



## Stomach Cancer and Exposure to Ionizing Radiation

**Summary:** Moderately strong evidence has been recorded of a possible connection between stomach cancer and exposure to ionizing radiation. This evidence is based upon studies of nuclear workers exposed to ionizing radiation. These findings are consistent with the National Research Council's determination that the stomach is sensitive to ionizing radiation. Stomach cancer is designated as a "specified" cancer under the Energy Employees Occupational Illness Compensation Program Act. Historically, stomach cancer incidence and mortality have been very low for Los Alamos County. Incidence and mortality in Rio Arriba County have been very high among New Mexico counties. Incidence means new cases of cancer, while mortality means deaths due to cancer.

### ***What is Stomach Cancer?***

Stomach cancer can develop in any part of the stomach and may spread throughout the stomach. It may extend along the stomach wall and grow into the esophagus or small intestine that are attached to the stomach. It also may spread to other parts of the body. Stomach cancer is also called gastric cancer. Stomach cancer is the second leading cause of cancer death in the world. (National Cancer Institute)

### **Findings of Human Health Research Studies**

Human health research studies compare the patterns of disease among groups of people with different amounts of exposure to a suspected risk factor. Below are results reported from such studies of stomach cancer among people exposed to ionizing radiation.

All of these studies found possible increases in stomach cancer among certain groups of exposed workers. Statistically significant is a term used to mean that the connection between the health outcome and the exposure was strong enough that it was unlikely to be due to chance. An asterisk (\*) was placed by statistically significant findings. All were mortality studies of stomach cancer death as a health outcome. Incidence studies, which look at new cases, can track health more quickly and accurately.

### ***Studies of Los Alamos National Laboratory (LANL) Workers***

Research conducted of LANL workers provides the most direct evidence about possible relationships between a health problem and workplace exposures at LANL.

- **Zia Study (unpublished):** An increase in deaths due to stomach cancer was found in a study of 4,942 men employed by Zia Company between 1946 and 1978. \* Hispanics had higher rates than Anglos.<sup>15</sup>

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\* Findings were statistically significant (strong evidence)

+ Evidence of a dose-response relationship (strongest evidence)



### **Studies of Other Nuclear Workers in the United States**

The next most relevant evidence comes from studies of workers in similar occupations with the same types of exposures. Listed below are studies that looked at stomach cancer and workplace exposures among nuclear workers in other parts of the United States.

- **Fernald:** A possible increase in stomach cancer deaths was observed among white male uranium processing workers employed from 1951 to 1989, followed to 1990.<sup>1</sup>
- **Oak Ridge Y-12:** Studies observed a possible increase in stomach cancer deaths among white male workers employed from 1943 to 1972, who were followed until 1978. This increase was seen in comparison to rates in Tennessee.<sup>50</sup> However this increase was not seen when the comparison was made to U.S. rates or in later years of follow-up.<sup>23, 24, 57, 67, 77</sup>
- **Portsmouth:** There was a possible increase in stomach cancer deaths in workers from 1954 to 1991.<sup>18</sup>

### **Studies of Other Nuclear Workers World-Wide**

Below are studies of nuclear workers outside of the United States that looked at stomach cancer in connection with radiation exposures.

- **Sellafield, England:** There was a possible increase in stomach cancer deaths seen in non-plutonium radiation workers who were employed between 1947 and 1975, and then followed until 1993.<sup>3</sup>

## **Other Research and Policy Findings**

### ***Is the Stomach Sensitive to Radiation?***

- **Yes.** According to the National Research Council's BEIR V Committee, the stomach is sensitive to the cancer-causing effects of ionizing radiation.<sup>8</sup>

The National Research Council advises the U.S. government on scientific matters. Their Committee on Biological Effects of Exposure to Ionizing Radiations (BEIR) V reviewed sensitivity of parts of the body to radiation. Their findings are based mostly on studies of cancer among atomic bomb survivors, as well as on some of the available information on the biology of the body, animal studies, and other evidence. The greatest risk is at high exposure levels.

### ***Is Stomach Cancer a "Specified" Cancer Under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA)?***

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\* Findings were statistically significant (strong evidence)

+ Evidence of a dose-response relationship (strongest evidence)



- **Yes.** Stomach cancer is a “specified” cancer under the EEOICPA consideration of Special Exposure Cohorts.

Policy makers have identified certain types of cancer among energy employees at nuclear facilities, including those employed at Los Alamos National Laboratory, as being potentially related to occupational exposures under the EEOICPA.

### **What Are Other Risk Factors for Stomach Cancer?**

In considering the risks of occupational exposure to ionizing radiation, it is important to understand other risk factors. Below is a list of other possible risk factors for stomach cancer.

- **Tobacco.** Smoking is believed to be a “minor” cause of stomach cancer; <sup>41</sup> “to a limited degree.”<sup>42</sup>
- **Diet.** Salted, pickled and smoked foods are among additional risk factors.
- **Other Work Exposures.** Asbestos and certain other dusts and fumes in the workplace have been linked to a higher than average risk of stomach cancer

These factors may add to any risk due to workplace exposure to ionizing radiation. Stomach cancer affects men twice as often as women, and is more common in black people than in white people. Also, stomach cancer is more common in some parts of the world -- such as Japan, Korea, parts of Eastern Europe, and Latin America -- than in the United States.

Nine counties in New Mexico have big deposits of uranium. These include Rio Arriba, Taos, Santa Fe, Sandoval, and Mora counties. Some scientists think that this may contribute to higher rates of stomach cancer in these counties.<sup>3</sup>

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<sup>3</sup> Wilkinson GS. Gastric cancer in New Mexico counties with significant deposits of uranium. Archives of Environmental Health 1985;40(6):307-.

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+ Evidence of a dose-response relationship (strongest evidence)



### ***What Makes Stomach Cancer and Radiation Exposure Difficult to Study?***

There are difficulties in all human studies because one cannot precisely determine all exposures and track all individual outcomes. In cancer this is especially the case as the cancer may take many years to develop to the point of diagnosis and possible death (disease latency). It is particularly difficult to diagnose stomach cancer until late stages.

## **Rates of Stomach Cancer In Exposed Counties**

### ***Los Alamos County***

There have been very low rates of stomach cancer reported in Los Alamos County for both stomach cancer incidence and mortality.

- Los Alamos County ranked 27<sup>th</sup> in stomach cancer incidence and very low in mortality from 1970 to 1996 of the 33 counties in New Mexico.<sup>13</sup>
- In recent years, about one new case of stomach cancer has been diagnosed each year in Los Alamos County.<sup>13,33</sup> Most of the cases are in men.<sup>14</sup>

### ***Rio Arriba County***

Rates of stomach cancer reported in Rio Arriba County have been very high for both stomach cancer incidence and mortality. These higher rates may be due to chance differences in area rates.

- Rio Arriba County ranked 4<sup>th</sup> highest in stomach cancer incidence from 1970 to 1996 of the 33 counties in New Mexico.<sup>33</sup>
- Rio Arriba County ranked highest in stomach cancer mortality from 1970 to 1996 of the 33 counties in New Mexico.<sup>33</sup>

Rio Arriba County's ranking for stomach cancer mortality is worse than its ranking for stomach cancer incidence. This means that the rates of diagnosis and treatment may be low relative to the number who actually have the disease. More work needs to be done to detect and treat stomach cancer early.

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+ Evidence of a dose-response relationship (strongest evidence)