves. Change gloves often. One should be careful not to contaminate the skin as some ³⁵S beta particles penetrate the dead layer of the epidermis. Some ³⁵S compounds may be incorporated in the skin causing very large skin doses and a pathway into the body. ³⁵S methionine, cysteine and Translabel® are volatile and should be used in a fume hood. Activated charcoal is effective in helping reduce contamination due to volatility.

Tools and equipment, such as incubators, should be checked for contamination after using ³⁵S-methionine or other volatile compounds. Excessive contamination can be found on the inside surfaces and in water reservoirs of incubators used for ³⁵S work. Most notable surface contamination can be found on rubber seals (rubber stoppers, gaskets or o-rings) of incubators and centrifuges.

SHIELDING

- None required.

DETECTION

- Survey meters with a GM probe have a low efficiency for ³⁵S, usually 4 - 8% (under ideal conditions). A pancake probe may be sensitive if used within a ½ inch of the surface. However, covering the window with plastic wrap or paraffin film will stop most or all of their betas from entering the detector.
- Wipe tests should be taken and counted in a Liquid Scintillation Counter for greatest sensitivity when detecting removable surface contamination.



Laboratory Safety

SAFETY RULES FOR ³⁵S

- Follow General Safety Precautions for all isotopes.

Specific Recommendations:

WHILE WORKING

- Suitable traps may be necessary if large gas or vapor releases are anticipated, to reduce the releases to the environment. It may be necessary to incorporate activated charcoal into experiments involving volatile forms of ³⁵S.
- Screw top tubes with rubber seals are recommended for storage of single-use aliquots of volatile ³⁵S material. Open tubes in a fume hood with appropriate precautions. Allow sufficient time for frozen stock solutions to thaw before withdrawing an aliquot. If you are working with ³⁵S-methionine, cysteine and Translabel® see the related worksheet on ³⁵S volatility.



POST-USE

- Take wipes of work areas and equipment surfaces and count them in a Liquid Scintillation Counter.
- Segregate ³⁵S waste and keep separate from ³²P, ¹²⁵I and other radioactive waste (with the exception of dual label experiments). Consolidate and store the waste in an isolated spot away from work and high traffic areas.
- Dispose of ³⁵S waste according to the waste disposal guidelines. If by sink disposal, ensure that it is soluble in water and does not exceed the posted limit (100 μ Ci daily, if only one radionuclide is being disposed of). Do not exceed this limit, unless otherwise authorized by the Radiation Safety Committee in the permit.

GENERAL RADIATION SAFETY INFORMATION

Radiolysis of ³⁵S labeled amino acids may lead to the release of ³⁵S labeled volatile impurities. Delivery vials and thawed materials should be opened in a fume hood. Vials of ³⁵S labeled cysteine and methionine should be opened and used in ventilated enclosures (exhaust hoods). The addition of stabilizers (buffers) will reduce (not prevent) the evolution of ³⁵S volatiles from tissue culture media. Vent ³⁵S amino acid stock vials with an open-ended charcoal-filled disposable syringe.

Radiolytic breakdown may occur during freezing processes, releasing as much as 1 μ Ci of ³⁵S per 8.0 mCi vial of ³⁵S amino acid during the thawing process. Place an activated carbon or charcoal canister, absorbent sheet, or tray (50-100 grams of granules evenly distributed in a tray or dish) into an incubator to passively absorb ³⁵S vapors. Discard absorbers in the solid radioactive waste.

INFORMATION ABOUT ³⁵S VOLATILITY

³⁵S labeled amino acids (methionine, cysteine, and translabelled) appear to have a volatile radioactive component. There is some indication that the amount of volatilization is amino acid dependent with

³⁵S-cysteine being less volatile than ³⁵S-methionine.

When a fresh 8 mCi vial of ³⁵S-methionine is thawed without a lid in a large open container, approximately 0.01% was released. This may be due to product breakdown during freezing (a physiochemical breakdown). There also appeared to be some volatilization when ³⁵S amino acids are initially introduced to cell culture medium at 37 °C. Therefore it can be reasoned that the release is not metabolic in nature.

It is believed that the ³⁵S contamination is due to either SO₂ or CH₃SH. The volatile component is water-soluble and contributes to contaminating equipment. Using a liquid scintillation counter, 300,000 cpm was detected in 500 ml of water after a container with 2.5 mCi of ³⁵S-methionine was incubated for 6 hours (0.00635%).

What to look out for:

- Incubators - walls of the incubator generally will become contaminated with ³⁵S
- Freezers - When defrosting freezers that stored ³⁵S, the water may be contaminated.

Recommendations for Researchers Using ³⁵S Amino Acids to Reduce Potential Contamination Due to Volatility:

1. Thaw ³⁵S amino acids in a fume hood. Use a needle and rubber septum to aliquot the material, if multiple experiments are going to be conducted using the same stock solution. This eliminates multiple thaw- freeze cycles with the stock vial.



2. Store aliquots in screw top tubes (example: NUNC tubes VWR Catalog).
3. Consider incorporating charcoal paper into the procedure. Line incubators and storage boxes with activated charcoal paper. Contact Atlantic Nuclear for prices 617-828-9118.
4. Change the incubator water after each labeling.

Remember to survey yourself, and work area thoroughly after using ³⁵S amino acids or any radioactive material.