

Perspective on Plutonium Finishing Plant Contamination Event

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From 1949 through 1989, the Hanford Plutonium Finishing Plant (PFP) was the last stage in U.S. plutonium production. At the plant, liquid plutonium nitrate extracted from irradiated fuel rods at other Hanford facilities was made into plutonium oxide powder and hockey puck-sized plutonium “buttons.” These products of PFP were shipped to other weapons production facilities throughout the United States. This process left significant amounts of plutonium and americium in PFP.

One PFP facility, the Plutonium Reclamation Facility (PRF), produces concentrated plutonium nitrate solutions, which were transferred to another PFP facility for conversion to either plutonium oxide or plutonium buttons.

High-fired Oxide Forms of Plutonium

Creating plutonium oxide requires application of intense heat (hundreds of degrees Celsius). For example, plutonium dioxide forms at about 1000 degrees Celsius. While the plutonium nitrate solutions created in the PRF can oxidize over time when exposed to air, that oxidation process does not create high-fired oxides, as there is insufficient heat to produce them.

Recent investigative analysis of the plutonium from the December 2017 PRF contamination spread determined it is unlikely that the contamination from PFP does contain high-fired plutonium oxides.

There was a highly contaminated glove box inside the PRF that was investigated for the type of plutonium and americium found outside of the control area during the contamination event. The glove box did not contain high-fired oxide forms of plutonium. The two glove boxes capable of producing high-fired plutonium oxides were removed from the PFP in 2015 and 2016.

Radiation Doses and Health Effects

Plutonium, like other radioactive materials, emits differing levels of radiation as it decays into various isotopes of plutonium and other elements. Exposure to radiation can cause adverse health effects, and exposure to any form of plutonium can be hazardous, depending on the level of exposure.

Plutonium must enter the body to cause significant health effects, and inhalation is the primary route by which plutonium can do this. Particle size affects how long plutonium particles remain in the body. Most particles over 10 microns (10 millionths of a meter) tend to be filtered out by the nose and upper respiratory tract, swallowed, and eventually passed out through the digestive tract. Smaller particles are more likely to be retained in the body, as they can more easily pass into the lungs.

Respiratory tract models and dosimetric modeling are used to determine the health effects for any form of plutonium, including high-fired plutonium oxides. High-fired oxides are highly insoluble, so if they are inhaled into the respiratory tract, they tend to remain in the body for a long time.

DOE and CHPRC understand the concerns that employees have about potential exposure from the PFP event. DOE and CHPRC also recognize their obligation to protect workers, the public, and the environment. Informational briefings about dose and dose risk are available; employees should contact their company’s dosimetry representative for more information. As always, any employee on the Hanford Site can request testing for potential exposure at any time.

