CANCER AS AN ENVIRONMENTAL DISEASE

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Of the diseases that affect humans, cancer is one of the best known, causing about one fifths of the deaths in some countries.

Since cancer is a large hetergeneous group of diseases, it is difficult to devise a simple definition which adequately describe all cancers. Cancer is a disease of multicellular organisms that is characterized by abnormal bahavior of cells relative to one another.

An agent which can cause cancer is known as a carcinogen. In addition to voluntary exposure to carcinogens such as cigarette smoking, there are many carcinogenic agents for which, the exposure is involuntary because of their presence in air, water or food products. Most cancers are probably caused by environmental factors. Some estimates attribute as much as 90% of all cancers to be caused by environmental factors.

A comparison of people living in cities and rural areas suggest that there is a strong connection between cities, heavy industry and cancer.

Some of the common agents which are present in the environment and may cause cancer are discussed below.

Halogenated Hydrocarbons

Most of the halogenated hydrocarbons occur in drinking water starting as chlorine for water disinfection. Both chlorinated and brominated hydrocarbons can oxidize natural bromides to bromine, a more reactive form. Organic precursors may be naturally occuring plant decay products or originate as agricultural or industrial chemicals.

Trihalomethanes (THM) are the most common products of water chlorination with chloroform ($CHCl_3$) being very important. Chloroform is carcinogenic to rats and mice. Nineteen other organic water contaminants have been known to be carcinogenic in at least one species of animals, mostly in colon, stomach and bladder. Surveys have revealed that there is an increased risk factor of about 2.3:1 for those who have consumed chlorinated water for about 60 years.

Asbestos

Various mineral fibers present in the environment are collectively called asbestos. They may be inhaled as dust or consumed in contaminated drinking water. Some studies have shown that there is a strong correlationship between lung cancer and inhaled asbestos as well as stomach and colon cancer with the consumption of asbestos contaminated drinking water. The danger is that the latent period for these types of cancer may range between 30 and 40 years.

Nitrates

Levels of nitrates in surface and ground water have increased markedly over the past 20 years due to increased use of artificial fertilizers and disposal of waste from animal farming.

Among other ill effects of nitrates, they are the precursors of N-nitroso compounds which are proven carcinogens in animals and man. The most common type of cancer caused by nitrates may be gastric cancer. The latent period of nitrate induced gastric cancer for humans has been estimated as ten years. The risk for nitrate induced cancer has a direct correlationship with drinking of well-water and hence has connections with the socioeconomic classification of the population. Testing the nitrate and nitrite

levels in saliva from high risk and low risk groups for gastric cancer has also shown a positive correlationship with these compounds and the disease.

Trace Metals

A variety of trace metals occur in drinking water. They may be leached from the soil and decaying plant material, from mining operations or from industrial waste.

Few of the trace metals which are known to cause cancer in animals and/or man are given below:

ARSENIC
BERYLLIUM
CADMIUM
CHROMIUM
LEAD
NICKEL

Studies in China have shown that exposure of 1 mg. of arsenic per person per day is positively correlated with the occurrence of cancer in the lung, bladder, liver and skin.

Positive correlationships also exists with beryllium, cadmium, chromium and lead. Some investigators indicate that although nickel may not be carcinogenic by itself it may be associated with other carcinogenic metals.

Other Environmental Carginogens

Benzopyrene and ozonised gasoline which contaminate air by exhaust emissions are known to cause cancer.

Formaldehyde inhalation is known to cause cancer at least in laboratory rodents.

Radiation by ultra violet rays is known to cause skin cancer. Radiation emitted by other natural causes, medical interferences and by accidents have caused leukemia, thyroid tumors etc; X-radiation in utero has caused juvenile cancer.

Industrial solvents like trichloroethylene and carbon tetrachloride etc. have caused liver cancer.

In addition, biologicals like aflatoxins ingested through contaminated food cause cancer.

Other natural products like Bracken fern when ingested has caused bladder cancer, at least in animals.

Radio Active Isotopes

Radioactive isotopes occur in the earth's crust, air and water. Exposure to these give man, part of his 'normal' background radiation. Because of the short half life of most of these isotopes the radiation received from these is short lived. But substances like radium 228 and radium 226 which as a result of their subsequent decay may give rise to a series of alpha-emitting daughter products. Most of these concentrate in bone and skeleton and may cause cancer in those organ systems.

Modern living which has given us nickel cadmium batteries in our electronic systems find their way through dustbins and waste dumps to our drinking water and food. Attractive car number plates which glow in the dark contaminate our environment with radio active elements. Will chlorine which protect us from diarrhoea and dysentery causing bacteria, give us the risk of cancer?

When we interfere with nature and the environment it should be done with caution and as budding scientists we should always pose the questions Why? How?? and What???