

**Special Exposure Cohort Petition**

under the Energy Employees Occupational Illness Compensation Act 8-25-08 A11:25 IN

**U.S. Department of Health and Human Services**

Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health

OMB Number: 0920-0639

Expires: 05/31/2007

**Special Exposure Cohort Petition — Form B**

Page 1 of 7

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

**General Instructions on Completing this Form** (complete instructions are available in a separate packet):

Except for signatures, please PRINT all information clearly and neatly on the form.

Please read each of Parts A — G in this form and complete the parts appropriate to you. If there is more than one petitioner, then each petitioner should complete those sections of parts A – C of the form that apply to them. Additional copies of the first two pages of this form are provided at the end of the form for this purpose. A maximum of three petitioners is allowed.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

If you have questions about the use of this form, please call the following NIOSH toll-free phone number and request to speak to someone in the Office of Compensation Analysis and Support about an SEC petition: **1-800-356-4674**.

<b>If you are:</b>	<input type="checkbox"/> A Labor Organization,	Start at D on Page 3
	<input type="checkbox"/> An Energy Employee (current or former),	Start at C on Page 2
	<input checked="" type="checkbox"/> A Survivor (of a former Energy Employee),	Start at B on Page 2
	<input type="checkbox"/> A Representative (of a current or former Energy Employee),	Start at A on Page 1

**A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.**

A.1 **Are you a contact person for an organization?**  Yes (Go to A.2)  No (Go to A.3)

**A.2 Organization Information:**

Name of Organization

Position of Contact Person

**A.3 Name of Petition Representative:**

Mr./Mrs./Ms. First Name

Middle Initial

Last Name

**A.4 Address:**

Street

Apt #

P.O. Box

City

State

Zip Code

A.5 **Telephone Number:** ( ) -

A.6 **Email Address:**

A.7  Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization

**If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.**

Name or Social Security Number of First Petitioner: \_\_\_\_\_

Special Exposure Cohort Petition — Form B

**B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.**

B.1 **Name of Survivor:** \_\_\_\_\_  
First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** \_\_\_\_\_

B.3 **Address of Survivor:** \_\_\_\_\_  
Street Apt # P.O. Box  
City State Zip Code

B.4 **Telephone Number of Survivor:** \_\_\_\_\_

B.5 **Email Address of Survivor:** \_\_\_\_\_

B.6 **Relationship to Employee:** \_\_\_\_\_

Go to Part C.

**C Employee Information — Complete Section C UNLESS you are a labor organization.**

C.1 **Name of Employee:** \_\_\_\_\_  
First Name Middle Initial Last Name

C.2 **Former Name of Employee (e.g., maiden name/legal name change/other):**  
Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** \_\_\_\_\_

C.4 **Address of Employee (if living):**  
Street Apt # P.O. Box  
City State Zip Code

C.5 **Telephone Number of Employee:** ( ) \_\_\_\_\_

C.6 **Email Address of Employee:** \_\_\_\_\_

C.7 **Employment Information Related to Petition:**

C.7a **Employee Number (if known):** \_\_\_\_\_

C.7b **Dates of Employment:** Start 1968/1974 End 1974/1978

C.7c **Employer Name:** Linde Ceramic

C.7d **Work Site Location:** Tonawanda, NY

C.7e **Supervisor's Name:** \_\_\_\_\_

Go to Part E.

Name or Social Security Number of First Petitioner: \_\_\_\_\_

**Special Exposure Cohort Petition — Form B**

**D Labor Organization Information — Complete Section D ONLY if you are a labor organization.**

**D.1 Labor Organization Information:**

\_\_\_\_\_  
Name of Organization

\_\_\_\_\_  
Position of Contact Person

**D.2 Name of Petition Representative:**

\_\_\_\_\_

**D.3 Address of Petition Representative:**

\_\_\_\_\_  
Street

\_\_\_\_\_  
Apt #

\_\_\_\_\_  
P.O. Box

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip Code

**D.4 Telephone Number of Petition Representative:** (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

**D.5 Email Address of Petition Representative:** \_\_\_\_\_

**D.6 Period during which labor organization represented employees covered by this petition**  
(please attach documentation): Start \_\_\_\_\_ End \_\_\_\_\_

**D.7 Identity of other labor organizations that may represent or have represented this class of employees (if known):**

\_\_\_\_\_

**Go to Part E.**

Name or Social Security Number of First Petitioner: \_\_\_\_\_

Special Exposure Cohort Petition — Form B

E Proposed Definition of Employee Class Covered by Petition — Complete Section E.

E.1 Name of DOE or AWE Facility: Linde Ceramic

E.2 Locations at the Facility relevant to this petition:  
Building # 11 and # 30

E.3 List job titles and/or job duties of employees included in the class. In addition, you can list by name any individuals other than petitioners identified on this form who you believe should be included in this class: Computer programmers, Systems Analyst

E.4 Employment Dates relevant to this petition:  
Start 1968 End 1974  
Start 1977 End 1978  
Start \_\_\_\_\_ End \_\_\_\_\_

~~E.5~~ Is the petition based on one or more unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents?  Yes  No

If yes, provide the date(s) of the incident(s) and a complete description (attach additional pages as necessary):

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Go to Part F.

Special Exposure Cohort Petition — Form B

F Basis for Proposing that Records and Information are Inadequate for Individual Dose —  
Complete Section F.

Complete at least one of the following entries in this section by checking the appropriate box and providing the required information related to the selection. You are not required to complete more than one entry.

- F.1  I/We have attached either documents or statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that potential radiation exposures were not monitored.

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- F.2  I/ We have attached either documents or statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is no information regarding monitoring, source, source term, or process from the site where the employees worked.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that radiation monitoring records for members of the proposed class have been lost, altered illegally, or destroyed.

As it states in the attached letter  
from DOW (union Carbides Retirement Services)  
that my records  
have been destroyed.  
Also attached is a page from his  
medical records stating ~~staff~~ to his

Part F is continued on the following page.

Name or Social Security Number of First Petitioner: \_\_\_\_\_

Special Exposure Cohort Petition — Form B

Appendix — Continuation Page

Continuation Page — Photocopy and complete as necessary.

Doctor, that was exposed to very dusty conditions for a 2 year period of time through that two year time if any records were kept for radiation contamination they were destroyed. Making it impossible to do a true dose reconstruction.

On my 3rd attachment (Doc# SEA-TR-TASK-0014 pg # 109 of 126) it shows building # 11 was remodeled (1/2 building) in the late 60's and then again in the late 70's - I believe. I do remember talking about the dusty, dirty conditions at Kinde during the late 1970's from remodeling. I don't know if building # 11 was the only building was working from at that time or where the computer room was moved to. In the 60's + 70's computers were room size, so it would make sense to remodel this area.

I see by looking at the same page (# 109) building # 30 also had offices. We cannot know for sure what building it was, detailed records have been destroyed.

Through my research for information on multiple Myeloma Cancer and based on the facts of my supporting documents from: Mayo Clinic, Roswell Park Cancer Institute, Cancer, Ora, Cancer Center of America

A 2 year exposure incident would have a devastating effect on anyone's health. Based on the risk factors for Multiple

Attach to Form B if necessary.

Name or Social Security Number of First Petitioner: \_\_\_\_\_

Special Exposure Cohort Petition — Form B

Appendix — Continuation Page

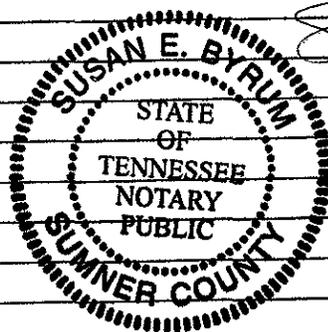
Continuation Page — Photocopy and complete as necessary.

myeloma and taking into account:  
- Race  
- Body weight  
- Age  
it is statistically shown that more likely than not radiation exposure caused the multiple myeloma in my father case.

In closing I have to the best of my ability truthfully and honestly collected pertinent documents, data and information pursuant to my claim that it is 100% impossible to accurately reconstruct dosage data with destroyed records.

Respectfully,

Sworn to and subscribed before me this 21<sup>st</sup> day of August, 2008



Susan E. Byrum  
Exp. 2/23/11

Attach to Form B if necessary.

Name or Social Security Number of First Petitioner: \_\_\_\_\_

**Special Exposure Cohort Petition — Form B**

F.3  I/We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting the limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition. The report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR Part 82 and related NIOSH technical implementation guidelines.

(Attach report to the back of the petition form.)

F.4  I/We have attached a scientific or technical report, issued by a government agency of the Executive Branch of Government or the General Accounting Office, the Nuclear Regulatory Commission, or the Defense Nuclear Facilities Safety Board, or published in a peer-reviewed journal, that identifies dosimetry and related information that are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of employees covered by the petition.

(Attach report to the back of the petition form.)

**Go to Part G.**

**G Signature of Person(s) Submitting this Petition — Complete Section G.**

**All Petitioners should sign and date the petition. A maximum of three persons may sign the petition.**

Signature

8/20/08  
Date

Signature

Date

Signature

Date

**Notice:** Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided under EEOICPA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both. I affirm that the information provided on this form is accurate and true.

Send this form to: SEC Petition  
Office of Compensation Analysis and Support  
NIOSH  
4676 Columbia Parkway, MS-C-47  
Cincinnati, OH 45226

**If there are additional petitioners, they must complete the Appendix Forms for additional petitioners. The Appendix forms are located at the end of this document.**

Name or Social Security Number of First Petitioner: \_\_\_\_\_

### **Public Burden Statement**

Public reporting burden for this collection of information is estimated to average 300 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

### **Privacy Act Advisement**

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. § 552a), you are hereby notified of the following:

The Energy Employees Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385) (EEOICPA) authorizes the President to designate additional classes of employees to be included in the Special Exposure Cohort (SEC). EEOICPA authorizes HHS to implement its responsibilities with the assistance of the National Institute for Occupational Safety (NIOSH), an Institute of the Centers for Disease Control and Prevention. Information obtained by NIOSH in connection with petitions for including additional classes of employees in the SEC will be used to evaluate the petition and report findings to the Advisory Board on Radiation and Worker Health and HHS.

Records containing identifiable information become part of an existing NIOSH system of records under the Privacy Act, 09-20-147 "Occupational Health Epidemiological Studies and EEOICPA Program Records. HHS/CDC/NIOSH." These records are treated in a confidential manner, unless otherwise compelled by law. Disclosures that NIOSH may need to make for the processing of your petition or other purposes are listed below.

NIOSH may need to disclose personal identifying information to: (a) the Department of Energy, other federal agencies, other government or private entities and to private sector employers to permit these entities to retrieve records required by NIOSH; (b) identified witnesses as designated by NIOSH so that these individuals can provide information to assist with the evaluation of SEC petitions; (c) contractors assisting NIOSH; (d) collaborating researchers, under certain limited circumstances to conduct further investigations; (e) Federal, state and local agencies for law enforcement purposes; and (f) a Member of Congress or a Congressional staff member in response to a verified inquiry.

This notice applies to all forms and informational requests that you may receive from NIOSH in connection with the evaluation of an SEC petition.

Use of the NIOSH petition forms (A and B) is voluntary but your provision of information required by these forms is mandatory for the consideration of a petition, as specified under 42 CFR Part 83. Petitions that fail to provide required information may not be considered by HHS.

Name or Social Security Number of First Petitioner: \_\_\_\_\_



Union Carbide Corporation  
A Subsidiary of The Dow Chemical Company  
USA

February 27, 2008

This is in response to your letter that I received on February 5, 2008 requesting information regarding retirement benefit. You also requested information regarding his employment history at Union Carbide Corporation ("UCC").

Date of Hire was 1952 and his adjusted Continuous Service Date at UCC was 1953. This adjustment results from a brief period where he was laid off. employment ended on 1986 as a result of the Voluntary Severance Program which included a "3 + 3" pension benefit enhancement. The "3 + 3" enhancement added an additional 3 years to his age and service for purposes of pension calculation. When employment at UCC ended, actual age was 52 year, 10 months and actual service was 33 years, 6 months. Application for Retirement Benefits" is enclosed.

He elected to commence his pension benefit immediately on 1986. He elected the 50% Joint and Survivor option (enclosed) and also elected the Level Income option (enclosed). He received \$2,079.55 per month prior to age 62 and was scheduled to receive \$1,477.55 per month after age 62 but passed away before this benefit became effective. The survivor pension (\$905.78) was based on his pension benefit prior to processing his Level Income election. pension calculation is enclosed.

He passed away on 1994 and your survivor pension (\$905.78) commenced on 1994. It was increased to \$955.78 on 2007 as a result of the recent pension adjustment.

According to our records management schedule, personnel files of employees are kept for 6 years plus the current year after an employee leaves employment. Therefore, personnel file has been destroyed and I am unable to provide great detail of his employment history with Union Carbide Corporation. However, there was some information in his pension file that I can share with you (enclosed).

He retired from the Carbon Products division at their facility in Clarksville, TN. His last position was a Staff Analyst in the Information Technology group. It appears that he

spent his entire career in the Carbon Products division. Prior to July 1, 1965 he appears to have worked in clerical positions, e.g., Senior Clerk. Starting on July 1, 1965 and until he retired he held a variety of positions in the Information Technology group starting as a Program Analyst until his final position as Staff Analyst. During this time he worked in:

- Niagara Falls, NY: 1959.
- Clarksburg, WV: 1959 - , 1960
- Columbia, TN: 1960 - , 1965
- Niagara Falls, NY: , 1984
- Clarksville, TN: 1984 - , 1986.

If you have any further questions, please call the Retiree Service Center at (800) 334-0661.

Sincerely,



Andrew Flood  
Authorized Representative of Union Carbide Corporation

322-12

**MOUNT ST. MARY'S HOSPITAL OF NIAGARA FALLS**  
5300 Military Road  
Lewiston, New York 14092-1997  
716-297-4800

**CONSULTATION REPORT**

Name:  
Address:  
City:

Date: 06/11/94

DOB: 11/27/33

Insurance: Aetna, Policy , patient name thru Union Carbide

Consulting Physician: Norman O. Fiorica, M.D.

Attending Physician: Frank A. Ferraro, M.D.

**REASON FOR CONSULTATION:** Diffuse interstitial--alveolar infiltrate, fever and mildly immunocompromised host.

**HISTORY OF PRESENT ILLNESS:** This 60 year-old was admitted on 6/9/94 with a history of temperature to 101.2°. The patient noted a cough productive of small amounts of yellow sputum. In addition, one blood culture from 6/6/94 had grown Staph. coag. negative organism in one culture medium. A chest x-ray from 6/9/94 revealed diffuse lung process with left-sided predominance. CT of chest was performed on 6/10/94 which revealed diffuse pulmonary abnormality, left more than right with interstitial alveolar infiltrates, predominantly alveolar. No pleural fluid was identified. There was no significant mediastinal lymphadenopathy. CBC on 6/9/94 revealed white blood count of 4.3 thousand with 74 segs, 2 bands, and 3 eosinophils. Repeat CBC on 6/11/94 revealed white blood count 5,000 with 63 segs, 2 bands, and 11 eosinophils. Hemoglobin 9.1, hematocrit 28, platelet count 225,000.

The patient has had only mild history of tobacco abuse. He states that he smoked one pack of cigarettes daily for 20 years but quit smoking in 1968. He was a computer operator with Union Carbide. He worked in an office inside the plant which was quite dusty for a two year period of time. He then was transferred to Tennessee where he remained a computer operator. He retired from Union Carbide in 1986. He then work in a pencil factory for a short time.

He has no pets. He does not raise birds. He does not operate a farm. He has no exposure to silos. He has not purchased any new furniture in his home during the past six months.

He does have a cough productive of small amounts of yellow sputum. He is mildly dyspneic.

**PAST MEDICAL HISTORY:** The patient has had history of Waldenstrom's macroglobulinemia. He was hospitalization from 4/6-9/94. Medical problems at that time included dehydration, oral candidiasis, pancytopenia secondary to chemctherapy, coagulopathy secondary to Waldenstrom's macroglobulinemia, and a transfusion reaction associated with hemolysis. Free hemoglobin was present in urine on 4/8/94. Coagulation profile on 4/6/94 had revealed protime 16/11 seconds with PTT 44 seconds, fibrinogen 163. Bone marrow examination in

**CONSULTATION REPORT**

ORIGINAL

Linde  
Ceramic →  
Site

### Site Description

The southwest corner of the site was referred to as the Tonawanda Laboratory. This included Buildings 10, 11, 12, 13, 14, 15, 16, 23, 34, 43, 44, 47, 52, 62, 66 and 100. The factory area made up the remainder of the site and included the production facilities used during the MED project. Table A3.1 below describes the buildings on the Linde site and their current status.

**Table A3.1. Descriptions of Select Linde Buildings**

Building	Description	Current Status
A	Manhattan Engineering District offices	Torn down
B	Administrative	Torn down
1	Administrative Support	Current
2	Factory Manufacturing Area	Converted to laboratories; Current
8	Old Powerhouse	Pending tear down
9	Meter and Generating Room	Renovations
10	Laboratory Administration with Labs; Navy Laboratory	Current
11	Instrument Service Department, Silicon Rubber, Silicon, Dynamonitor Lab, Navy Project	Remodeled half the building in the late-1960s to create office area and large computer room; Remodeled again to remove the computer room and add labs upstairs
14	R&D Laboratory, Uranium Processing; High Flux Tubing; Silicon Production; Experimental Laboratory; Oxygen manufacturing	In Process of being Torn Down
15	Engineering Laboratory; Cryogenic Laboratory; Garages; Krypton-85 gases used	Renovations several times; Current
16	Engineering Laboratory	Renovations several times; Current
19	Metal Fabrication Building	Torn down; New Powerhouse built where this building was previously
23	Guard Shack	Torn down
25	Battery House	Torn down
27	Engineering Department	Current
29	Maintenance Department	Torn down
30	Ceramics Building; Storage; Offices; wooden building with cinder blocks and dirt floor	Torn Down
31	Molecular Sieves; Research Laboratory; U-processing	Pending tear down; Renovated in 1957
33	Engineering Department	Torn Down
34	Molecular Sieves Laboratory Building	Pending tear down
37	Storage; High Flux Cooling Area	Torn Down
38	Rare Gas Laboratory; U-processing; wooden building with cinder blocks and dirt floor	Torn Down
39	Laboratory Building; wooden building with cinder blocks and dirt floor	Torn Down

*Contaminated tunnel was connected*  
←  
*77-78*

*Research Development*

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Jan 11, 2008

## Multiple myeloma

### ARTICLE SECTIONS

- Introduction
- Signs and Symptoms
- Causes
- Risk factors
- When to seek medical advice
- Screening and diagnosis
- Complications
- Treatment
- Self-care
- Coping skills

Enter e-mail address

[More Information](#)

### Risk factors

Multiple myeloma isn't contagious. Most people who develop multiple myeloma have no clearly identifiable risk factors for the disease.

Some factors that may increase your risk of multiple myeloma include:

- 7 ■ **Age.** The majority of people who develop multiple myeloma are older than 50, with most diagnosed around age 70. Few cases occur in people younger than 40.
- Y ■ **Sex.** Men are more likely to develop the disease than are women.
- N ■ **Race.** Blacks are about twice as likely to develop multiple myeloma as are whites.
- N ■ **History of a monoclonal gammopathy of undetermined significance.** Every year 1 percent of the people with MGUS in the United States develop multiple myeloma.
- N ■ **Obesity.** Your risk of multiple myeloma is increased if you're overweight or obese

Other factors that may increase your risk of developing multiple myeloma include exposure to radiation and working in petroleum-related industries.

Get the facts about multiple myeloma.

*was thin to average not at all obese*

[PREVIOUS](#)

[NEXT: When to seek medical advice](#)

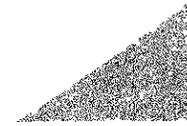
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Home > Patient Care > Types of Cancer > Hematology > Multiple Myeloma

## Multiple Myeloma

### Overview

Multiple myeloma is the name given to a group of diseases called plasma cell neoplasms. Plasma cells are made by white blood cells called lymphocytes. The plasma cells make antibodies, the parts of the blood that fight infection and toxins). When plasma cells become cancerous, they may make too many antibodies.

Multiple myeloma is more common in African-Americans than Caucasians, in people over age 45, and in people who have been exposed to radiation and industrial chemicals.



*was  
so he was less likely to have  
casually contacted Multiple M.*

### Incidence

The American Cancer Society estimates that more than 19,900 new cases of multiple myeloma will be diagnosed in 2008.

### Signs & Symptoms

Early symptoms may include swollen lymph nodes, liver and spleen, bone pain, and easy bruising.

### Screening & Diagnosis

No screening tests are available. Blood tests, lymph node biopsy, CT and MRI scans, and bone marrow biopsy are used to diagnose this cancer.

### Treatment

Chemotherapy is the main treatment option, although some patients may receive immunotherapy or radiation therapy as well. In some cases, blood and marrow transplantation may be an option.

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### Be Healthy After Treatment

Nutrition for Cancer Survivors

Cancer Prevention

Early Detection

Glossary

### I Want to Help

Help in the fight against cancer. Donate and volunteer. It's easy and fun!  
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## Radiation Exposure and Cancer

Radiation is the emission (sending out) of energy from any source. The light that comes from the sun is a source of radiation, as is the heat that is constantly coming off our bodies. When talking about radiation, however, most people think of specific kinds of radiation such as that produced by radioactive materials or nuclear reactions. Most forms of radiation have not been linked to cancer. Only high frequency radiation (ionizing radiation and ultraviolet radiation) has been proven to cause genetic damage, which can lead to cancer.

The hazards of exposure to some kinds of radiation were recognized shortly after the discovery of the x-ray in 1895. Skin reactions were observed in many people working with early x-ray generators, and by 1902 the first radiation-caused cancer was reported in a skin sore. Within a few years, a large number of such skin cancers had been observed. The first report of leukemia (a cancer of the bone marrow) in radiation workers appeared in 1911. Marie Curie, the discoverer of radium, and her daughter are believed to have died of radiation-caused leukemia. Since that time, many studies have confirmed the cancer-causing effects of some types of radiation.

### Ionizing Radiation

Radiation can generally be defined as being ionizing or non-ionizing. Ionizing radiation consists of high-energy waves that are able to penetrate cells and can cause ionization in different parts of the cell. Ionization is the development of a positive charge in a molecule (group of atoms) that is normally neutral (without a charge). Ionized molecules are unstable and quickly undergo chemical changes. This can lead to the formation of free radicals that can damage the molecule or other molecules around it.

One type of molecule that is sensitive to ionizing radiation is DNA, the part of the cell that contains the genes (blueprints) for each person's characteristics. Ionizing radiation can lead to a mutation (change) in a cell's DNA, which could contribute to cancer, or to the death of the cell. All cells in the body can be damaged by ionizing radiation. The amount of damage is related to the dose of radiation received by the cell. While the process of cellular change from radiation takes only a fraction of a second, other changes such as the beginning of cancer may take years to develop.

Types of ionizing radiation include x-rays, gamma rays, cosmic rays, and

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particles given off by radioactive materials such as alpha particles, beta rays, and protons. These forms of radiation have different energy levels and can penetrate cells to different extents, but all are capable of causing ionization.

People may be exposed to 3 main types of ionizing radiation:

- **Natural background radiation** comes from cosmic rays from our solar system and radioactive elements normally present in the soil. This is the major contributor to worldwide radiation exposure.
- **Non-medical synthetic radiation** occurs as a result of above ground nuclear weapons testing that took place before 1962 as well as occupational and commercial sources.
- **Medical radiation** comes in the form of diagnostic x-rays and other tests, as well as from radiation therapy. Radiation therapy is currently used to treat some types of cancer and involves dosages many thousand times higher than those used in diagnostic x-rays.

### Does Ionizing Radiation Cause Cancer?

Ionizing radiation has been shown to induce (cause) cancer in many different species of animals and in almost all parts of the body. It is one of the few scientifically proven carcinogens (cancer-causing agents) in human beings, although it appears to be a relatively weak carcinogen compared to many chemical agents. Many years may elapse between the radiation exposure and the appearance of the cancer.

The types of cancer that can be caused by radiation can also occur naturally (without increased exposure to radiation), but some occur more frequently as a result of radiation. For example, a higher percentage of small cell lung cancers occur in uranium miners as a result of exposure to alpha radiation (a form of highly ionizing radiation).



Organs differ in their sensitivity to the effects of radiation. The thyroid gland and bone marrow are most sensitive to radiation, while the kidney, bladder, and ovary seem to be least affected. Some forms of leukemia, a type of cancer that arises in the bone marrow, appear to be the most common radiation-induced cancers.

Evidence that ionizing radiation causes cancer comes from studies of atomic bomb survivors in Japan, persons exposed to large amounts of x-rays, and from certain occupational exposures, such as workers with lung exposure to alpha radiation. These studies, however, generally involved relatively high-dose exposure - greater than 10 centigray. (A centigray (cGy) is a standard unit of radiation dose.) Therefore, the risk estimates for lower doses of radiation have to be estimated from the high-dose data, and may not be accurate.

### Dose-Related Radiation Effects

Ionizing radiation is probably the only carcinogen with evidence that its effects are related to dose exposure. The probability that cancer will result from radiation exposure increases as the dose increases. However, there is no evidence to suggest that the grade (tendency to grow and spread) of the resulting cancer is affected by the dose. In other words, higher doses of radiation do not cause more aggressive cancers.

### Low-Dose Radiation Exposure

How the dose reconstruction was done as if higher dose increased cancer growth

A number of studies over the past 20 years have looked at the impact of environmental radiation exposure in the dose range of 10 cGy or less. Careful analysis of this research revealed no significant increase in the incidence of all cancers combined, or of cancers in specific parts of the body. Research in this area is continuing.

#### Types of Cancer Associated With Ionizing Radiation

Leukemia was at one time thought to be the major cancer to arise from high-dose radiation exposure, based on the experience with people exposed to the atomic blasts in Japan. It is now known that other cancers can result from radiation exposure, although they may take longer to develop (usually at least 10 to 15 years). Leukemias, by contrast, begin appearing as early as 2 years after acute radiation exposure.

Studies of the survivors of the atomic blasts have demonstrated that high-dose radiation (at least 100cGy) increases the risk of developing several types of cancer.

- For these survivors, the risk of developing leukemia is five and a half times greater than in the general public. Children appear to be twice as sensitive as adults to the leukemia-causing effects of radiation, and unborn children exposed to radiation in the uterus are even more sensitive.
- The risk for developing any type of cancer in those highly exposed to an atomic blast is about 50% higher than the risk in those not exposed.
- Female breast cancer risk is more than twice as high as normal, and women who are exposed when under the age of 20 are found to be at higher risk than older women.
- The risk of developing lung cancer is 50% higher, and the risk for multiple myeloma is more than twice as high as in the general population.

Does this mean  
more than 50%  
?

Some people serving in the armed forces were exposed to radiation in nuclear weapons testing during the Cold War era. Information on this topic is available in our document, "Cancer Among Military Personnel Exposed to Nuclear Weapons."

#### Cancers Caused by Radiation Therapy

Ionizing radiation is an effective way to treat certain kinds of cancer. During radiation therapy, high doses of ionizing radiation are directed at the cancer, resulting in the death of the cancer cells. However, this can lead to DNA mutations in cells that survive the radiation, which can eventually lead to the development of another cancer (called a second primary cancer).

An increase in second primary tumors in the area being irradiated has been observed in patients with several types of cancer following radiation therapy and/or chemotherapy. Some studies have associated radiation therapy with an increased incidence of thyroid cancer and early-onset breast cancer. Overall, however, radiation alone does not appear to be a very potent cancer-causing agent in second tumors. This is probably due to the fact that it is often used in a localized area, which means fewer normal cells are exposed to radiation.



Cancer Treatment  
Centers of America

Winning the fight against cancer cannot wait every day.

PS

## Multiple Myeloma Information

**MEET our cancer patients and read their testimonials.**



Click on button to read testimonials.

- Betty



No case is typical. You should not expect to experience these results.

Multiple myeloma is a type of cancer that affects the plasma of white blood cells. If you have been diagnosed with multiple myeloma, you have a powerful ally in Cancer Treatment Centers of America. CTCA will work with you to find a multiple myeloma treatment that is most appropriate for you. Please keep reading to learn more about CTCA and how we can help in your fight against multiple myeloma. To gather more valuable information on multiple myeloma and other cancers we treat, you may also want to visit our homepage: [CancerCenter.com](http://CancerCenter.com).

### Information on Multiple Myeloma

Myeloma cells collect in the bone marrow and in the hard, outer part of bones. Sometimes they collect in only one bone and form a single mass, or tumor, called a plasmacytoma. In most cases, however, the myeloma cells collect in many bones, forming many tumors. When this happens, the disease is called multiple myeloma.

Although multiple myeloma affects the bones, it does not begin in the bones. Multiple myeloma originates in cells of the immune system. Multiple myeloma is different from bone cancer, which actually begins in cells that form the hard, outer part of the bone. Therefore, diagnosis and treatment of multiple myeloma are different from that of bone cancer.

### Multiple Myeloma Statistics

According to the International Myeloma Foundation, there are over 13,500 new cases of Myeloma in the U.S. each year. This represents 20% of all blood cancers, and 1% of all types of cancer. The chances of getting multiple myeloma increase with age.



Risk factors for **multiple myeloma** include exposure to atomic radiation, petroleum products, pesticides, solvents, heavy metals and airborne particles.

### Cancer Treatment Centers of America: Multiple Myeloma Treatment

At CTCA, treatment for multiple myeloma depends on your age, the stage of your multiple myeloma, your overall health and a variety of other factors. Your multiple myeloma treatment may include intensity modulated radiation therapy, fractionated dose chemotherapy, and autologous stem cell rescue with post transplant immunotherapy. In addition to these traditional treatment forms, your multiple myeloma treatment may include complementary and alternative therapies.

**Multiple Myeloma - More Information**

To learn more about multiple myeloma, please visit our Multiple Myeloma Cancer Center at this link: [Multiple Myeloma & CTCA](#). You can also gain valuable information about multiple myeloma by visiting our homepage.

### **Additional Cancer Information And Resources**

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Don't miss this additional information on multiple myeloma. Click on the links to the right to learn more about breast cancer or call 1-800-615-3055 to discuss your treatment options with one of our Oncology Information Specialists.

**URL:** <http://www.cancercenter.com>

- ▶ [Site Map](#)
- ▶ [Multiple Myeloma Index](#)
- ▶ [Multiple Myeloma Information](#)
- ▶ [Skin Cancer](#)

Call 800-615-3055 for a free, no-obligation conversation with one of our Oncology Information Specialists.

Our representatives are available 24 hours a day, every day.

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