ENVIRONMENTAL HEALTH AND SAFETY
University of Nebraska-Lincoln

Safe Operating Procedure

(Revised 3/20)

SAFETY PROTOCOL: Cl-36

Use of radioactive materials requires a safety protocol be submitted to the UNL Radiation Safety Committee (RSC) for approval. This is a safety protocol. To obtain RSC approval:

- Submit an Authorization for Radioactive Material Use request for review by the UNL RSC. Contact the UNL Radiation Safety Officer (RSO) for specific instructions.
- Agree to use this safety protocol or submit an alternative and equivalent procedure that you develop to meet your unique needs.

All radiation workers must be at least 18 years of age and have completed required radiation safety training. **Never handle radioactive material prior to the completion of radiation safety training.**

All research protocols involving the radioactive material must be approved by the RSC.

Physical Data

- Half-life of Cl-36 = 300,000 years.
- Beta particles are the primary radiation hazard.
- Beta particle maximum energy = 710 keV.
- The maximum beta range in air = 2 m.

Radiation Protection Procedures

1. Special equipment or procedures
    a. Use transfer pipettes, spill trays, and absorbent coverings to confine contamination.
    b. Volatile chemical forms should be handled in a certified fume hood.
    c. Use lab coats, safety glasses, and disposable gloves.
    d. Replace gloves as needed.
    e. Regularly monitor and promptly decontaminate gloves and work surfaces to maintain contamination and exposures As Low As Reasonably Achievable (ALARA).
    f. Select gloves appropriate for chemicals handled.
2. Shielding requirements
    a. Handle and store millicurie or greater quantities behind Lucite type (or equivalent) shields of approximately 0.5 cm thickness.

3. Surface contamination survey schedule
    a. A survey meter should be used to monitor work surfaces after use.
    b. A removable contamination (swipe) survey utilizing a smear and appropriate counter must be performed each month in which radioactive material is used (including sewer disposal). The RSC may require a higher contamination survey frequency depending on the amount of material in process.
    c. The action limit for cleanup of removable contamination is 1000 dpm/100 cm^2. Any indication above this limit on a swipe survey or above two times background with a survey instrument is considered to be contamination. Any accessible area found to be contaminated above this limit shall be decontaminated.

4. Bioassay requirements
    a. None routinely required.

5. Dosimetry
    a. Cl-36 can pose an external dose hazard.
    b. The total body is the critical organ for uptake of transportable compounds of Cl-36. Sodium chloride is removed from the body in urine with a 10-day biological half-life. A conservative biological half-life for other transportable chlorine compounds is 29 days. The lung and lower intestine are the critical organs for inhalation and ingestion, respectively, of non-transportable Cl-36 compounds.
    c. The beta emissions can present a substantial skin dose hazard. Multi-millicurie quantities of Cl-36 can produce secondary radiation (called Bremsstrahlung) presenting an external exposure hazard. Additional lead shielding may be necessary to reduce dose rates. When handling millicurie quantities, do not work over an open container, as practical.
    d. The annual limit of intake through ingestion is 2 mCi.

Waste Disposal

EHS procedures for disposal of hazardous and/or radioactive wastes are to be followed. Cl-36 waste should be segregated from other radioactive waste.

Survey Meters

A survey meter is required to work with Cl-36. A thin window Geiger-Mueller tube is necessary to detect Cl-36.

Personnel Monitoring

Dosimeters are required when any individual will receive or is likely to receive in any period of one year an occupational dose in excess of 10% of the applicable limits. At UNL, all users of Cl-36 are issued whole-body and ring dosimeters.