

Appendix B

SAFETY

STANDARD OPERATING PROCEDURE

HANDLING OF RADIOACTIVE CHEMICALS

I. INTRODUCTION

Velsicol Chemical Corporation has a Byproduct Materials License from the U.S. Nuclear Regulatory Commission (license number 12-08920-01) to receive, acquire, possess and transfer byproduct, source and special nuclear material as designated in the license.

Dr. Ching C.Yu has been appointed as Radiation Protection Officer. In his absence, Dr. Yousef H. Atallah will assume the responsibility.

Two radioactive sources are generally used in the Chicago laboratories:

1. Carbon-14 is used in certain environmental and metabolism studies.
2. Nickel-63 (sealed sources) are used in electron capture (EC) detectors for gas chromatographs.

Tritium and phosphorus-32 (P-32) radionuclides might be used occasionally. Because P-32 is a more energetic beta emitter compared to tritium or carbon-14, utmost care must be exercised when it is handled.

There is a multitude of regulations and safety procedures governing the use of radioactive chemicals. The following is an outline of safety procedures for the Chicago laboratories and the Velsicol Agricultural Research Center (VARC) at Woodstock, IL. For more details, the reader is referred to the references cited at the end of this procedure.

2. SAFETY OPERATING PROCEDURES

- A. Licensed radioactive material shall be used only at the designated laboratories in the 351 East Ohio Street building (specified by license).
- B. Licensed radioactive material shall be used by, or under the supervision of, licensed personnel.

- C. Nickel-63 Detector cells shall not be opened or foils removed by anyone at Velsicol. For service, send detector to manufacturer.
- D. Nickel-63 wipe tests must be performed on EC-gas chromatographs at intervals of 6-months or less. All lab areas where unsealed by-product radioactive materials (e.g. solutions, solids, suspensions) are used will be surveyed monthly utilizing wipe tests and a portable survey meter. The cold room (where radioactive materials are stored) or any location with more than 200 microcuries will be surveyed weekly with a portable survey meter. Results of all surveys including wipe tests will be recorded in a log book. The Radiation Protection Officer will assign personnel to conduct the survey.
- E. When P-32 is used, a mandatory survey with a portable survey meter and wipe test will be conducted after each use. If millicurie (> 1.0 millicurie) quantities of P-32 are employed finger dosimeters will be used.
- F. Copies of AEC-3 (2-72) 10 CFR 20 Form must be posted in clearly visible places in designated laboratories. These regulations must be read before entering the area to work.
- G. Handling and use of radioactive materials is limited to authorized laboratory personnel only.
- H. Laboratory benches must be covered with absorbent material. This material shall be changed at regular intervals or when contaminated.
- I. Mouth-pipetting is not allowed. No smoking, eating or storage of food, drink or personal effects is allowed in the laboratory.
- J. Radioactive stock materials must be kept locked in the refrigerator and the key available only to authorized personnel.
- K. An inventory of radioactive stock materials must be kept and reviewed quarterly by the Radiation Protection Officer. Maximum allowable radioactivity for each radionuclide is listed in the NRC license. All shipping and receiving of radioactive materials is handled by the Radiation Protection Officer. Also, the Radiation Protection Officer will be notified of all orders for radioactive materials to ensure that the maximum allowable amount is not exceeded. Incoming radioactive shipments will be inspected in accordance with Section 20.205 of 10 CFR, Part 20.

- L. Glassware and apparatus used in handling radioactive chemicals must be held and cleaned separately and segregated in toto from routinely used glassware.
- M. Any direct contact of radioactive chemicals with skin must be avoided. Disposable gloves must be worn at all times, and cannot be used more than once. Laboratory coats are required. Laboratory coats should be laundered at regular intervals (weekly) and should not be worn outside of laboratory areas such as the library and cafeteria.
- N. Liquid and solid radioactive waste must be disposed of in accordance with Sections 20.301 to 20.306 10 CFR, Part 20.
- O. Waste materials that are not disposed of in the sanitary sewerages must be properly packed (according to regulations) and picked up by a licensed contractor for disposal at a licensed disposal site.
- P. Radioactive materials are not to be transferred outside designated areas except for shipping or transport.
- Q. Bench area should have the proper caution signs, labels, and signals during the use of radiocarbon materials. All samples and containers should be properly labeled.
- R. In handling volatile radioactive materials, work should only be conducted in well ventilated areas, preferably in a hood and appropriate trapping systems to collect the radioactive volatiles must be used.
- S. Ancillary personnel will be informed on an annual basis of the following safety practices:
 - 1. Ancillary personnel are not permitted to touch anything in the laboratories except non-radioactive waste containers and floors.
 - 2. If an apparent spill or leakage of radioactive material is discovered by ancillary personnel they should contact the Radiation Protection Officer immediately. These personnel should not attempt to clean up apparent spills or leakages.
- T. In case of a spill:
 - 1. Mark the area where the spill occurred.

2. Call the Radiation Protection Officer immediately if spill involves greater than 200 microcuries of carbon-14 or tritium or any amount of P-32. This constitutes a major spill. Otherwise the spill can be considered minor.
 3. Determine the extent of contamination caused by the spill.
 4. In case of a minor spill, the radioactivity should be contained and removed to the proper disposal container following established disposal procedures. A decontaminating agent such as "Count-Off®" will be applied to the contaminated area and thoroughly wiped over the area until radioactivity is reduced to 0.005 microcuries in the contaminated area.
 5. In case of a major spill, the Radiation Protection Officer or a qualified designate will supervise decontamination and determine if evacuation is necessary. The Radiation Protection Officer will then supervise decontamination in accordance with sound safety practices. In the case of millicurie quantities of P-32, lead impregnated rubber gloves and other shielding are required.
 6. This procedure will be posted in the laboratory and storage area where radioisotopes are utilized.
- U. Some radiolabeled chemicals might also be toxic where additional safety procedures are applicable as obtained in the Safety SOP's 2.9, 5.1, and 5.2.

4. REFERENCES

- A. U.S. Nuclear Regulatory Commission. Rules and Regulations. Title 10, Chapter I, CFR, Part 19 "Notices, Instructions, and Reports to Workers; Inspections". April 30, 1975.
- B. U.S. Nuclear Regulatory Commission. Rules and Regulations. Title 10, Chapter 1, CFR, Part 20 "Standards for Protection Against Radiation". December, 1975.
- C. U.S.D.H.E.W. The National Institutes of Health Radiation Safety Guide. U.S. Government Printing Office. 1979. Washington, D.C.
- D. Choppin, G. and Baisden, P. Radiochemistry ACS Audio Course. 1978.

U.S. Nuclear Regulatory Commission. Rules and Regulations. Title 10 CFR, Part 20 "Biomedical Waste Disposal". March, 1981.