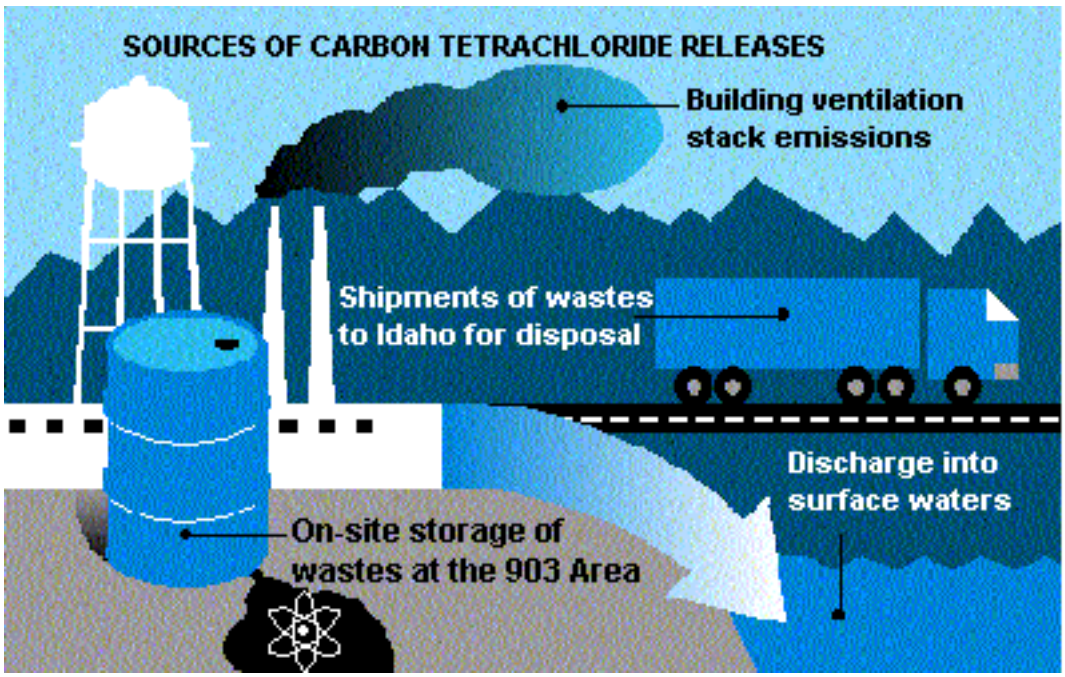
Citizen Summaries

Rocky Flats Historical Public Exposures Studies

Chemical Releases from Rocky Flats



Introduction

Routine operations at the former Rocky Flats Nuclear Weapons Plant frequently involved the use of the chemicals carbon tetrachloride and beryllium. Because these chemicals are toxic and were released from the plant through the air, they were selected for a more detailed analysis. The quantities of these substances actually released during Rocky Flats' years of operation from 1952 to 1989, and the potential cancer risks to people living near Rocky Flats, were estimated initially by scientists with ChemRisk. These estimates were re-evaluated in more detail by Radiological Assessments Corporation (RAC).

CARBON TETRACHLORIDE

What is carbon tetrachloride and how was it used?

Once a widely used household cleaning fluid, carbon tetrachloride now has limited availability. The Environmental Protection Agency designated it as a potentially hazardous air pollutant, a probable human cancer-causing agent and an ozone-depleting substance. Its use is being phased out.

Large quantities of carbon tetrachloride were used at Rocky Flats primarily for cleaning and degreasing product components and equipment used to manufacture nuclear weapons parts. These included plutonium and uranium glovebox walls, furnaces, machinery and instruments.

How did it travel off-site into the community?

Air

Carbon tetrachloride was released into the atmosphere from 1953 to 1989 from roof vents in Buildings 776 and 707 during day-to-day operations of the plant. Carbon tetrachloride also was discharged to surface waters - such as holding ponds, creeks and reservoirs - and was stored in waste barrels at the 903 Area. Releases to surface water and at the 903 Area were small compared to the large releases from roof vents.

Since the chemical easily vaporizes, carbon tetrachloride from Rocky Flats evaporated and was readily transported by air. No controls existed at Rocky Flats to trap carbon tetrachloride vapors, and virtually all carbon tetrachloride that was used was probably released into the air.

Breathing carbon tetrachloride in air was the primary way people may have been exposed.

Surface Water/Groundwater

Carbon tetrachloride was released from holding ponds on the plant site to creeks that carried it off-site. The releases were unmonitored; therefore, the amount released is unknown. Most of the carbon tetrachloride discharged in liquid waste probably evaporated before it reached public water supplies off-site.

Although surface water did not appear to have been an important way in which people were exposed, neither ChemRisk nor RAC could make reliable estimates because not enough information was available. Because carbon tetrachloride does not accumulate in vegetables, fish or meat, eating foods contaminated with the chemical was ruled out as a way people were exposed.

Carbon tetrachloride was released directly onto soil and leached into the groundwater. This groundwater probably did not flow off-site, and people were not exposed to carbon tetrachloride in groundwater.

How much carbon tetrachloride was released?

The total amount of carbon tetrachloride used annually at Rocky Flats was not reported in the early years, and it varied considerably. ChemRisk and RAC both conservatively calculated air concentrations assuming that the entire inventory of carbon tetrachloride used at the plant evaporated into the air. Total releases were estimated to be between 1,100 and 5,400 tons from 1953 to 1989. The highest releases occurred between 1958 and 1970. Air concentrations and cancer risks were estimated for the releases.

How were people living or working off-site exposed?

The primary way in which people living or working near the plant site could have been exposed was by breathing carbon tetrachloride. The primary health effect from exposure to carbon tetrachloride is increased risk of liver cancer.

BERYLLIUM

What is beryllium and what are its hazards?

Beryllium is a light, hard, grayish non-radioactive metal that is lighter than aluminum. It can be found naturally in rocks, coal, soil and volcanic dust. At Rocky Flats, beryllium was used to make nuclear weapons components.

In addition to the beryllium used to manufacture nuclear weapons parts at Rocky Flats, there were several nearby sources of the metal. These included a beryllium ore processor located 1.24 miles (2 km) east of the plant; a beryllium ceramics manufacturer 9.3 miles (15 km) south of the plant; coal burning and other combustion sources near the plant; and, beryllium in gravel brought to the site.

The EPA currently classifies beryllium as a probable cancer-causing agent, primarily because evidence of beryllium-causing cancer in humans is considered inadequate or limited. Experimental animals exposed to beryllium and its compounds have developed cancer.

Inhaling or breathing dust containing beryllium is the main way in which people could have been exposed. A primary health effect from exposure to beryllium is an increased risk of cancer. Inhaling beryllium dust or fumes also may cause chronic beryllium disease. In this condition, scar tissue gradually replaces normal lung tissue, resulting in loss of respiratory capacity. The disease generally becomes progressively worse over time, leading to severe disability and death.

Chronic beryllium disease occurs in a portion of the population who can become sensitized to beryllium. Many people who inhale beryllium suffer no signs or symptoms of the disease, while others become severely affected. The percentage of people in the general population who might become sensitized to beryllium is not well known. However, the incidence of chronic beryllium disease in exposed workers has been less than 15 percent.

How did beryllium travel off-site into the community?

Beryllium dust was formed during the machining of beryllium, a process that involves cutting the metal into shapes suitable for weapons use. Beryllium dust particles were released through vents and stacks at the plant. As a particulate, beryllium was captured by the same air filters used to control releases of plutonium. These filters significantly limited the total amount of the metal released to the environment. Beryllium releases from Rocky Flats have been monitored since 1963.

Because beryllium does not dissolve easily in water, most of the metal settles to the bottom of a lake or stream. In soil, beryllium is not very mobile. It adheres to soil particles and generally does not move into the groundwater. Because beryllium is not very mobile in water, researchers determined that surface water was not a primary source of exposure for nearby residents. RAC concluded that distribution of beryllium through the air was the primary means of carrying this material off-site and therefore, breathing the particles was the mostly likely way in which people may have been exposed.

How much beryllium was released from Rocky Flats?

Despite significant use of the metal at Rocky Flats from 1958 to 1975, estimates suggest that relatively small amounts of beryllium were released into the environment. The total amount of beryllium released from Rocky Flats between 1953 and 1989 may have been about 11 ounces (about 325 grams). Estimated beryllium concentrations in the air varied with distance from the plant.

Where can I get more information on chronic beryllium disease?

Contact the National Jewish Medical and Research Center and ask for the *Med Facts on Beryllium Disease* fact sheet. Phone 800-222-5864 or 303-355-5864.

What were the cancer risks to people working or living off-site?

Researchers calculated the cumulative cancer risk of chemicals released from the plant. This information is available in the *Summary of Findings* booklet.

How can I get more information about the studies?

The reports, *Estimated Exposure and Lifetime Cancer Incidence Risk from Carbon Tetrachloride Released to the Air from the Rocky Flats Plant,* and *Estimated Exposure and Lifetime Cancer Incidence Risk from Beryllium Released to the Air from the Rocky Flats Plant*, written by P.D. McGavran, Ph. D., A.S. Rood, M.S., and J.E. Till, Ph.D., (principal investigator) of Radiological Assessments Corporation, provide a detailed, technical account of this topic. This Citizen Summary provides a simplified overview of the technical reports. The reports are available at the locations listed below.

For more information on the Rocky Flats Historical Public Exposures Studies call **303-692-2700** or visit the web site: **www.cdphe.state.co.us/rf** or any of the following libraries or Rocky Flats Reading Rooms:

Colorado Department of Public Health and Environment
Information Center,
Building A, First Floor
4300 Cherry Creek Drive S.
Denver, CO 80246-1530
Phone: (303) 692-2037

Front Range Community College
DOE Rocky Flats
Reading Room
College Hill Library
33705 W. 112th Ave.,
Room L 169
Westminster, CO 80030
Phone: (303) 469-4435

Citizens Advisory Board
9035 N. Wadsworth Pkwy, Suite 2250
Westminster, CO 80021
Phone: (303) 420-7855

University of Colorado Boulder
(After January 1, 2000)
Government Publications Library
Campus Box 184
3rd Floor, Norlin Library
Boulder, CO 80309
Phone: (303) 492-8834

Study Overview

Research concerning carbon tetrachloride and beryllium released from Rocky Flats was part of a comprehensive study of all major contaminant releases from the plant. The Rocky Flats Historical Public Exposures Studies involved nine years of research including identification and assessment of past releases of radioactive materials and chemicals from the former Rocky Flats Nuclear Weapons Plant. The researchers estimated the cancer risk to residents living or working in surrounding communities during the plant's operation from 1952 to 1989.

The project was administered by the Colorado Department of Public Health and Environment and overseen by a 12-member Health Advisory Panel appointed by former Governor Roy

Romer.

Phase I of the Historical Public Exposures Studies, a toxicologic review and dose reconstruction, began in 1990 and concluded in 1994. ChemRisk, a division of McLaren/Hart Environmental Engineering, conducted Phase I. Radiological Assessments Corporation conducted Phase II, a toxicity assessment and risk characterization, from 1992 to 1999.

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