

Chemicals – Cancer & You

Nagaraja Setty K¹ Dr. Syeda Jeelani Basri T² Sreenubabu A³ Ravi M⁴

¹Lecturer in Chemistry, SML Govt. Degree College, kns1196@gmail.com, Yemmiganur

²Associate professor, G.Pullaiah College of Engg. & Tech. Dept. of Chemistry, Kurnool

³Lecturer in Chemistry, SML Govt. Degree College, sreenubaburoyal@gmail.com, Yemmiganur

⁴Assistant professor, G.Pullaiah Engineering College, Dept. of Chemistry, Kurnool

ABSTRACT:

Substances known to cause cancer are called carcinogens. Coming into contact with a carcinogen does not mean you will get cancer. It depends on what you were exposed to, how often you were exposed, and how much you were exposed to, among other things.

An early link between cancer and a chemical was found in the late 1700s. An English physician noted that a large number of chimney sweeps had cancer of the scrotum due to exposure to soot, which contains chemicals known as polycyclic aromatic hydrocarbons. Since then, many more chemicals have been identified as known or suspected causes of cancer. Today, much of what we know about chemicals causing cancer in humans we have learned from workers exposed at their jobs.

Examples of some known human cancers are asbestors, benzene ,berellium,arsenic, vinyl chloride,DDT,chloroform.

I. INTRODUCTION:

What Is Cancer?

The cell is the basic building block of all living things. All cells normally grow and divide (multiply) to replace old cells to keep the body healthy. A cell becomes cancerous when it grows quickly and uncontrollably. In most cancers, this process leads to the growth of tumors. A tumor is an abnormal growth of tissue resulting from uncontrolled cell growth. Tumors are either benign or malignant[1]. Benign tumors are not cancer. Cells from benign tumors do not spread to other parts of the body. Benign tumors are not usually life threatening. Malignant tumors are cancer.

Cancer cells can spread to other tissues and organs near the tumor. They can also spread to other sites in the body through the bloodstream or lymphatic system. This spreading is called metastasis. People of all ages get cancer, but it is most common in people older than 55. One of every three people will get cancer at some point in his/her life. Though we know more about some cancers than others, in most cases we don't know why or how a normal cell changes into a cancer cell. We do know that changes occur in a series of steps, which usually takes a long time. The time from the first cell change to the time the cancer is detected is called the latency period[2].

Exposure to chemicals in the outdoors, at home, and at work may add to your chances of getting cancer. Certain chemicals, including benzene, beryllium, asbestos, vinyl chloride, and arsenic are known human carcinogens, meaning they have been found to cause cancer in humans. A person's risk of developing cancer depends on how much, how long, how often, and when they are exposed to these chemicals. When you are exposed is important because a small exposure in the womb, for example, may be more serious than a small exposure as an adult[3,4]. The genes that you inherit from your parents also play a role.

II. Exposure at Work:

Chemical exposures in the workplace can happen at high levels and over long periods of time. That is why some jobs require that employees wear protective clothing and equipment and/or respirators.

Cancers Associated with Various Occupations or Occupational Exposure

Cancer	Substances or Processes
Lung	Arsenic, asbestos, cadmium, coke oven fumes, chromium compounds, coal gasification, nickel refining, foundry substances, radon, soot, tars, oils, silica
Bladder	Aluminum production, rubber industry, leather industry, 4-aminobiphenyl, benzidine
Nasal cavity and sinuses	Formaldehyde, isopropyl alcohol manufacture, mustard gas, nickel refining, leather dust, wood dust
Larynx	Asbestos, isopropyl alcohol, mustard gas
Pharynx	Formaldehyde, mustard gas
Mesothelioma	Asbestos
Lymphatic and hematopoietic	Benzene, ethylene oxide, herbicides, x-radiation system
Skin	Arsenic, coal tars, mineral oils, sunlight
Soft-tissue sarcoma	Chlorophenols, chlorophenoxy herbicide
Liver	Arsenic, vinyl chloride
Lip	Sunlight

III. Cancer Clusters

A cancer cluster is when more people within a specific geographic area have the same type of cancer or related cancers than would normally be expected over a certain time period[5]. However, what appears to be a cluster may actually reflect the expected number of cancer cases within the

group or area, or it may be due to chance alone. Clusters may be suspected if the cancer found is normally rare. For example, mesothelioma is found only in people who have been exposed to asbestos; therefore, many cases of mesothelioma were found in communities with asbestos exposure.

Cancer clusters are rare, especially those that are linked to an environmental exposure. When a group of cancers is linked to an environmental exposure, it is usually because of the conditions below:

Many more cases than expected of one specific type of cancer or related cancers have been found.

- The cancer is found in an age group in which it is not usually found.
- The type of cancer is rare.
- Scientific evidence supports the link between the chemical in question and cancer.

IV. Risk Factors for Cancer

The most important risk factors are

- Age: Although people of all ages can get cancer, older people are at greater risk.
- Genetics: Your family history may put you at risk for cancer. If you or someone in your family had a certain type of cancer, you may be more at risk for that type of cancer. Genetics play a large role for many cancers, such as breast cancer and colon cancer.
- Behaviors: Tobacco use and exposure to the sun or other sources of UV radiation are risk factors for cancer. Other lifestyle choices that might affect your chances of getting cancer include a poor diet, lack of exercise, or heavy drinking[6].
- Viruses or bacteria: Some cancers are caused by a virus or bacteria. Some viruses linked to cancer are the human papillomavirus (HPV), which causes cervical cancer; hepatitis B and C viruses, which can cause liver cancer; and the Epstein-Barr virus, which may cause a type of lymphoma. Also, the H. pylori bacterium can cause gastric cancer.
- Exposure to chemicals: As we have discussed, being exposed to chemicals may also be a risk factor.

V. Behavioral Risk Factors

Tobacco: Thirty percent of all cancers are caused by smoking or chewing tobacco. Cigarette, cigar, and pipe smoking can cause cancers of the lung, mouth, throat, larynx (voice box), esophagus, pancreas, kidney, bladder, stomach, and cervix, as well as acute myeloid leukemia. You should also

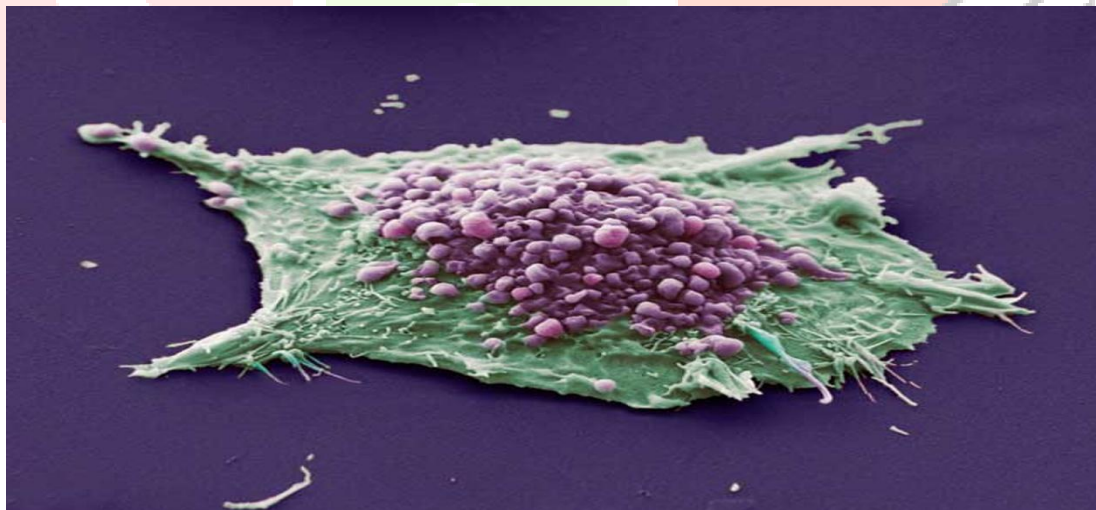
avoid exposure to secondhand smoke, which causes lung cancer in nonsmoking adults and may increase the risk of other cancers in adults and children[7].

Alcohol :If you overuse alcohol, you may be putting yourself at risk for cancer. Long-term alcohol misuse is associated with cancers of the mouth, throat, esophagus, liver, colon, and breast.

Sexual Behavior: Cervical, vaginal, and other genital cancers are caused by certain types of HPV. Genital HPV spreads through sexual contact, but condoms may reduce your risk of getting HPV. Vaccines can prevent infections with some but not all cancer-causing HPV types.

Exposure at Work: Jobs that put workers at high risk for cancer include uranium miners, asbestos workers, shipbuilders, certain factory and chemical plant workers, and workers in nuclear industries. Workers can also bring home contamination on their clothing, shoes, or skin, which can potentially put others who share a home or car at risk. Visit <http://www.cdc.gov/niosh/> for more information on workplace safety.

Pollution & Exposure to Chemicals :Exposure to some chemicals and hazardous substances can increase the risk of cancer. A few well-known carcinogens are asbestos, nickel, cadmium, radon, vinyl chloride, benzidene, and benzene. These carcinogens may act alone or with another carcinogen to increase your risk. For example, asbestos workers who also smoke have a higher risk of lung cancer. Visit <http://www.atsdr.cdc.gov/> for more information on specific chemicals and your health.



This image shows a single cell grown from a culture of lung epithelial cancer cells. The purple spheres are blebs: irregular bulges where the cell's internal scaffolding - its cytoskeleton - becomes unlinked from the surface membrane. This image received an award from the Wellcome Trust, as part of the annual Wellcome Image Awards, for its ability to communicate the wonder and fascination of science[8].

The six other additions, all of which fall into the second "anticipated" category, include:

- Captafol: a fungicide that had been used to control fungal diseases in fruits, vegetables, ornamental plants, and grasses, and as a seed treatment. It has been banned in the United States since 1999, but past exposures may still have an effect on health.
- Cobalt-tungsten carbide (in powder or hard metal form): commonly referred to in the United States as cemented or sintered carbide, this substance is used to make cutting and grinding tools, and wear-resistant products for various industries, including oil and gas drilling, as well as mining.
- Certain inhalable glass wool fibers: include only those fibers that can enter the respiratory tract, are highly durable, and are biopersistent, meaning they remain in the lungs for long periods of time. The largest use of general purpose glass wool is for home and building insulation, which appears to be less durable and less biopersistent, and so less likely to cause cancer in humans.
- o-nitrotoluene: used as an intermediate in the preparation of azo dyes and other dyes, including magenta and various sulfur dyes for cotton, wool, silk, leather and paper; it is also used in preparing agricultural chemicals, rubber chemicals, pesticides, petrochemicals, pharmaceuticals and explosives.
- Riddelliine: found in certain plants of the genus *Senecio*, a member of the daisy family, grown in sandy areas in the western United States and other parts of the world. Though not used commercially in the United States, many species have been identified in herbal medicines and teas.
- Styrene: a synthetic chemical used worldwide in the manufacture of products such as rubber, plastic, insulation, fiberglass, pipes, automobile parts, food containers and carpet backing. People may be exposed to it by breathing indoor air with styrene vapors from building materials, tobacco smoke and other products. The greatest exposure to styrene in the general population is through cigarette smoking.

"Reducing exposure to cancer-causing agents is something we all want, and the Report on Carcinogens provides important information on substances that pose a cancer risk," Linda Birnbaum, director of both the National Institute of Environmental Health Sciences and the National Toxicology Program, said in a statement.

With these additions, the 12th Report on Carcinogens now includes 240 listings, which can all be found here. Each substance undergoes an extensive evaluation with numerous opportunities for scientific and public input before it is added to the report.

However, even if a substance is listed in the report, it doesn't necessarily mean that it will cause cancer. Many factors influence whether a person will develop cancer, including an individual's susceptibility to a particular substance, and the amount and duration of exposure to the substance.

VI. Finding Cancer

Tools for finding or diagnosing cancer include

- Biopsy—a doctor removes tissue, which is looked at under a microscope;
- Ultrasound—the use of reflected high-frequency sound waves to examine tissues of the body;
- X-ray—producing an image by passing x-rays through the body;
- Computed tomography (CT)—the use of x-rays to produce a cross-sectional picture of body parts; and
- Magnetic resonance imaging (MRI)—the use of magnetic fields and radio waves to show changes in soft tissues without the use of x-rays.
- Ultrasound, X-ray, CT, and MRI are all painless and noninvasive; however, having too many CTs or x-rays can increase your risk of developing cancer because they expose you to radiation. In most cases the benefits outweigh the risks.
- Mammograms are an example of how X-rays can be used to detect cancer. Other tools for finding and diagnosing cancer or abnormal cells that may become cancer include Pap tests, which look for abnormal cervical cells; HPV DNA tests, which look for DNA from cancer-causing HPV types in cervical cells; fecal occult blood tests (FOBT), which check for blood in the stool; sigmoidoscopy, which examines the lower colon; and colonoscopy, which examines the entire colon.

VII. Summary:

Cancer is a common disease. Many people worry that exposures in their environment may cause cancer. In the United States, millions of people live with cancer or will get cancer during their lifetimes. Some environmental risk factors that cause cancer include pollution, tobacco smoke, exposure at work to chemicals, and radiation in our homes and workplaces.

IX. References:

1. The risk of getting some types of cancer may be reduced by changes in a person's lifestyle. Some examples of cancerpreventing behaviors include not smoking, avoiding smoke from others, maintaining a healthy weight, exercising, and being careful about the chemicals you use in your home.
2. Screening is very important to early detection and treatment of certain cancers. In many cases, the sooner you find a cancer and start treating it, the better your chances for living a long and full life.

3. CPDB: Carcinogenic Potency Database. <http://potency.berkeley.edu/app14.html>
Environmental Defense reviewed this compilation of results on carcinogenicity in rats and mice covering 1298 chemicals and added any chemical with positive results in at least two species by a relevant route of exposure to its list of suspect carcinogens.
4. EPA-TRI: US EPA. Addition of Certain Chemicals; Toxic Chemical Release Reporting; Community Right to Know. Proposed and Final Rules. 59 Federal Register 1788 (Jan 12, 1994); 59 Federal Register 61432 (November 30, 1994). Summarized in Hazard Information on Toxic Chemicals Added to EPCRA Section 313 Under Chemical Expansion. http://www.epa.gov/tri/chemical/hazard_cx.htm
5. NTP-BR: National Toxicology Program. Summary for Agents, Substances, Mixtures or Exposure Circumstances to be Reviewed in 2001-2002 for Possible Listing in the Report on Carcinogens, Eleventh Edition. NTP Board of Scientific Counselors, NTP, Research Triangle Park, NC. <http://ntp-server.niehs.nih.gov/NewHomeRoc/11thConsideration.html>
6. P65-MC: Hazard identification based on an extension of a Proposition 65 listing. Substance is either a member of a class that is a recognized Proposition 65 hazard, or is a class that contains a member that is a recognized Proposition 65 hazard. See Environmental Defense's Member Class Hazard Identification documentation.
7. P65-PEND: California EPA, Office of Environmental Health Hazard Assessment. Notices of Intent to List . http://www.oehha.org/prop65/CRNR_notices/admin_listing/intent_to_list/index.html. Chemicals noticed for listing under Proposition 65 because a body considered to be authoritative by the state's qualified experts has formally identified it as causing cancer (through July 2004).
8. Air Toxics Web Site. Nickel Compounds. Washington, DC: U.S. Environmental Protection Agency, 2000. Available online. Last accessed December 16, 2014.