# RADIATION SAFETY DATA – $^{35}S$

$^{35}S$ has become widely used in molecular biology due to the combination of moderate beta energy emission and high attainable specific activity. The low beta energy emission makes $^{35}S$ safe to handle (unless volatile), yet permits some detection with a hand-held monitor and very efficient detection by liquid scintillation counting.

## Physical Data

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| Decay mode | beta emission to $^{35}Cl$ (stable) |
| Physical half-life | 87.4 days |
| Major emissions | beta minus, 167 keV max, 48.8 keV avg |
| Range in air | 26 cm |
| Range in water/tissue | about 0.3 mm |

## Biological Data

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| Dose to live skin | Minimal external hazard, since beta particles barely penetrate the outer dead skin layer |
| Other doses | Most radiochemicals result in < 10 mrem/μCi intake for adults. |
| Annual limit on intake | 6 mCi ingestion<br>2 mCi inhalation |

The critical organ for $^{35}S$ uptake is the whole body. The elimination rate depends on the chemical form and varies from ~ 7 days to 80 days.

The generally low specific activities encountered minimize exposure hazards.

## Common Hazards – Precautions

Detection of contamination is difficult using portable survey instruments, and necessitates the use of swipes counted by liquid scintillation. Liquid scintillation counting efficiency approaches 95%. Typical efficiency for a pancake GM probe at ½" is ~2-3%.

Some $^{35}S$-labelled compounds (notably methionine and cysteine, but not thio-nucleotides) generate volatile decomposition products, which are released during lypholization, incubation, or after storage. Storage containers should always be opened in the fume hood to vent any volatiles. Activated charcoal present during storage or incubations (available in paper form in various sizes from Schleicher & Schuell: β-*Safe*) can absorb such volatiles. Such an absorber should be present in incubator chambers when large-scale incubations with $^{35}S$-labeled amino acids are carried out [refer to Meisenhelder and Hunter, *Nature* 335(1988):120].

No shielding is required during $^{35}S$ use.

Specific Requirements for Handling at OSU

No film or finger badges are required due to minimal external hazard. Survey meters are required when handling > 10 μCi amounts.

Liquid waste must be stored in appropriate containers with properly-fitting screwcaps supplied by the Radiation Safety Office. These containers must be inside a secondary container capable of holding the entire fluid in the event of bottle rupture. Volatile compounds must be stored in a fume hood and vented extensively before disposal. Dry solid waste should be held in the provided 15-gallon drums. Drain disposal is not permitted; the second rinse of a container is considered to be free of $^{35}S$.

The Oregon State limit for $^{35}S$ release in a fume hood is $3 \times 10^{-9}$ μCi/ml ($8.495 \times 10^{-5}$ μCi/ft$^3$). It has been estimated that up to 1 μCi of volatile $^{35}S$ can be released per opening of a 1-mCi stock vial of $^{35}S$-labeled amino acid [Meisenhelder and Hunter, *Nature* 335(1988):120]. When estimating volatile release for Radiation Use Authorization applications, estimate the number of times per year a 1 mCi or 5 mCi stock vial would be opened, multiply by 1 μCi, and use the result as the estimated annual fume hood release. A 3 foot fume hood drawing 100 linear foot/minute with sash at 15" draws 375 ft$^3$/minute; use this data to determine whether projected release will meet the state limit.