

# Risk of lung cancer among chromium workers



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## **2. Literature Review:**

For the pursuance of our study, we conducted an extensive literature review in order to gather related information so that it may be helpful for us to understand the various aspects of this subject. Moreover, this was done in hopes that it would provide us the evidences about the views and findings of other scientists who are divulging assiduously in this field of research as well.

### **2. 1. Human Health and Trace Elements:**

It has been reported in various studies that metals and their compounds have enormous impact on health of an organism. Since they are ubiquitously present in our environment, exposure to these elements is tenacious and it cannot be precluded. All metals are not carcinogenic and their concentration, oxidation state, synergistic effect, and the response of organisms's body to its environment contribute greatly to the etiology of cancer. The combination of any of these two factors put the organism in danger in a way that it builds oxidative stress, creates hormonal imbalance, changes the order of chemical reaction, controls the rate of metabolism, alters the oxidation reduction process, and influences the biochemistry of metabolites etc. For instance, there are some chemicals already present in the environment that can act as an either impersonator of hormones or growth factors, or affect the rate of chemical reactions exhibited by these hormones. These actions of environmental chemicals may be responsible for disrupting the chemical process and could affect the delicate balance that controls cell division. For example, some breast tumors depend on estrogen for their development and

growth, and chemicals that impersonate the effect of estrogen may engage in supporting the growth of estrogen-dependent breast tumors (111).

In a study, it has been pointed out that there is an association between chromium and carcinogens; a high incidence of lung cancer has been demonstrated as an occupational disease among workers engaged in the chromate production process in Germany and the United States.

The risk of lung cancer among chromium workers compared to an ordinary population is very high. The lung cancer prevalence rate 100, 000 versus 578, and the relative risk from the standpoint of lung cancer deaths has reached from 3. 6 to 29. 1. Histopathologically, the most common chromium related lung cancer is squamous cell carcinoma and small cell cancer (112).

## **2. 1. 1. Trace Metals Implicate Malignancy:**

It has been recorded that nearly one in two men and more than one in three women in the United States is diagnosed with cancer at some point in his or her lifetime. Cancer is the foremost cause of death for individuals under age 85 as reported by statistical data reports in America. It is evident that the exposure to these metals remains the single most significant preventable cause of cancer.

The development of cancer depends on combination of various factors including diet, genetics and the way an organism is exposed to a particular carcinogen. However, the type of cancer is reliant on the kind of toxicant in the environment. For instance metals such as arsenic, chromium, and motor vehicle exhaust and polycyclic aromatic hydrocarbons, are associated with bladder, lung and skin cancer. On the other hand, pesticide exposure

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enhances the risk of brain tumor, Wilms tumor, leukemia, and non-Hodgkin's lymphoma (113). Furthermore, it has also been reported that there are various trace elements such as zinc, molybdenum, silicon, chromium, selenium, vanadium, and copper that behave as instigators or the inhibitor agents of cancer. Nevertheless, it may be possible to draw inferences on the basis of their concentration levels in the body of organism as diagnostic or prognostic abets for cancer patients (114). Moreover, it could be plausible that the ratio of trace elements that exists in the blood of healthy human beings gets disturbed due to the onset of the disease, or by the exposure to toxicants, can create an atmosphere that could be favorable for implicating the malignancy.

## **2. 2. Susceptibility of Cancer Contingent to Gender and Age:**

The most important and inevitable determining factor for susceptibility to cancer is age. However, there is little evidence that the aging process per se increases susceptibility to cancer. To a certain extent, age provides the time essential for the accumulation of cellular events required for the development of neoplasia (115). For example, in a study it was discussed that the GSTT1 genotype, and perhaps also the GSTM1 genotype for which a similar, but non-significant effect was seen, might be the age influencing the onset of colorectal cancer (116).

In a study, cancer and mortality rates among a variety of cancer [patients] was investigated. In addition, the impact of particular age on the rate of occurrence of cancer was investigated. However, it was assumed that the cancer contributing factors would remain consistent over the definite period of time. It was observed that certain types of cancers, including lung cancer, <https://assignbuster.com/risk-of-lung-cancer-among-chromium-workers/>

had an equivalent rate of occurrence for both genders. Moreover, various types of cancer including, prostate cancer for men and breast cancer for women, present a reasonable association with the original hypothesis (117).

A study was conducted at Harvard University and it was found that cancer is not inexorable at advanced age, but rather reaches a maximum cumulative probability of affliction with any cancer of about 70% for men and 53% for women in the US, and much smaller values for individual cancers (118).

Age and gender also impart differences in susceptibility, whereas immune suppression or inadequate nutrition may also increase susceptibility of cancer (119).

### **2. 3. Chromium as an Etiological Agent for Cancer:**

There is a large body of literature on the role of trace elements in the development of cancer that has been reviewed. Generally it is focused on the chromium exposure in relation to the risk of cancer. Over the past few decades, a number of researchers have attempted to estimate the proportion of cancer cases or deaths due to environmental and occupational exposures to chromium. Despite their well intentioned efforts, the net conclusion was that the cancers embark through a complicated interconnection of multiple causes. On the other hand, scientific research has also been explicated that avertable environmental and occupational exposures are fueling excess cancer cases and deaths (120-122). Cancer, in general, results from interactions between environmental exposures and genetics. Genetic factors alone may account for not more than 5% of cancers (123). Despite the fact that genetics alone does not account for most

cancers, cancer is essentially a genetic disease, in terms that environmental agents or viruses can alter the genes regulating cell division.

Several studies of the chrome-plating industry have demonstrated a positive relationship between cancer and exposure to chromium compounds (124).

Evidence has been presented demonstrating the mutagenic capacity of a number of hexavalent chromium compounds in vitro and in vivo (125).

Chromium (III) is recognized as a trace element that is essential to both humans and animals. Occupational exposure to chromium (VI)-containing compounds is known to induce lung toxicity and increases the incidence of respiratory-system cancers (126-127).

The National Toxicology Program has published a list of harmful toxicants, and carcinogens (128). The numerous listed chemicals are actually of chemical mixtures such as tobacco smoke and alcoholic beverages. Others include metals such as arsenic, cadmium, hexavalent chromium, and thorium known as carcinogens, and beryllium, lead, and nickel, as probable carcinogens. However, it appears that some physiologic mechanisms by which the effects of pro-oxidant metals and organic toxicants are mutually abrogated at the molecular level. Our understanding of the metal-organic toxicant interactions has significantly advanced because of the recent elucidation of several intracellular stress-response signaling pathways and the points of cross-talk among them (129).

By the 1980s, considerable evidence had accumulated on cancer risks of chromium-exposed workers, which led to the identification of chromium (VI)

compounds as a human carcinogen (130). The strongest evidence presented at that time was mainly