

# **W.R. Grace and Company Special Exposure Cohort Evaluation Report**

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# Background

- **W.R. Grace is located in Curtis Bay, MD**
- **Originally 260 acres, now 109 acres**
- **Original site owned by Davison Chemical Company**
- **W.R. Grace bought Davison Chemical in 1954**
- **Rare Earths Inc., entered AEC contract in 1955, license transferred to W.R. Grace in ~ 1957**
- **W.R. Grace to extract thorium from monazite sand for AEC at two facilities (Wayne, NJ and Curtis Bay, MD)**

# Background—cont.

Building 23

Former  
monazite  
processing  
area



# Site Operations

- **Process AEC-owned monazite ore to extract thorium and rare earths**
- **Monazite contains ~ 6% thorium oxide**
- **95% of thorium in ore to be extracted**
  - **5% remained in residual material buried on-site**
- **Total of 997 tons of monazite processed between May 1956 and Spring 1957**
- **Problems with process led to contract termination**

# Site Operations—cont.

- **All thorium work done in part of Building 23**
  - **Monazite ground in ball mill**
  - **Reacted with concentrated sulfuric acid**
  - **Crystallizer tanks**
  - **Rake classifier (crude separation)**
  - **Filtering of Th-bearing solution and separation from unreacted material**
  - **Precipitation and reaction to end product (thorium hydrate)**
  - **Finished product shipped to Curtis Bay Government Storage Depot**

# Petition Overview

- **December 21, 2010: NIOSH received an 83.13 petition**
- **February 17, 2011: Petition qualified for evaluation**
- **July 14, 2011: Evaluation Report approved**

# Proposed and Evaluated SEC Class

- **Petitioner proposed class definition:**
  - **Chemical operators, bar mill operators, and pot operators who worked with or on rotary dryers, pill machines, nauta mixes (sieves), hydroxide dryer, blenders #1 and #3, reactor 906 and 902 material, Red Dog and Vanadium material at the Specialty, Monasito [sic], LDI Plants, Tech Center, Buildings 109, 193, 194, and 224 at W.R. Grace and Company, Curtis Bay, Maryland, from 1955 through 2009.**
  
- **NIOSH evaluated class**
  - **All Atomic Weapons Employees who worked at W.R. Grace and Company in Curtis Bay, Maryland, for the operational period from January 1, 1955 through December 31, 1958 and the residual radiation period from January 1, 1959 through October 31, 2009.**

# Petition Bases and Concerns

- **Unmonitored workers**
  - **Petitioner presented an affidavit indicating that all work performed at the W.R. Grace facility in Curtis Bay, MD between 1953-1990 was conducted without the use of dose monitoring equipment or all monitoring data was destroyed or is missing**

# Sources of Available Information

- **ORAU Technical Information Bulletins**
- **Case files in NIOSH database**
- **NIOSH Site Research Database**
  - **132 documents pertaining to W.R. Grace - MD**
- **Documentation and/or affidavits provided by petitioner**
- **Interviews – one former worker, one petitioner representative**
- **Various electronic databases (DOE, NRC)**

# Previous Dose Reconstructions

## NIOSH OCAS Claims Tracking System

Information available as of August 2, 2011

- **W.R. Grace MD claims submitted to NIOSH** **1**
- **Claims that meet the class definition** **1**
- **Dose reconstructions completed for claims that meet the class definition** **1**
- **Claims containing internal dosimetry** **0**
- **Claims containing external dosimetry** **0**

# Potential Internal Radiation Exposure

- **Monazite processing resulted in worker exposures from thorium, uranium and their decay products**
  - **Inhalation and ingestion of dust from operations, especially dry-handling of materials**
  - **Inhalation and ingestion of re-suspended particles in work areas**
  - **Ingestion of particles from eating and drinking in work areas**
  - **Inhalation of gaseous decay products (radon and thoron)**

# Potential External Radiation Exposures

- **Photon/beta exposure from thorium and uranium and decay products present in monazite sands during milling and extraction operations**

# Availability of Internal Dosimetry Data

- **Operational period:**
  - **No internal dosimetry data, air sample data or sufficient source term or process data have been located**
  
- **Residual Period:**
  - **Air sample data from Rare Earths/W.R. Grace, Wayne, NJ from 1959 and 1961 (shared contract with W.R. Grace, MD)**
  
  - **1986 and 2000/2001 site characterization data from FUSRAP**

# Availability of External Dosimetry Data

- **Operational period:**
  - **No external personnel or area monitoring data (including medical X-rays) have been located**
  
- **Residual period:**
  - **Dose rate data from 1986 site characterization from FUSRAP**

# Approach to Residual Period Dose Reconstruction

- **Internal:**
  - Use of air concentration values at beginning and later during the residual period to calculate intake rates
  - Assume exponential relationship to calculate intake rates for intervening time periods
- **External:**
  - Radiation dose rate data measured in 1986
  - Application of depletion factor determined above

# Evaluation Process

- **Two-prong test established by EEOICPA and incorporated into 42 C.F.R. § 83.13 (c)(1) and 42 C.F.R. § 83.13 (c)(3):**
  1. **Is it feasible to estimate the level of radiation doses of individual members of the class with sufficient accuracy?**
  2. **Is there a reasonable likelihood that such radiation dose may have endangered the health of members of the class?**

# Feasibility of Dose Reconstruction

**The process and source term information provide insufficient information to estimate doses associated with monazite processing with sufficient accuracy for workers at W.R. Grace and Company.**

# Summary

Feasibility Findings for W. R. Grace and Company Petition May 1, 1956 – January 31, 1958		
Source of Exposure	Reconstruction Feasible	Reconstruction NOT Feasible
<b>Internal</b>		
- all radionuclides		X
<b>External</b>		
- Photon		X
- Beta		X
- Neutron		N/A
- Occupational Medical X-ray		N/A

# Summary—cont.

Feasibility Findings for W. R. Grace and Company February 1958 – October 2009		
Source of Exposure	Reconstruction Feasible	Reconstruction NOT Feasible
<b>Internal</b>		
- all radionuclides	X	
<b>External</b>		
- Photon	X	
- Beta	X	
- Neutron	N/A	
- Occupational Medical X-ray	N/A	

# Health Endangerment

- **The evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of radionuclides and direct exposure to radioactive materials.**
- **Consequently, NIOSH is specifying that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC .**

# Proposed Class

**All Atomic Weapons Employees who worked in any building or area at the facility owned by W.R. Grace and Company in Curtis Bay, Maryland, for the operational period from May 1, 1956 through January 31, 1958, for a number of work days aggregating at least 250 work days, occurring either solely under this employment, or in combination with work days within the parameters established for one or more other classes of employees in the Special Exposure Cohort.**

# Recommendation

- For the period May 1, 1956 – January 31, 1958, NIOSH finds that radiation dose estimates cannot be reconstructed for compensation purposes

Class	Feasibility	Health Endangerment
May 1, 1956 – January 31, 1958	No	Yes