NMT Gadgetry

Technetium-99m Storage and Decay System*

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A lead-shielded apparatus designed to safely store and dispose of radioactive materials in laboratories with limited space is described. In addition to improving storage and disposal methods within the laboratory, the system confines radioactive materials to one area and reduces handling and radiation exposure time.

Nuclear medicine laboratories lacking adequate preparation and storage facilities are often forced to store prep vials and syringes containing ^{99m}Tc in an open box or bag (Fig. 1) in the immediate work area, a method that presented disposal difficulties to our staff. Such a method is also unsightly, unsystematic, consumes valuable counter space, and unnecessarily exposes workers in the adjacent prep area. The need for a disposal system that was safe, economical, and simple to use, in addition to allowing for the separation of materials according to day of use, was evident.

Materials and Methods

A lead-shielded apparatus was designed (Fig. 2) to improve the methods of storing and disposing of radioactive materials. The apparatus is cylindrical in shape, measuring 18 in. in diameter and 12 in. in height. Seven "wedge-shaped" storage boxes (open at the top) rest on a recessed turntable base featuring a positive locking mechanism. A circular lead-shielded top covers the openings at the top of each box. A wedge-shaped access door allows placement of materials into one box per day. Ten half-value layers (3 mm) of lead *(1)* are provided by the storage system for ^{99m}Tc.

The system is relatively foolproof and simple to use if a few basic rules are observed. All materials containing ^{99m}Tc are placed into the empty storage

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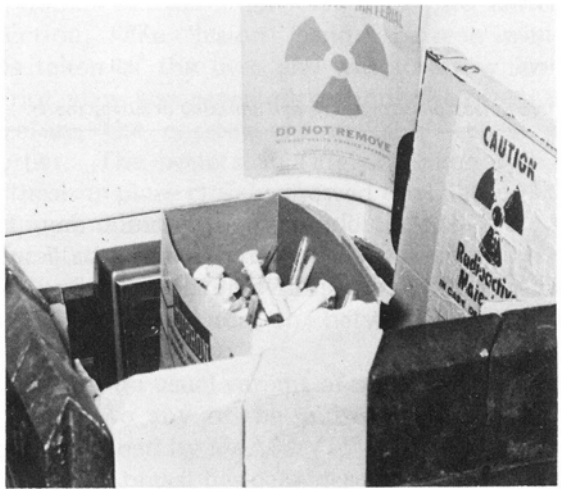

FIG. 1. Previous system of storing vials and syringes in open box.

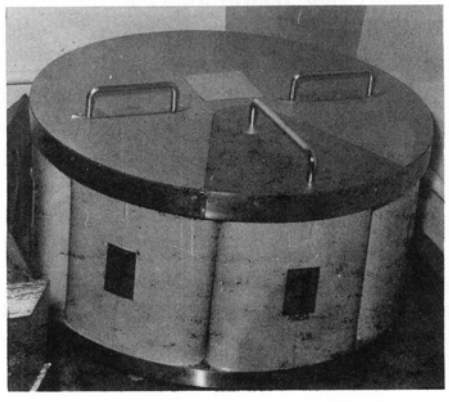

FIG. 2. Cylindrical storage and disposal apparatus containing seven storage boxes for each day of week.

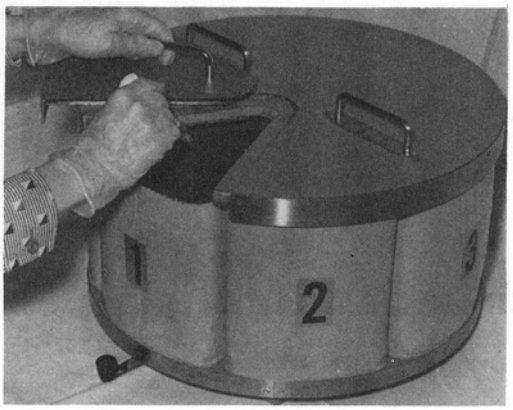

FIG. 3. Method of disposing of decayed materials.

TABLE 1. Storage and Activity Record of ^{99m}Tc in Average Week

Day	Number of entries	Amount of activity (mCi)	Day 7 activity
Monday	19	44.0	ND*
Tuesday	22	15.0	ND
Wednesday	14	5.8	ND
Thursday	16	11.3	ND
Friday	17	9.0	ND

**No detectable activity by well counting or survey meter.*

box (Fig. 3) available for that particular day. Each box is numerically numbered from 1 to 7 and is used according to the days of the week, i.e., box 1 on Monday. The turntable is rotated the next morning so an empty box is made available. After the seventh day has passed, the box used on Monday to store the decayed ^{99m}Tc material may be emptied and disposed of so that it can then be used to repeat the cycle. Inexpensive 9 x 10-in. plastic bags are used to line the boxes, further simplifying disposal. Approximately 28 half-lives for ^{99m}Tc and 2.5 half-lives for ^{99m}Mo are provided if materials are held for disposal until the seventh day. Extra shielding, such as lead bricks around the perimeter of the storage box, may be desirable if excessive amounts of ^{99m}Tc are to be stored. It is our practice to keep all vials with high activity in their shields until the following morning, at which time they are placed into storage, thereby eliminating the need for extra shielding.

Discussion

The total number of entries and the amount of activity stored in the apparatus for an average week were recorded (Table 1). Detectable amounts of activity did not remain in these samples when handled in the manner described.

References

1. Lange RC: *Nuclear Medicine for Technicians.* Chicago, Year Book, 1973, p 148

2. Wang Y: *Handbook of Radioactive Nuclides.* Cleveland, The Chemical Rubber Company, 1969

3. *Radiological Health Handbook* (rev ed). Washington, DC, U.S. Department of Health, Education and Welfare, January 1970