Procedures for RIA I-125 Waste Disposal

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I-125 can be effectively removed from coated tubes and plastic beads used as solid-phase separators by a 50% household bleach solution. This technique enables the user to dispose of these separators into common trash.

J Nucl Med 23: 354, 1982

The present method for disposal of I-125 from RIA and other radioligand assays poses serious problems to the active laboratory owing to the 60-day half-life and the quantities of tubes or beads to be disposed of.

The waste consists of a small amount of radioactivity in the free phase as a liquid and a small amount of radioactivity in the bound phase attached to a solid-phase separator such as plastic beads or coated tubes.

The liquid waste is usually disposed of directly into sewage, and this activity is generally about 20 nCi per tube. The allowable concentration of I-125 in sewage is 40 pCi/ml, requiring a dilution of about 400 times. The liquid from 100 tubes would contain about 2 μCi, requiring a diluting volume of about 40 l. The normal sewage outflow from a hospital is more than enough to dilute adequately the maximum allowable level of 10 μCi per day. Within these limits it is possible and convenient to dispose of the liquid I-125 waste of the active laboratory by transfer to sewage.

The disposal of the solid waste is another matter. About one third of the radioactivity will remain in the bound phase, attached to the solid-phase separator. Incineration is not a viable solution due to the very low levels permitted in stack effluents. Burial is a possibility but regulatory constraints and physical quantity militate against this solution. From a laboratory performing 10,000 patient tests per year, the resultant volume could be as high as 20,000 to 25,000 tubes and/or beads per year.

Storage to decay is the most common expedient, but this is not satisfactory because of the volume of material involved. The general index of ten half-lives of decay would require retention for 600 days or storage space for almost 2 yr worth of tubes. Some laboratories store for 1 yr and then monitor for disposal to trash. Even this compromise requires extensive storage space and delayed but repeated handling.

Another alternative is to load the tubes into metal drums and transfer to a waste-disposal company. This saves on space requirements but increased cost makes the method undesirable.

A better alternative would be to convert all waste into liquid form and transfer to sewage. If the I-125 could be effectively removed from the solid-phase separator, all radioactivity could be transferred to sewage as liquid and the nonradioactive tubes and beads could be disposed of as common trash.

A number of acids, bases, and common solvents were tried, with results uniformly unsuccessful. Extraction succeeded, however, with a dilute solution of household bleach. The effective solution was a 50% dilution with tap water.

The used tubes were filled with the bleach solution at the end of the day and allowed to soak overnight. Next day the solution is decanted to sewage and the tubes are rinsed with tap water.

This procedure has been tried on 2000 tubes from digoxin and cortisol assays and 1000 plastic beads from hepatitis tests. For the tests, the untreated tubes and beads were counted in a NaI scintillation well counter. Typically, these samples counted 17,000 to 20,000 cpm, which indicates about 10 nCi I-125 per tube. The tubes and beads were then soaked overnight in the 50% bleach. Tubes and beads were rinsed and counted again. The subsequent count rates ranged from 20 to 60 cpm, with a background of 35 cpm. The efficiency of the counting system at two times background is 40 pCi. This indicates an effective reduction of less than 1:500. Within the limits of sensitivity of the well counter, there was no residual radioactivity.

The extraction technique is effective and offers a considerable simplification of the waste-disposal problems for these procedures. An increase of about 50% in the release of I-125 into sanitary sewage will be easily accommodated by present disposal limits. The limiting factor will be 10 μCi per day.

Received Nov. 13, 1981; revision accepted Nov. 20, 1981.

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