SECTION 9

DETERMINATION OF I-125 IN ENVIRONMENTAL SAMPLES

PART A

PRINCIPLE

In this method a direct comparison is made with standards obtained from an NIST traceable source. This is a rapid quantitative method for I-125 if it is known, either by the sample preparation procedure or by a qualitative analysis on some device such as a high resolution intrinsic planar detector, that I-125 is the only radionuclide contributing to the observed peak.

REFERENCES

1. M. R. Mayhugh, Efficiency of Well Detectors, I-125 and I-129, Harshaw Technical Paper.
2. D. L. Harracks and P. R. Klein, Nuclear Institute Method, 124, 585, (1975).

Certification Record for

PROCEDURE #9

DETERMINATION OF IODINE-125 IN ENVIRONMENTAL SAMPLES

		CHECKPOINTS
1.	SAMPLE PREPARATION	_____
2.	IODINE PURIFICATION	_____
3.	FINAL CALCULATIONS	_____
4.	MSDS/HAZARDS DISCUSSED	_____

TECHNICIAN'S SIGNATURE: _____

CERTIFIED BY: _____

DATE: _____

ANALYSIS VALUE: _____

KNOWN VALUE: _____

COMMENTS: _____

_____

_____

PART B

1.0 PURPOSE AND SCOPE

1.1 These procedures describe methodology to determine the content of the I-125 isotope in environmental samples, such as soil, sediment, vegetation, water, milk, filters (air or water), etc.

2.0 APPARATUS AND MATERIALS

2.1 Sample Preparation

Disposable glass culture tubes (16 x 125 mm)
#4 rubber and cork stoppers
Tared scale
Tweezers
Thin spatula
Vegetation grinder
Funnel
Anion exchange resin, chloride form, I-X8 mesh
Decontamination agent

2.2 Analytical Equipment

3" x 3" NaI well crystal detector
Lead shield with cadmium-copper sleeve
Multichannel analyzer
I-125 reference standard (traceable to NIST)

3.0 PROCEDURE

Before proceeding, you must be certified as indicated in Section 4(1) of this manual and Section 5 of the QA Manual. See preceding page for a copy of the certification record.

3.1 Preparation

3.1.1 Soil or sediment

3.1.1.1 Mix soil well to obtain a uniform distribution - do not dry soil before mixing.

3.1.1.2 Place approximately 10 g of soil into a tared 16 mm glass culture tube (see 3.2.1).

3.1.1.3 Weigh the filled tube.

3.1.1.4 Insert a stopper and secure with tape.

3.1.2 Vegetation

3.1.2.1 Grind frozen or fresh vegetation - do not dry vegetation before I-125 analysis.

3.1.2.2 Place approximately 3-5 g of ground vegetation into a tared 16 mm culture tube (see 3.2.1).

3.1.2.3 Weigh the filled tube.

3.1.2.4 Insert stopper and secure with tape.

3.1.3 Water

3.1.3.1 Water can be filtered to distinguish between suspended solids and the soluble fraction if desired.

3.1.3.2 Place approximately 10 ml of water into a tared 16 mm culture tube (see 3.2.1).

3.1.2.3 Weigh the filled tube.

3.1.2.4 Insert stopper and secure with tape.

3.1.4 Milk (alternate water) A

3.1.4.1 Place 10 g of anion exchange resin (chloride form, 1-X8, 50-100 mesh) in 1 liter of water.

3.1.4.2 Stir well for approximately 60 minutes.

3.1.4.3 Allow to settle and decant liquid.

3.1.4.4 Remove resin and transfer to a tared 16 mm culture tube (see 3.2.1).

3.1.4.5 Insert stopper and secure with tape.

3.1.5 Milk (alternate water) B

3.1.5.1 Place 10 g (preweighed) of anion exchange resin (chloride form, 1-X8, 50-100 mesh) in a column.

3.1.5.2 Pass 1 liter of liquid through the column at a rate of approximately 20 ml/min.

3.1.5.3 Transfer the resin to a tared 16 mm culture tube (see 3.2.1).

3.1.5.4 Weigh the filled tube.

3.1.5.5 Insert stopper and secure with tape.

3.1.6 Air and Water Filter Papers

3.1.6.1 Place paper in 16 mm culture tube (paper may be cut to achieve desired geometry).

3.1.6.2 Insert stopper and secure with tape.

3.1.7 Charcoal Filter Media

3.1.7.1 Determine the total weight of the charcoal sample.

3.1.7.2 Mix the charcoal well to obtain a uniform distribution.

3.1.7.3 Fill a tared 16 mm glass culture tube to approximately 6.3 cm (see 3.2.1).

3.1.7.4 Weigh the filled tube to determine amount of charcoal sample used (should be 4-6 g).

3.1.7.5 Insert a stopper and secure with tape.

3.2 Calibration

3.2.1 Place an NIST traceable liquid standard in a 16 mm culture tube. The level of this liquid should be about 6.3 cm. (Sample volumes will be adjusted to reproduce this geometry.)

3.2.2 Using a 3" x 3" NaI well-counter, adjust the pulse height analyzer region of interest for energies between 25 and 35 keV.

3.2.3 Determine the efficiency (cpm/dpm) or (cpm/pCi) for this counting arrangement by spiking with an NIST traceable standard.

3.3 Sample Counting

3.3.1 Wipe outside of culture tube to remove any external contamination.

3.3.2 Place tube in a 3" x 3" NaI well-counter, connected to a pulse height analyzer.

3.3.3 Determine the counting rate in the 25 to 35 keV range.

3.4 All necessary data is recorded and reduced using the following calculations:

$$pCi\ /\ UNIT \qquad \frac{(pCi\ of\ I\text{-}125)\ (ncnts\ of\ sample)}{(ncnts\ of\ I\text{-}125)}$$

$$ERROR\ /\ UNIT = 1.96\sqrt{gcnts + bkg} \times \frac{pCi\ of\ I\text{-}125}{ncnts\ of\ I\text{-}125}$$

$$MDA\ /\ UNIT = 2.71 + 4.66\sqrt{bkg} \times \frac{pCi\ of\ I\text{-}125}{ncnts\ of\ I\text{-}125}$$

4.0 INTERFERENCES

Because of the low photon energies associated with Compton scattering and x-ray photons from other radionuclides it may cause significant interferences in this procedure.