ENVIRONMENTAL HEALTH HAZARDS OF CHROMIUM AND IMPACT OF HUMAN HEALTH.

G.Tulasi* and K. Jayantha Rao

Department of Zoology, Sri Venkateswara University, Tirupati – 517502. AP.

ABSTRACT
Chromium is a naturally occurring element found in rocks, soil, plants and animals in volcanic dust and gases. Chromium is a carcinogen poses very serious health hazard to making. Reports of “Adeno carcinoma” in a worker who had been involved in chromium pigment production for 20 years are also evidenced. American st studies indicate an increased incidence of highly exclusive lung cancer rates among chromate producers and chrome pigment makers. Chromium possesses toxicological, carcinogenic and mutagenic properties and is extremely hazardous to aquatic biota. An industrial effluent is very essential before it is released in any form into the aquatic environment. The chemical hazards are local action, inhalation and ingestion. Some chemicals cause dermatitis, eczema, ulcers and even cancer by primary irritant action (Park and Park, 1977). Occupational dermatitis is a big problem in industry. Inhalation includes dusts, gases, metals and their compounds.

KEYWORDS: Adeno carcinoma, Occupational dermatitis.

INTRODUCTION
Hazards of Chromium
Hexavalent chromium compounds tend to be oxidizers (many strong oxidizers) and are associated with cancer risk and kidney damage. Hexavalent chromium (Cr⁶⁺) is instable and can be reduced to trivalent chromium (Cr³⁺) by many oxidizing agents. Metallic and acidic hexavalent chromates and dichromate’s tend to be strong oxidizing agents. Strongly oxidizing agents can cause damage to DNA and many other tissue structures. Certain Hexavalent chromium (Cr⁶⁺) compounds when administered via inhalation at high dose have the potential to induce lung famous in human and experimental animals.
High incident of bronchial asthma is also report in workers of Ferro chromium industry. The chromates are reported to induce chromic ulcers to skin and bronchiolization of alveoli i.e. Living of alveolar walls by cells resembling bronchial epithelium in different animals (Langard and Norseth, 1979; Langard, 1990).

**MATERIALS AND METHODS**

Manufacturing of animal products (Ex. Hair, Wool, hides) and agricultural workers are specially exposed to biological hazards (Park and Park, 1977). Manufacturing, disposal of products or chemicals containing chromium or fossil fuel burning release chromium to the air, soil and water. Particles settle from air in less than 10 days. Small amounts move from soil to ground water. On occupational exposure to the metal occurs via inhalation of Chromium containing food and water. Trivalent chromium (III) is poorly absorbed, regardless of the route of exposure, whereas hexavalent chromium (VI) is more readily absorbed. Humans and animals localized chromium in the lungs, liver, kidney, spleen, adrenal glands, plasma, bone marrow and red blood cells.

**RESULT**

**Carcinogenicity of Chromium**

Hexavalent chromium is a commonly used industrial metal, is well known human lung carcinogen. Associations between lymphoma, leukemia, prostate cancer, multiple myeloma, and soft tissues sarcoma have been reported in studies, with less association found for other cancers. The world wide deaths and chronic illness due to chemical poisoning number about one million per year (Langard, 1990).

Central Fisheries Extension Center (CFEC), Hyderabad revealed the mortality of large variety of fish during 1973 due to chemical substances. According to a report of Central Bureau of Investigation (CBI), Government of India, as many as 4,536 persons died in 1965 alone on account of carelessness in handling poisonous substances.

Environmental stress caused by the pollutant. The contamination of fresh waters with a wide range of pollutants has become a matter of concern the decades. The natural of aquatic systems contaminated with heavy metals released from domestic, industrial and other man made activities.
High concentrations in the environment are due to industrial emission, effluents from waste dumps, sewage sludges, fossil fuel combustion, incineration of municipal solids and hazardous wastes. Virtually all foods contain trivalent chromium (III) at levels up to 0.5 ppm wet weight. The estimated daily intake is 0.03 to 0.1 mg/person/day. The daily human requirement is about 0.01 - 0.04 mg of organically complexed chromium or about 0.1 -0.3 mg of chromium in an inorganic form.

Workers exposed to chromium have developed nasal irritation, nasal ulcers, perforation of the nasal septum and hyper sensitivity reactions and “Chrome holes” of the skin. Respiratory and dermal toxicity of chromium is well documented. Many neural defects, malformation and fetal deaths have been caused by hexavalent chromium (VI). The sub chronic and chronic oral reference dose value is 1mg/ kg/ day for trivalent chromium (III). The chronic and sub chronic oral for Cr (VI) are 0.02 mg/ kg/ day and 0.005 mg/ kg/ day, respectively. Excessive chromium is present in the environment due to

- Chrome plating and polishing operation
- Cooling tower and steel mill effluents
- Inorganic chemical production
- The tanning industries
- Wood processing facilities
- Petroleum refineries

DISSCUSSION

In USA greater than 50,000mg of Chromium is used every year and 4500kg/d of Chromium is released into the environment. USA regulations say Chromium that could be present in drinking water is 0.1 mg/l. EPA maximum level of Chromium (III) and Chromium (VI) in drinking water: 100 micrograms/lit. Occupational Safety and Health Administration (OSHA) limit for an 8-hour work day, for metallic chromium (0) insoluble in state. National Institute for Occupational Safety and Health (NIOSH) exposure limit: 500 micrograms/m3 for chromium (0), chromium (II), and chromium (III) for a 10- hour work day. NIOSH considers all chromium (VI) compounds to be potential occupational carcinogens and recommends an exposure limit of 1 microgram/m3 for a 10 - hour workday. National Research council (NRC) dietary intake of chromium (III) limit: 50-200 micrograms/day. In the US, severe deficiency is rare, marginal deficiency may be more common. Chromium (III) helps insulin maintain normal glucose levels.
Very small amounts of trivalent chromium (III) are in everyday foods. All forms of chromium can be toxic at high levels, but hexavalent chromium (VI) is more toxic than trivalent chromium (III). Acute toxic effects occur when breathing very high levels of hexavalent chromium (VI) in air that can damage and irritate the nose, lungs, stomach and intestine. Hexavalent chromium (VI) cause damage to the nose (bleeding, itching, sores), lungs and can increase the risk of non-cancer lung diseases.

Ingesting very large amounts of chromium can cause stomach upsets and ulcers, convulsions, kidney and liver damage and even death. We don’t know if chromium harms the fetus or our ability to reproduce. Skin contact with liquids or solids containing chromium (VI) may lead to skin ulcers. Some people have allergic reactions like redness and swelling.

The Department of Health and Human Services (DHHS) has determined that certain hexavalent chromium (VI) compounds are known carcinogens. Animal studies also indicate chromium (VI) is a carcinogen. Chromium can be measured in the hair, urine, serum, red blood cells and whole blood. Tests are more useful for high-level exposed people. Exact levels of exposure or how these levels will affect health cannot be inferred from tests. Chromium allergy may be detected by skin patch test.

**Manifestations**

Oxidation potential is a critical factor for chromium and some other metals. Chromium (VI) exposure may be considered as safe or hazardous. Soluble hexavalent chromium (VI) may be weakly carcinogenic to the lungs, but pose a significant carcinogenic risk if ingested. This is because of low pH of the stomach as particulate chromate dissolves at low pH.

Physiologic characteristics of young children, such as high intake of food, water and air per unit of body weight may also increase their exposures (National Research Council, 1976). Because children’s are developmentally immature, they also are at higher risk for adverse health effects.

**Dietary Sources**

Dietary sources of chromium include brewers yeast, cheese, pork kidney, whole grain breads and cereals, molasses, spices and some bran cereals. Brewers yeast (particularly yeast grow in Chromium – rich soil) is a rich dietary source of chromium, meat, mushrooms, oatmeal,
prunes, nuts, asparagus, whole grains and cereals. Vegetables, fruits and most refined processed food (except for processed food) contain low amounts of chromium.

**Precautions**

Although the type of Chromium found in foods is generally considered safe, extremely high doses of this mineral can inhibit the effectiveness of insulin and cause stomach irritation, itching and flushing. There have also been rare reports of fast, irregular heart rhythms and liver dysfunction from too much chromium. Kidney damage has been reported from the use of chromium picolinate supplements. Dietary chromium is considered as safe, is often confused with an unsafe industrial form of chromium (hexavalent chromium) that is readily absorbed by the lungs, digestive tract, mucous membranes and skin. Hexavalent chromium (VI) is a toxic industrial compound that is primarily encountered through occupational exposure by either direct contact or through inhalation of dust or aerosols.

**REFERENCES**