

The Nuclides in Town

Does danger lurk in low-level radioactivity in sewage?

By GIGI MARINO

On a spring day in 1991, an airplane conducting an aerial investigation of a formerly contaminated site in Ohio for the Nuclear Regulatory Commission (NRC) found the unexpected. Its instruments registered the presence of radioactivity at the Southerly Sewage Treatment Plant in Cleveland.

A subsequent NRC investigation of Southerly turned up potentially dangerous cobalt-60 in ash from incinerated sewer sludge, contaminating some of the treatment plant's sludge and ash.

Prior to the accidental discovery at Southerly, NRC had assumed that cobalt-60, in oxide form, dispersed readily. No one imagined that when incinerated, it would form in elevated concentrations, as it did at Southerly.

In fact, that situation prompted Sen. John Glenn (D-Ohio) and Rep. Louis Stokes (D-Ohio) to request an investigation by Congress' General Accounting Office of what they called "this potentially serious health emergency."

The subsequent GAO investigation raised questions about the presence and regulation of radionuclides (radioactive atoms) in sewage sludge. GAO determined that neither NRC nor the Environmental Protection Agency did a good job of checking sewage sludge or any of its recycled products for the presence of radioactivity.

Neither agency has mandated requirements to test specifically for radionuclides, which are released from industrial facilities, hospitals, and medical centers into nearly every sewage treatment plant in the United States. And as GAO points out, no one knows if there's a health risk because no one has studied the issue closely.

In May, GAO officials told a congressional hearing that NRC and EPA had shirked their responsibilities. Each agency relied on the other's judgment regarding the relative safety of sewage sludge, yet neither performed adequate testing of the sewage. At the time GAO compiled its report, NRC had inspected only 15 of the 1,100 facilities that NRC licenses to discharge radioactive material to public sewage plants.

Finding radionuclides in sewage didn't surprise NRC, which sets standards for

allowable amounts of radioactive material introduced into sanitary sewer systems. In 1982 Americium-241, used in the manufacture of smoke detectors, appeared in a sewage treatment plant in Tonawanda, N.Y. In subsequent years, radionuclides have been discovered in about a dozen sewage treatment plants across the United States.

GAO's Jim Wells, one of the report's authors, agrees with NRC that this "isn't a panic situation, but it needs to be looked at." Some sewage sludge in the United States is recycled and ends up in bricks, on baseball diamonds, or in farmers' fields. EPA regulates the recycling, landfilling, and incineration of sludge, but it has yet to test sludge for radioactivity.

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"The numbers [of radionuclides] are low," Wells concedes, "but they are elevated above what NRC says is acceptable. If there's a way to prevent exposure, to prevent the public from picking up additional radiation, we should regulate it and prevent it from happening. That's NRC's charge, their responsibility. . . . We think the public needs to have a greater sense of confidence that they're being protected by NRC."

Tom Lenhart of the Northeast Ohio Regional Sewer District, which owns the Southerly plant, says that Advanced Medical Systems was largely responsible for the cobalt-60 contamination. The district is currently involved in litigation against the company, an NRC licensee that had manufactured radiation sources for cancer therapy.

Erwin Odeal, Southerly's executive

director, faults NRC for sloppy enforcement. "NRC does no independent verification [of the amount of radionuclides discharged to treatment plants]," he says. "They rely on an honor system with no screening. They visit a facility, write in the logbook, and don't take any samples. We have no easy accessibility to find out who's discharging."

Says NRC's Robert M. Bernero, "The general assumption that underlies authorized releases of pollutants is that the material is at its most dangerous right at the highest concentration — where it comes out at the pipe. Beyond that, it goes into dilution and you don't have to worry about it. . . . But we began to discover effluent reconcentration in the sewers 10 years ago. . . . Reconcentration is a known phenomenon, a known problem."

In response to this "known problem," NRC revised its regulations in 1991 for the first time in 30 years. The new regulations, which took effect in January 1994, now exclude insoluble discharges that could concentrate, like the cobalt-60 found at the Southerly treatment plant.

The GAO report details contamination at nine treatment plants and points out that NRC discovered only two of the sites; one of them, Southerly, was serendipitous.

"We certainly think the amount of radiation contamination that was found surprised NRC," Wells says. "The elevated levels. . . were much higher than they ever thought possible. We drew the conclusion that NRC was slow to act. They knew about these problems for 10 years."

But do radionuclides in the sewage really present an insidious threat?

"The full extent of the radioactive contamination of sewage sludge, ash, and related by-products nationwide is unknown," the GAO report states. "Neither NRC nor the EPA has conducted or required testing to determine the extent of the radioactive contamination occurring at treatment plants that receive radioactive discharges."

And the sources of radioactivity — manufacturers, decontamination facilities, reactors, medical centers, even patient excreta and nature itself — are as varied as the responses to the issue.

Sewage is largely exempt from regulation. Says health physicist David Allard, a consultant at Arthur D. Little in Cambridge, Mass., "The amount of radioactivity coming out of a hospital's sanitary sewage system because of patient excreta wouldn't be allowed if it were coming out of a nuclear reactor."

Prior to the May GAO report, NRC, in the Feb. 25 Federal Register, invited public comment on some proposed rule changes. One of the sections about which NRC requested information and comment concerned "the [current] exemption of patient excreta."

NRC does not currently regulate radionuclides that pass through the human body via radiation therapy and diagnostic tests. Many regulators believe the half-life of such radionuclides is too short to cause concern; dissipation will occur before detection.

Carol S. Marcus at the Harbor-University of California, Los Angeles, Medical Center in Torrance says the NRC's proposal "astounded" her. "If you stop allowing patient excreta to go down normal sewage, you'll end nuclear medicine," she wrote the NRC.

Marcus said the costs of supplying separate plumbing for patients undergoing radiation treatment and separate storage facilities for their blood and other fluids would be prohibitive if the excreta exemption were terminated. Moreover, it would require patients to remain in the hospital until the particular isotopes in their bodies had decayed — from 2 days to 2 years, depending on the half-life of the radionuclide used.

The costs would be astronomical, Marcus says. What's more, other low-level radioactive laboratory wastes now get washed down the drain. Small amounts of longer-lived isotopes used in radioimmunoassays — such as cobalt-57, tritium, and carbon-14 — enter the sewage system, she says, though they are "in such a diluted state that they pose no health risk."

If the NRC isn't properly testing sewage sludge, as Odeal claims, who is? "The old regulations assumed that the discharges would be dispersed in water, its radioactivity almost nondetectable," says GAO's Wells. "NRC blew it when they wrote the regulations. They didn't understand sewage treatment plant operations."

Alan Hais of EPA admits that the agency had not looked extensively at the presence or effects of radionuclides in sewage. "In 1988, we did a national sewage sludge survey.... We made a decision not to look for radionuclides. A literature review of what information was available on radionuclides in wastewater systems showed it was not widespread, probably wouldn't be at levels of concern." At the time, Hais notes, cost con-

cerns overrode any concerns about radionuclides.

Currently, EPA is designing a new sludge study that in 1996 will look for iodine-131, radium-226, Americium-241, and cesium-137. Although the agency believes there's little need for concern about health risks from such radionuclides in sewage sludge, Hais says, "we're still on the learning curve in terms of radionuclides."

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Hais says that if the regulatory responsibility of monitoring sludge eventually falls on EPA's shoulders, the process is so complicated that any changes probably wouldn't take effect until the year 2000, unless, as he notes, EPA finds "a reason to expedite rule making."

Radiation detection is easy, says Allard. Maybe too easy. Some radiation detectors work at such a level of sensitivity that one radioactive atom can trigger them. And as Allard notes, "radioactivity is ubiquitous, it's everywhere." Bananas, airplanes, dentures, Grand Central Station: All emit radioactivity. "What's the end effect?" asks Allard. "There are no criteria for low-level radiation."

This lack of criteria concerns people like Diane D'Arrigo of the Nuclear Information and Resource Service, a nonprofit public information group in Washington, D.C. "The presence of background radioactivity is used to justify releasing more into the water or air.... Most sewage systems I know don't monitor for this stuff. It costs a lot of money."

Lisa Stetar, a health physics consultant with Performance Technology Group in Nashville, says municipalities are ultimately responsible, and liable, although EPA sets wastewater standards.

"There's the potential — if you have a small treatment plant with multiple dis-

chargers [of radioactive wastes] — to accumulate significant amounts in the sludge, levels that make the sludge not acceptable for disposal through traditional methods," Stetar says. "Right now, there's not some number out there that tells me when I reach that point."

Wells says GAO hoped to raise public awareness of the possible radioactive contamination of sewage sludge with its report. Indeed, NRC has responded to the Southerly situation by hiring Pacific Northwest Laboratory (PNL) to investigate the geochemical mechanisms for reconcentration. PNL says its report should be ready by mid-September. Bernero believes that reviewing the current regulations exempting sewage will fail to turn up any reason for concern. Radionuclides in the sewage, Bernero says, are "radiological nuisances."

Last year, an NRC inspection of the Blue Plains wastewater facility in Washington, D.C., found elevated concentrations of medical isotopes in small quantities. "They're decaying away with such rapidity that it's not a problem," Bernero says. In contrast, Stetar notes, she has often come across elevated concentrations of iodine-131 (used in thyroid treatments) and believes their presence warrants further investigation.

Marcus, however, argues that the average person will get more radiation from nature than from sewage. "If you sleep with another person," she says, "you irradiate each other a little more each year."

Earlier this year, the National Association of Attorneys General asked Congress to include radioactive wastewater under the Clean Water Act. Ultimately, though, the first word will come from NRC, which expects to make a decision about its changes — if any — in wastewater-discharge rules in the next year or two.

Glenn still expresses concern that facility operators need to be notified about the possibility of radiation contamination, says an aide. For the original report, GAO contacted 21 treatment plants, one in each of the 21 NRC-licensee states. At the time, only five plants knew about the potential for radioactivity in sewage. Contacted again for this article, only three plants said they followed up with radiological testing.

One of those sites, in St. Paul, Minn., tested for radionuclides. Although it reported normal readings, the treatment plant's governing board budgeted for testing again next year. Leo Hermes of the Metropolitan Council Wastewater Services says, "we realize this is going to be a national issue."

"We relied on NRC for years without judging them," Hermes adds. "Now there's a question about whether their standards were appropriate." □