RADIOACTIVE WASTE MINIMIZATION AT A LARGE ACADEMIC MEDICAL FACILITY

Kenneth Krieger, CHP, NRRPT: UTMB
Christopher Walters: Texas A&M University

ABSTRACT

The University of Texas Medical Branch (UTMB) at Galveston is a large academic medical center. It houses about 12,700 employees, of which 200 are permitted radioactive materials users encompassing 350 laboratories. Consequently, UTMB generates a large amount of radioactive waste. The majority of this waste contains short-lived isotopes, such as P-32, P-33, and S-35, which is held for decay and then disposed at a sanitary landfill. However, some waste, including long-lived waste and stock vials, is packaged in drums, compacted, and stored in a warehouse facility on-site, perpetually awaiting disposal at a contract facility. Space in the warehouse is at a premium and shrinking, but these drums cannot currently be disposed due to the prohibitive cost involved. The continued pressure on university hospital budgets prompted this review of the waste program.

Recent reevaluation of the waste stream has resulted in shifting most of the material that was being drummed for disposal to landfill and incineration. Furthermore, materials that were previously assumed to be radioactive are now being evaluated prior to disposal to determine if they may be disposed of as non-radioactive waste. In one waste stream which was evaluated, long lived dry solid (gloves, paper, plastic, etc.), the amount of waste being drummed was decreased by 75% in the pilot program, which represents about 15% of the waste collected by UTMB's Environmental Protection and Management (EPM) group. Additionally, materials such as radioactive labels and decayed stock vials were removed from the drum waste stream and either sent to the landfill or incinerated. Separation of the waste was handled by EPM technicians since the technicians must correlate the tracking numbers on the vials with the numbers on the disposal forms turned in with the waste. The space that was saved due to the decrease in drumming for disposal is now used to hold the increased volume of landfill-disposable material. The monetary savings due to the drastic reduction in drum production is calculated to be about $45,000/yr. This program is currently being expanded to reduce other waste streams at the university.

INTRODUCTION

The University of Texas Medical Branch (UTMB) at Galveston is a large academic medical center. It started out as the medical department of the University of Texas in 1891 with 23 students. It was renamed UTMB in 1919 and was the only medical school in the state of Texas until 1949. Today, it houses about 12,700 employees and includes six hospitals, four schools and two institutes. The campus of UTMB is composed of 77 major buildings on 90 acres of land. The healthcare areas provide care for about 790,000 in- and out- patients annually, while and the research sector generates over $100 million annually in research money.

Of this number of employees, 200 are permitted radioactive materials users, with about 500 technical staff, encompassing 350 laboratories. Laboratories using radioactive material include basic science research, clinical laboratories, and a large nuclear medicine department. Consequently, UTMB generates a large amount of radioactive waste.

WASTE GENERATION AND MANAGEMENT

There are four basic types of radioactive waste streams generated at UTMB:

- Liquid scintillation vials
- Bulk liquids
- Research animals (carcasses)
- Dry solids

Liquid scintillation vials are generated during the process of doing research and the levels of radioactivity contained in them are usually minimal. Due to the chemical composition of the scintillation fluid**,** this waste stream is treated as a mixed waste and is shipped through a commercial waste broker and is ultimately incinerated as a fuel blend. It is interesting to note that even though scintillation fluid does get classified under the designation of waste, it is a reusable substance and may almost be considered recycled material.

Animal carcasses are generated as a result of research with radioactive materials and usually do not present any special disposal problems. Most of the disposed carcasses are held for decay and transferred to a Type I sanitary landfill. Texas is unique in that its waste regulations allow the disposal of radionuclides with half-lives less than 300 days in Type I sanitary landfills. These regulations have activity and concentration limits that must be met. The few carcasses that are above those limits are stored for decay in an Environmental Protection and Management (EPM) freezer.

Bulk liquids that contain hazardous chemical and short-lived nuclides are held for decay and disposed of as chemical waste. Texas regulations have expanded the NRC rules that allow C-14 and H-3 disposal to include I-125 in the 0.05 uCi/ml exemption. Aqueous-based radioactive bulk liquids can be disposed of down the sanitary sewer system despite their radioactivity. The limit of the activity that can be disposed of in this manner is specified in UTMB's license.

The majority of the waste generated at UTMB is in the form of dry solids, which is composed of disposable gloves, paper towels, plastic, glass vials and other contaminated objects. Along with these waste streams, needle boxes (sharps containers) from nuclear medicine and used stock vials constitute a significant portion of the dry solid waste. The majority of this waste contains short-lived isotopes, such as P-32, P-33, and S-35, which is held for decay. This material is then disposed of in the sanitary landfill if it is under the Texas regulation described for animal carcasses. However, some waste, including long-lived waste, non exempt amounts of H-3 and C-14, H-3 and C-14 stock vials, short-lived stock vials, and needle boxes are packaged in drums, compacted, and stored in a warehouse facility on-site, perpetually awaiting disposal at a radioactive waste disposal facility.

Space in the warehouse, where drums of compacted waste are stored, is at a premium and shrinking. The rate of generation of these drums is about 2 per month, but varies. We are currently storing about 80 55-gallon drums in two locations. This significant inventory of drums cannot currently be disposed due to the prohibitive cost involved. Shrinking budgets and money allocated to other projects makes finding money for the disposal of these drums very difficult.

In Texas UTMB is well-known for its minimization efforts, so we thought it our duty to find innovative ways to reduce these waste volumes and free up some of our precious space resources. The continual pressure on the university hospital's budget, as well as limited space resources prompted this review of the waste program.

SOLUTION

Recent reevaluation of UTMB's waste stream has resulted in a resegregation of most of the material that was being drummed for disposal, out of the drums and into the landfill and incinerator (Table I). Even thought most of the dry solid waste can be held for decay and landfilled, we wanted to further decrease the portion of the waste that was being drummed for radioactive waste burial. Materials that were previously treated as radioactive are now being evaluated prior to drumming to determine if they may be disposed of as non-radioactive waste. Items such as labels, tape, absorbent pads, etc. that were put into the radioactive waste just for the sake of convenience, are now being surveyed to make sure they belong in the radioactive trash rather than in the regular trash. Stock vials and needle boxes that were drummed for disposal for worker dose minimization or for biological safety concerns are now being incinerated. The amount of long-lived dry solid waste being drummed for radioactive disposal was decreased by 75% in the pilot program, which represents about 15% of the waste collected by UTMB's EPM group. Separation of the waste was handled by EPM technicians since the technicians have to compare disposed vials to paperwork that was turned in.

Decayed materials that go to the landfill must meet some criteria as well: all radioactive signs and symbols on labels must be defaced and sharps (needles, broken glass, etc.) must be treated. Due to the complicated procedure for treatment of sharps, incineration was the preferred method of disposal. Material that has already been drummed cannot go to the landfill due to these steps not being performed in the past when the material was originally placed in the drum. Separation of this material is being done now at the point of generation as part of the new program. Drums that contained visible radioactive symbols and untreated sharps had to either be buried as radioactive waste or reopened and treated (which could be a dangerous process for the technicians) before they could go to the landfill.

Table I. Outline of radioactive waste streams and disposal methods before and after reevaluation.

Type of Waste	**Dry Solids $T_{1/2}$ <300 d**	**Dry Solids $T_{1/2}$ >300 d**	**LS Vials**	**Bulk Liquids (aqueous)**	**Bulk Liquids (non-aqueous)**
Before	Landfill	Rad waste	Permafix	San Sewer	S&D,Permafix
After	Landfill	Landfill, Incinerate, Rad waste	Permafix	Sanitary Sewer	S&D,Permafix
Type of Waste	Animal $T_{1/2}$ <300 dy	Animal $T_{1/2}$ >300 dy	Stock Vials $T_{1/2}$ <300 dy	Stock Vials $T_{1/2}$ >300 dy	Sharps (nuclear med)
Before	Landfill	Dereg, Rad Waste	Rad Waste	Rad Waste	Rad Waste
After	Landfill	Dereg Rad Waste	S & D, Landfill	Landfill, Incinerate, Rad Waste	S & D Incinerate

But, through some testing at our medical incinerator, we found that the opening of the incinerator was large enough to fit a whole drum. The residual material following the burning of the drum was minimal, so it will not interfere with the operation of the incinerator. The additional volume of this waste stream will be very small compared to the average daily volume of the medical waste that is processed through the incinerator. So now, all the drums that were awaiting burial can be incinerated. The space that was saved due to the decrease in drumming for disposal is now used to hold the increased volume of landfill-disposable material. The relative cost of burying material at the local landfill versus radioactive waste disposal is about 1% and the burning of material in the incinerator adds no cost to disposal. So, whatever decrease in disposal volume occurs, translates into a significant cost reduction. The monetary savings due to the drastic reduction in drum production and moving most the material from disposal to burial is calculated to be about $45,000/yr. This procedure for reducing the solid waste stream is being looked at to see if it can be applied to other waste streams generated at UTMB.