



## Cancer of the Oral Cavity and Pharynx and Exposure to Ionizing Radiation

**Summary:** Little evidence has been recorded of a possible connection between cancers of the oral cavity and pharynx and exposure to ionizing radiation. There is no evidence from studies conducted at Los Alamos National Laboratory or studies of nuclear workers at other sites who have been exposed to ionizing radiation. The National Research Council's determination that the pharynx and hypopharynx have "low" sensitivity to ionizing radiation. Salivary glands, another site among head and neck cancers, are considered more sensitive to radiation. Oral cancer and pharyngeal cancer (cancer of the pharynx) are designated as "specified" cancers under the Energy Employees Occupational Illness Compensation Program Act. Historically, oral and pharyngeal cancer incidence and mortality have been among the lowest in the state for Los Alamos County. Incidence and mortality in Rio Arriba County are approximately among the top third of New Mexico County rates.

### ***What are cancers of the oral cavity and pharynx?***

These cancers that begin in the oral cavity or pharynx are among the cancers of the head and neck. The oral cavity includes the lips and parts of the mouth and tongue. The pharynx is a hollow tube about 5 inches long that starts behind the nose and leads to the esophagus (the tube that goes to the stomach) and the trachea (the tube that goes to the lungs).

Most head and neck cancers begin in the squamous cells that line the structures found in the head and neck. Because of this, head and neck cancers are often referred to as squamous cell carcinomas. Some head and neck cancers begin in other types of cells. (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 the few such studies that have been conducted of cancers of the oral cavity and pharynx among people exposed to ionizing radiation.

#### ***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.

- In studies performed to date, there is no reported evidence from health studies of LANL workers of increased rates of oral or pharyngeal cancer.

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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 oral or pharyngeal cancer and workplace exposures among nuclear workers in other parts of the United States.

- Lawrence Livermore, California: Increased incidence of salivary gland tumors was seen in females who were employed between 1969 and 1980. \* Findings were based on just two cases.<sup>22</sup>

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

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

- No evidence is available from health studies of nuclear workers in other countries of increased rates of oral or pharyngeal cancer.

## **Other Research and Policy Findings**

### ***Do the Oral Cavity and Pharynx Contain Radiation-Sensitive Organs?***

- According to the National Research Council's BEIR V Committee, the tissues of the pharynx and hypopharynx have low sensitivity to the cancer-causing effects of ionizing radiation. Salivary glands, also located in the head and neck under the tongue, in front of the ears, and under the jawbone, as well as in other parts of the upper digestive tract, are more radiation-sensitive.<sup>12</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.

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



## ***Is Cancer of the Oral Cavity and Pharynx a “Specified” Cancer Under the Energy Employees Occupational Illness Compensation Program Act (EEOICPA)?***

- **Yes.** Cancer of the oral cavity and pharynx 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 Cancer of the Oral Cavity and Pharynx 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 oral and pharyngeal cancer.

- **Tobacco.** Tobacco (including smokeless tobacco) is an important risk factor for cancers of the oral cavity, oropharynx, hypopharynx, and larynx. Eighty-five percent of head and neck cancers are linked to tobacco use.<sup>2</sup>
- **Alcohol.** Alcohol is another important risk factor for these cancers. People who use both tobacco and alcohol are at greater risk for developing these cancers than people who use either tobacco or alcohol alone.
- Other risk factors for cancers of the oral cavity include: sun exposure (lip) and human papillomavirus (HPV) infection.
- Other risk factors for cancers of the pharynx include:
  - Nasopharynx*—Epstein-Barr virus infection; occupational exposure to wood dust; and consumption of certain preservatives or salted foods.
  - Oropharynx*—Poor oral hygiene, mechanical irritation such as from poorly fitting dentures, and use of mouthwash that has a high alcohol content.
  - Hypopharynx*—Plummer-Vinson (also called Paterson-Kelly) syndrome, a rare disorder that results from nutritional deficiencies.

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

## ***What Makes Cancer of the Oral Cavity and Pharynx 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).

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<sup>2</sup> HARRAS A, EDWARDS K, BLOT WJ, GLOECKLER RIES LA. Cancer Rates and Risks. 4<sup>th</sup> ed. Washington, D.C.: National Cancer Institute, 1996.

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



## Rates of Cancer of the Oral Cavity and Pharynx In Exposed Counties

### **Los Alamos County**

There have been low rates of cancer of the oral cavity and pharynx reported in Los Alamos County for both cancer incidence and mortality. This is probably due to lower rates of smoking in residents of the county. Los Alamos County

- Ranked 28th in incidence of cancer of the oral cavity and pharynx and
- also ranked very low in cancer mortality due to cancer of the oral cavity and pharynx from 1970 to 1996 of the 33 counties in New Mexico.<sup>13</sup>
- In recent years, there has been about one new case diagnosed every couple of years in Los Alamos County.<sup>14</sup>

### **Rio Arriba County**

Rates of cancer of the oral cavity and pharynx reported in Rio Arriba County have been somewhat higher than average county rates for both cancer incidence and mortality. These higher rates may be due to chance differences in area rates. Rio Arriba County:

- Ranked 11th in incidence of cancer of the oral cavity and pharynx and
- Ranked 12th in cancer mortality due to cancer of the oral cavity and pharynx from 1970 to 1996 of the 33 counties in New Mexico.<sup>33</sup>

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