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Kidney Cancer and Exposure to Ionizing Radiation

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Kidney Cancer and (and cancer of the renal pelvis) Exposure to Ionizing Radiation

Summary: Strong evidence has been recorded of a possible connection between kidney cancer and exposure to ionizing radiation. This evidence is based upon studies conducted at Los Alamos National Laboratory, studies of nuclear workers at other sites, and others exposed to ionizing radiation. These findings are consistent with the National Research Council's determination that radiation can cause cancer of the kidneys and other urinary organs. Kidney cancer is designated as a "specified" cancer under the Energy Employees Occupational Illness Compensation Program Act. Historically, incidence of kidney cancer has been relatively low for Los Alamos County while mortality has been in the top third of New Mexico counties. Incidence and mortality due to kidney cancer in Rio Arriba County has been comparable to other NM counties. Incidence means new cases of cancer, while mortality means deaths due to cancer.

What is Kidney Cancer?

The kidneys are two organs located just above the waist, one on each side of the spine. Their main function is to filter blood and produce urine to rid the body of waste. The kidneys also help control blood pressure and regulate the formation of red blood cells. Several types of cancer can develop in the kidney. Renal cell (pelvic) cancer is the most common form of kidney cancer in adults. Wilms' tumor is the most common type of childhood kidney cancer. (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 kidney cancer among people exposed to ionizing radiation.

These studies found increases and possible increases in kidney cancer among certain groups of exposed individuals, in some cases followed over time. 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. The research included an incidence study, which look at new cases of cancer. Incidence studies can track health more quickly and accurately than mortality studies of deaths due to cancer. Adding to the strength of the findings is that increasing rates of kidney cancer were observed with higher doses in some studies.

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.

* *Findings were statistically significant (strong evidence)*

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



- **Mortality Study up to 1991:** The overall rate of death due to kidney cancer was lower in white male LANL workers than in the general population, probably due to lower rates of smoking. But there were increasing rates of death due to kidney cancer with increasing doses of external radiation.^{*+} This was evident only when workers with body burdens of plutonium were dropped from the analysis.²¹

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 kidney cancer and workplace exposures among nuclear workers in other parts of the United States.

- **Hanford, Washington:** A possible increase in deaths due to kidney cancer was found in a study of 35,000 males who were employed between 1944 and 1972, and then followed through 1972.⁵¹ Possible increases were also seen in a study of 44,100 workers who were followed through 1981 and again through 1986.^{49, 52}
- **Mallinckrodt, St. Louis, Missouri:** Possible increasing rates of death due to kidney cancer were observed with increasing doses of external radiation in a study of 2,514 men who were employed between 1942 and 1966, and then followed through 1993.⁺ The jobs with the greatest risk were pitchblende processing and processing of ore prior to removal of radium.²
- **Oak Ridge Y-12:** A possible increase in deaths due to kidney cancer was observed in a study of workers who were employed between 1947 and 1974, and then followed to 1990.²⁴

Studies of Other Nuclear Workers World-Wide

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

- **Atomic Weapons Establishment of the U.K.:** A possible increase in kidney cancer deaths was observed in an analysis of 3,742 workers who were monitored for internal radionuclides while employed between 1951 and 1982, and then followed through 1982 (This study assumed a 10 year latent period).⁵³
- **Sellafield, England:** A possible increase in deaths due to kidney cancer was seen in a study of plutonium workers, compared to non-radiation workers.³
- **Obninsk, Russia (I.P.P.E.):** Increased incidence of male kidney cancer was found in a study of 5,644 workers who were hired before 1981, and still employed between 1991 and 1997.^{7 *}

* Findings were statistically significant (strong evidence)

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



Studies of Other Ionizing Radiation Exposures

Studies among other groups of people who were not nuclear workers can also be significant as evidence of possible increases in kidney cancer among those who have been exposed to ionizing radiation. Most other research has been conducted of people exposed to atomic bombs.

- **Atomic Bomb Survivors**: Increasing deaths due to all urinary tract tumors combined were observed with increasing doses of radiation in a study of 76,000 A-bomb survivors.^{54 *+}

Other Research and Policy Findings

Is the Kidney Sensitive to Radiation?

- **Yes.** According to the National Research Council's BEIR V committee, radiation can cause cancer of the kidneys and other urinary organs.⁹

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 Kidney Cancer a "Specified" Cancer Under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA)?

- **Yes.** Kidney cancer is a "specified" cancer under the EEOIC Act 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.

* *Findings were statistically significant (strong evidence)*

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



What Are Other Risk Factors Associated with Kidney Cancer?

In considering the cancer risk from exposure to ionizing radiation at work, it is important to understand other risk factors. Below is a list of other possible risk factors for kidney cancer.

- **Tobacco use:** Research shows that smokers are twice as likely to develop kidney cancer as nonsmokers. In addition, the longer a person smokes, the higher the risk. However, the risk of kidney cancer decreases for those who quit smoking.
- **Obesity:** Obesity may increase the risk of developing kidney cancer.
- **Occupational exposure:** Studies suggest that coke oven workers in steel plants have above-average rates of kidney cancer. There is some evidence that working with asbestos, which has been linked to cancers of the lung and mesothelium (a membrane that surrounds internal organs of the body), also increases the risk of some kidney cancers.
- **Radiation therapy:** Women who have been treated with radiation therapy for disorders of the uterus may have a slightly increased risk of developing kidney cancer. Also, people who were exposed to certain radioactive substances sometimes used with diagnostic x-rays in the 1920s, have an increased rate of kidney cancer.
- **The drug Phenacetin:** Some people have developed kidney cancer after heavy, long-term use of this drug. This painkilling drug is no longer sold in the United States.
- **Dialysis treatment:** Patients on long-term use of dialysis to treat chronic kidney failure have an increased risk of developing renal cysts and renal cancer.
- **Von Hippel-Lindau (VHL) disease:** Researchers have found that people who have this inherited disorder are at greater risk of developing renal cell carcinoma, as well as tumors in other organs. (National Cancer Institute)

These factors may add to any risk due to workplace exposure to ionizing radiation.

Rates of Kidney Cancer in Exposed Counties

Los Alamos County

There have been low rates of kidney cancer incidence reported in Los Alamos County and high rates of mortality. This is an indication that more needs to be done to detect and treat these cancers early. In recent years, about one case occurred annually.^{13, 14} Los Alamos County:

- Ranked 26th in incidence of kidney and renal pelvis cancer and
- Ranked 10th highest in mortality among the 33 counties in New Mexico from 1970 to 1996.^{13, 14}

Rio Arriba County

There have been moderate rates of kidney cancer reported in Rio Arriba County for both cancer incidence and mortality. Rio Arriba County:

- Ranked 17th highest in incidence and
- 13th highest in mortality from kidney and renal pelvis cancer among the 33 counties in New Mexico from 1970 to 1996.³³

* Findings were statistically significant (strong evidence)

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