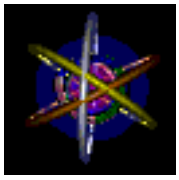

Physics Division

ESH Bulletin 97-2

CONTAMINATION FROM RADIOACTIVE GAS AT BNL

On June 3, 1997, at the Brookhaven National Laboratory Medical Research Reactor, radioactive gases released from an irradiated research sample contaminated six technicians. Radiological Control Technicians (RCTs) determined one technician received 200,000 to 1 million dpm beta contamination. The RCTs estimated that this technician received a dose of approximately 90 mrem. The other technicians were contaminated to levels of 5,000 to 20,000 dpm beta and received doses of 15 mrem or less. The primary source of the contamination was chlorine-38 gas. Because chlorine-38 has a half-life of approximately 37 minutes, the RCTs could not determine if the technicians received uptakes. The technicians were unaware that the research sample required special handling and there was a potential for gas release. The failure to properly plan for an infrequent evolution and communicate special handling requirements resulted in contamination of the six workers. (ORPS Report CH-BH-BMRR-1977-0002)

Researchers use the Medical Research Reactor to irradiate specimens in capsules. In order to minimize the spread of contamination, they frequently wrap the specimens in aluminum foil. At the special request of an off-site researcher, a sample of plastic wrap was inserted into a capsule for irradiation. Engineers evaluated the potential effect of the wrap on the reactor and determined that it would not be affected. However, they failed to evaluate the possible effect of the

irradiated plastic on personnel safety. The researcher realized that the capsule would require special handling, but failed to inform the technicians.

After the capsule had been in the reactor for an hour, a technician removed it and placed it in a shielded capsule-handling room. The technician used a remote handling tool to remove the sample from its capsule. He then placed the sample just outside the capsule-handling room to obtain a dose rate reading. The technician determined that the sample read 50 R/hr and returned to sample to the capsule-handling room. While the technician was handling the capsule, it released radioactive gas. The technician was not aware there was a problem because there was no indication that gas had been released. A short time later, two technicians alarmed exit portal monitors as they attempted to leave the facility. Radiological control technicians responded to the scene and discovered the release and contamination of the workers.

Facility personnel are investigating this event to determine its cause and appropriate corrective actions. However, their preliminary analysis indicates that failure to assess potential hazards to personnel from the irradiated plastic wrap and inadequate communications were significant causal factors.

This event is similar to the February 26, 1997, contamination of a researcher at the Lawrence Berkeley National Laboratory. The researcher spilled a small amount of orthosphosphate P-32 while opening a vial. The spill resulted in skin, clothing, and internal contamination of the researcher and contamination to the clothing of two other people. The surrounding area and equipment were also contaminated. Investigators determined there were failings in the system of checks and balances for procuring hazardous materials and chemicals. The researcher was able to procure this radioisotope without the required management reviews and without identifying cautions specific to the material. (ORPS Report SAN-LBL-LSD-1997-0002)

Operating Experience, Analysis and Feedback (OEAF) engineers searched the Occurrence Reporting and Processing System (ORPS) database for personnel contamination events and found 2,675 reports for 2,897 occurrences.

The Brookhaven event demonstrates how inadequate communication and inadequate personnel safety analysis of an infrequent evolution can create unexpected radiological hazards. Although the researchers perform many non-routine experiments at the Medical Research Reactor, the handling and processing of the capsules is routine. The non-routine part of this experiment was the use of

the plastic wrap. DOE-EH-0256T, *Radiological Control Manual*, section 313, states that at facilities with routine recurring process operations, special management attention should be directed to radiological activities that are infrequently conducted or represent first-time operations. Managers at facilities that perform infrequent or special evolutions should review these activities to ensure that work control processes are followed and all possible contamination mechanisms are evaluated.

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