

**Office of Compensation Analysis and Support**  
**Program Evaluation Report**

Document Number: OCAS-PER-012  
Effective Date: 8/7/2007  
Revision No. 0

**Evaluation of Highly Insoluble Plutonium Compounds**

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RECORD OF ISSUE/REVISIONS

ISSUE AUTHORIZATION DATE	EFFECTIVE DATE	REV. NO.	DESCRIPTION
8/7/2007	8/7/2007	0	New document to determine which previously completed claims require evaluation for the affect of OTIB-0049, Highly Insoluble Plutonium Compounds.

**1.0 Description**

In the first version of the Rocky Flats Plant (RFP) Internal TBD (Jan 2004), it was noted that highly insoluble forms of plutonium were generated during the Rocky Flats fires. In response to the need to assess claims with potential exposure to this material, ORAUT-OTIB-0049 was developed. ORAUT-OTIB-0049 delineates the methods for assessing potential exposure to highly insoluble forms of plutonium, not only from the RFP fires, but at other sites in the complex that may have worked with this material.

**2.0 Issue Evaluation**

The issuance of ORAUT-OTIB-0049 on February 6, 2007 provided guidance for assessing claims with potential exposure to highly insoluble forms of plutonium.

ORAUT-OTIB-0049 does not propose a new type of material for general modeling purposes or propose a new variation of the lung model. Rather, to account for the difference in organ doses, the TIB analysis developed empirical “dose adjustment factors” from selected cases from RFP and Hanford that exhibited Type Super S behavior following intakes of <sup>239</sup>Pu mixtures. For intakes calculated from urinary excretion data, a bounding analysis is implemented as an intake adjustment factor rather than a defined change in ICRP model parameters.

Due to the increased doses assigned to some workers exposed to Type Super S plutonium, previously completed claims that were assigned plutonium doses at sites

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where this material is potentially available for exposure need to be reexamined to determine the impact (if any) on the dose assessment.

### **3.0 Plan for Resolution or Corrective Action**

#### **3.1 Determining the total population of claims**

The criteria used to determine the population of claims potentially affected by ORAU-OTIB-0049 are:

1. Probability of Causation (PC) less than 50%;
2. Most recent version of the dose reconstruction approved by OCAS on or prior to February 6, 2007
3. Potential for highly insoluble form of plutonium at the site (see Attachment A); and,
4. Claim currently at DOL (some claims are returned for rework for various reasons)

On July 5, 2007, these criteria were used to generate the list of 4,865 potentially affected claims.

#### **3.2 Determination of claims which will not change due to ORAU-OTIB-0049.**

Each of the 4,865 identified claims would require a new dose reconstruction, unless it can be definitively shown that the Probability of Causation (PC) will not increase to 45% or greater<sup>1</sup> under the maximum possible change in dose. Under ORAUT-OTIB-0049, there are two screening criteria that can employed to make this determination.

##### **Screening Criterion 1**

The effect of OTIB-0049 on changing a compensation decision for previously completed dose reconstructions can be evaluated by examining the Probability of Causation (PC) on a case by case basis. The use of PC as a screening criterion is based on the fact that the dose estimate is mathematically proportional to the Excess Relative Risk (ERR). As shown below, the probability of causation is determined directly from the ERR as:

$$PC = [ERR/(1+ERR)]*100\%$$

From this equation, it can be seen that an ERR of 1.0 would result in a PC of 50% and an ERR of 0.818 would result in a PC of 45%. It can also be seen that, for a given case, the effect on PC of a known increase or decrease in dose can be mathematically determined using only the original PC and this equation.

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<sup>1</sup> A PC of 45% was selected because any claim that could exceed this value would be required to have 30 IREP runs with 10,000 iterations per run.

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For ORAUT-OTIB-0049, the effect on dose to the lung and the LN(TH) is dependent on factors which can not be evaluated using screening techniques. **Because of this, NIOSH will request DOL to return for rework those cases in which the lungs or the thoracic lymph nodes were the reconstructed organ.** For the remaining organs, the effect of ORAUT-OTIB-0049, as shown in table 4-5 of the OTIB, is to increase the dose from the inhalation of plutonium by a factor of 4. Although the exact effect can only be determined on a case by case basis, it is clear that the maximum amount that the dose would increase for any of these cases is a factor of four.

Using the PC equation above, it can be calculated that, ORAUT-OTIB-0049 can not raise the PC to 45% if the original PC was at or below 16.97%. Because of this, a PC at or below 16.97% is used as a screening criterion to determine which cases can not increase to greater than 45% PC when OTIB-0049 is applied. **As noted above, this criterion does not apply to cases in which the lung or the LN(TH) are the reconstructed organ.** It also does not apply to cases that are affected by other technical program changes. It should also be noted that this is a conservative analysis in that it applies the factor of four to all doses, including external dose and internal dose from other isotopes. In a revised dose reconstruction, this increase obviously would not be applied to these other doses. Therefore, this screening criterion will conservatively identify a population of claims larger than the population that will actually have an increase in PC to greater than 45%.

### Screening Criterion 2

An additional screening criterion can be established to eliminate those cases from further consideration in which ORAUT-OTIB-0049 will cause no change in the dose estimate. Those would be cases in which no plutonium dose was reconstructed or cases in which the intake was not estimated using bioassay data<sup>2</sup> and the target organ was not lung or LN(TH).

Screening criteria 1 and 2 identified 3,108 cases of the total affected population of 4,865 that can be definitively identified as remaining below 45% in light of the changes required by ORAUT-OTIB-0049.

### 3.3 Consideration of other Program Changes

Some of the claims that would remain below 45% as a result of ORAU-OTIB-0049 may be affected by more than one change in methodology. Since claims in this population come from a number of sites, there are a number of changes that could affect them. Some of these other changes require a new dose estimate to determine the affect on the

<sup>2</sup> In ORAUT-OTIB-0049, the only plutonium dose calculations that are affected (other than lung and thoracic lymph nodes which are being reworked) are those based on bioassay data. Those plutonium doses that were determined using air concentration data are not affected by the new Super S calculation.

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claim. It is therefore necessary to review each claim to determine if additional changes potentially affect the claim. NIOSH will review each of the 3,108 cases and provide DOL with a document indicating what changes the claim was reviewed against and why none of changes would raise the Probability of Causation above 45%. For any cases where it is not possible to provide this document without a new dose estimate, NIOSH will request that DOL return the case for a new Dose Reconstruction.

### **3.4 Path Forward**

DOL will be provided a list of the entire population of potentially affected claims (4,865 claims). NIOSH has determined that 1,757 of these claims required a new dose estimate to determine the affect of this change. NIOSH is requesting that DOL return these claims to NIOSH for a new Dose Reconstruction. NIOSH will review the remaining 3,108 claims to determine if any other changes also affect the claim. For each of these claims, NIOSH will either request the claim be returned for a new Dose Reconstruction, or provide DOL with documentation indicating why the changes will not cause the Probability of Causation to increase above 45%.

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#### **4.0 References**

1. ORAUT (Oak Ridge Associated Universities Team), ORAUT-TKBS-0011-5, *Technical Basis Document for the Rocky Flats Plant – Occupational Internal Dose, Rev 00*, January 12, 2004.
2. ORAUT (Oak Ridge Associated Universities Team), ORAUT-OTIB-0049, *Estimating Doses for Plutonium Strongly Retained in the Lung, Rev 00*, February 6, 2007.

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### Attachment A

Sites where Type Super S is to be considered or excluded for this PEP

**Consider Super S**

Albuquerque Operations Office  
Amchitka  
ANL-East  
ANL-West  
Area IV Santa Susana  
Battelle (King and/or W. Jefferson)  
Brookhaven  
Clarksville  
Conn. Aircraft Nuclear Eng. Lab  
General Atomics  
GE-Evendale (Ohio)  
GE-Vallecitos  
Hanford (PNNL)  
INEEL  
LANL  
LBNL  
LLNL  
Mound  
Nevada Site Office  
NTS  
NUMEC  
Pantex  
Peek Street  
Rocky Flats  
Salmon Nuclear  
SLAC  
Sandia National Lab (SNL)  
SNL-Livermore  
SPRU (Knolls)  
Savannah River Site  
Tonopah Test Site  
West Valley  
Westinghouse Nuclear Fuels Division  
W.R. Grace  
X-10 (ORNL)

**Exclude from Super S**

Allied Chemical (based on SEC)  
Armour Research Foundation  
Baker-Perkins  
Bethlehem Steel  
Bliss & Laughlin Steel  
BONUS Reactor  
Bridgeport Brass  
BWXT, Inc.  
Canoga Ave Facility  
Clinton Eng. Works  
Combustion Engineering  
De Soto  
Downey Facility  
Extrusion Plant (RMI)  
Fernald (FMPC)  
Harshaw  
Heppenstall Company  
Iowa Ordinance Plant  
Jessop Steel  
K-25  
Kansas City Plant  
Landis Machine Tool Company  
Mallinckrodt  
Medina  
Oak Ridge Hospital  
ORISE  
Paducah  
Pinellas  
Portsmouth  
Reed Rolled Thread Company  
S-50  
SAM Laboratories, Columbia University  
Seymour Specialty Wire  
Simonds Saw and Steel  
Superior Steel  
Torrington Company  
U.S. Steel Corporation  
Vitro Manufacturing  
Weldon Spring  
Westinghouse Atomic Power Devel. Plant  
Y-12