

Disposal of Small Quantities of Radioactive Materials in Local Landfills: Problems and Solutions

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Many landfill owners are utilizing monitoring equipment to screen incoming trash for radioactivity. In many cases, the landfill operators, regulators and waste generators are not using the same guidelines for determining what level is radiologically safe and what is not. This report describes problems hospitals may face when private corporations make policies that are more stringent than existing law. This report does not intend to criticize the efforts of state agencies, private corporations, citizen groups or any individual to protect the environment from hazardous materials. In this pursuit for environmental protection, however, hospitals and universities have been burdened with unnecessary costs, even though they are not in violation of any federal or state regulation and indeed are not despoiling the environment or endangering the public.

In 1990, several truckloads of hospital trash were rejected by a metropolitan Detroit landfill because items contaminated with small amounts of radioactive material exceeded the trigger level for the alarm on the landfill monitoring system. The sources of contamination are listed in Table 1. Each time a contaminated item triggered the alarm, the entire trash container was prevented from entering the landfill. The hospitals were assessed fees for lost vehicle time by the landfill owners. Additional fees were charged for retrieving and sorting the trash. After three such incidents, one area hospital purchased a monitoring device similar to the one used at the landfill and initiated a costly program for surveying all outgoing hospital trash.

In 1985, a similar situation was reported in the Los Angeles area (1). Members of the Western Regional Chap-

ter of The Society of Nuclear Medicine were instrumental in modifying a Los Angeles waste disposal policy. As a result, nuclear medicine diagnostic patient waste was essentially excluded from detection at Los Angeles landfills.

In response to the Detroit area landfill problem, members of the nuclear medicine community chose to work directly with the landfill owner and operators to achieve a detection level acceptable to both parties.

The landfill owner allowed two certified medical physicists to examine the monitoring equipment on-site. The landfill monitor (Bicron Landfill Monitor, Bicron Corp, Newbury, OH) consisted of two sodium iodide (1"×1") detectors mounted in lead sleeves on opposite sides of the entrance to the landfill property. Each was positioned to sample the trash container at a height of 7 ft above the roadbed. A total distance of 13 ft separated the detectors; however, the location of the detector on the driver's side permitted the trash container to come as close as 2 ft to the detector. Exempt quantities of ¹³³Ba (2.9 μCi) and ⁶⁰Co (1.0 μCi) were measured in air between the two detectors. When either source was positioned within 2 ft of either detector, the alarm was triggered.

During a return visit, the medical physicists examined the trigger level for the alarm. Background levels, monitored with no sources of radioactive material present, ranged from 370 to 510 cpm. The threshold for detection set by the landfill owner was less than twice background (600 cpm).

A meeting of all concerned parties was convened. The landfill operators had reviewed the company's procedure for landfill monitoring and found that the recommended distance between each detector and the side of the trash container was 4-5 ft. The landfill management agreed to increase the distance between the trash container and detector on the driver's side to five feet.

The level of detection selected by the landfill owner (i.e., 600 cpm) was a more difficult problem to resolve. Most states, including Michigan, do not have regulations for landfill disposal of small quantities of radioactive materials. Texas allows disposal of short-lived radionuclides in landfills (1). In Los Angeles, landfill owners allow disposal of up to four times the background level (2). Minnesota,

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TABLE 1
Contaminated Items Rejected by Michigan Landfill

1. Infant diapers (diagnostic studies with ^{131}I)
2. Empty catheter bag (residual urine from ^{131}I -hippuran study)
3. Disposable items from therapy patient room that measured background on GM (^{131}I)
4. Toothbrush discarded from home of patient post-thyroid therapy (^{131}I)

however, prohibits deposition of any material containing radioactivity (3). The landfill management was willing to work with the state government and the nuclear medicine community as long as it was legally protected long after landfill closure. Representatives of the Michigan Department of Radiological Health met with the landfill management and agreed that a trigger level of approximately twice background (i.e., 800 cpm) was consistent with company policy and in conformity with existing radiological health standards.

The minimum detectable activity of commonly used radionuclides in nuclear medicine was determined with sources positioned at 5 ft from the detector on the driver's

TABLE 2
Landfill Monitor Readings of Selected Radionuclides at Various Activity Levels

Radionuclide	Activity	Landfill monitor reading (cpm)
Background	0	370-510
^{131}I	1 μCi	500
	10 μCi	560
	50 μCi	820*
^{67}Ga	100 μCi	730
	500 μCi	2520*
$^{99\text{m}}\text{Tc}$	500 μCi	500
	2000 μCi	970*

* Triggered alarm: set point 800 cpm (changed by Michigan landfill from 600 to 800 cpm).

side (8 ft from the other detector). The trigger level for the alarm was set at 800 cpm. Varying activities of each source were measured in air. No other routine operating parameters were changed. The results (listed in Table 2) showed that with no attenuation, 10 μCi of ^{131}I , 100 μCi of ^{67}Ga and 500 μCi of $^{99\text{m}}\text{Tc}$ were below the alarm threshold.

This level of detection protects the landfill and public from improper disposal of radioactive material. It also relieves the nuclear medicine community from implementing costly, time consuming monitoring of large volumes of hospital waste.

In conclusion, members of the nuclear medicine community should be prepared to work closely with landfill owners to resolve problems related to disposal of small quantities of radioactive material. When this problem occurs, a qualified person should determine if the landfill monitoring system is functioning within the owner's guidelines (e.g., proper positioning of the scintillation detectors) and that the alarm threshold is appropriate.

Cooperation among all concerned parties can lead to productive results from landfill monitoring as demonstrated in Texas (1) and Los Angeles (2). As a result of a similar cooperative effort, Detroit area hospitals have resumed established practices for monitoring and disposal of potentially contaminated items from nuclear medicine procedures.

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