

## Cancer Chemical Cause

Exposure to environmental contaminants has a stronger impact on cancer risk than previously believed accumulation of certain synthetic chemicals in humans and in the food chain, possible combination effects of low doses of multiple chemicals, potential radiation risks from medical imaging devices, the large number of industrial chemicals environmentally induced cancer biologic mechanisms by which environmental contaminants may increase cancer risk

environmental cancer research investments and needs and key issues regarding the regulation of environmental pollutants.

### Genetics

Single-gene inherited cancer syndromes are believed to account for less than 5 percent of malignancies

Some due to normal endogenous (internal) processes like cellular detoxification processes can produce oxygen radicals that damage DNA. Aging cells tend to make more errors in DNA replication than younger cells, exogenous (outside of the body) factors,

Exposure to environmental hazard occur as a single acute episode, but most often, individual or multiple harmful exposures take place over a period of weeks, months, years, or a lifetime **genes and environment interact in ways that are so complex that it's really not worth arguing in my mind about how much plays what role because... we cannot change our ancestors. So a rational place to begin a program of cancer prevention [is]... with the environment, and lifestyle**

Exposure to environmental contaminants can result in hormonal dysfunction some synthetic chemicals and natural compounds act as weak estrogens in the human body.

Among other effects, these substances appear to be contributing to earlier puberty and, therefore, to a longer period of estrogen exposure in women.

Longer lifetime estrogen exposure is linked to higher risk of hormone-dependent cancers Inflammation of lung tissue, caused by inhaling asbestos fibers, tobacco smoke, or fine particles in the air from diesel engine exhaust and industrial sources, is a major factor in lung and other respiratory tract cancers

### DNA Damage

Some environmental exposures, particularly radiation, can damage DNA. Errors commonly occur when DNA is copied during cell division, but the cell has built-in mechanisms for identifying such errors and repairing them.

gene products that suppress tumor growth may not be produced, allowing individual tumor cells in the body to grow out of control, leading to cancer.

### EPIGENETICS

From 1938 to 1971, thousands of pregnant women were prescribed diethylstilbestrol (DES), a drug intended to prevent miscarriage.

Some daughters born to these women (referred to as DES Daughters) have reproductive system malformations and have been predisposed to a rare type of vaginal and cervical cancer.

In some cases, epigenetic changes also may be passed on to future generations; limited data suggest that DES Granddaughters may have an increased risk for ovarian cancer.

#### BPA

bisphenol A (BPA), which is widely used in the production of polycarbonate plastics and epoxy resins, and is found in plastic food and drink containers more than 130 studies have linked the chemical to breast cancer, obesity, and other disorders. polybrominated biphenyls (PBB) and polychlorinated biphenyls (PCB).

The highest serum PBB levels are associated with significantly higher rates of breast cancer, non-Hodgkin lymphoma, and digestive system cancers (esophagus, stomach, liver, pancreas) chemicals are linked to liver and biliary cancers and are suspected carcinogens for breast cancer prostate cancer, melanoma, and non-Hodgkin lymphoma.

#### PCB s

PCBs accumulate in adipose tissue. They also can induce fat cell differentiation and inflammatory responses, which may contribute to obesity.

In addition to increased cancer risk, EPA also indicates that PCBs are hormone disruptors with effects on the immune, reproductive, nervous, and endocrine systems. PCBs, which were used as coolants and lubricants in transformers, capacitors, and other electrical equipment.

PCBs also were used in oils for motors and hydraulic systems, adhesives and tapes, thermal insulation materials, oil-based paint, dyes, caulking, carbonless copy paper PCBs persist in the environment because many of these compounds degrade very slowly and cycle between air, water, and soil.

They also bioconcentrate significantly in the aquatic food chain and the above-ground parts of food crops and other plants

#### Asbestos

Asbestos is classified by IARC as a lung and laryngeal carcinogen, and some evidence suggests it may increase risk for non-Hodgkin lymphoma, chronic lymphocytic leukemia, and multiple myeloma.

Brazil have banned asbestos

#### Chromium

Chromium exposure is a known cause of lung, nasal, and nasopharyngeal cancers.

Hexavalent chromium directly damages cellular DNA, and studies show a strong lung cancer dose-response relationship with human occupational exposures to hexavalent chromium.

## PCE

Perchloroethylene (PCE, also known as perc and tetrachloroethylene) is a solvent that has been a mainstay of the dry cleaning industry for decades. It is classified as "reasonably anticipated to be a carcinogen"

High levels of PCE in drinking water are associated with elevated breast cancer risk. Animals exposed to high levels of PCE developed kidney and liver tumors.

## Trichloroethylene (TCE)

TCE is strongly associated with kidney, liver, and biliary cancers, and is a suspected carcinogen for cervical cancer, Hodgkin and non-Hodgkin lymphomas, and leukemia  
Sources- adhesives, paint removers, varnishes, paints, lacquers, typewriter correction fluids, printing inks, and spot removers.

## diesel exhaust

EPA believes that diesel exhaust is among the substances that may pose the greatest risks.

Average lifetime cancer risk from exposure to diesel exhaust alone may exceed 1 in 100,000 and could be as high as 1 in 1,000.

Inhalation of particulate matter from diesel exhaust is classified by EPA as a likely human carcinogen

Coal workers at coal-fired power plants, those in factories that produce chlorine gas and caustic soda for use in some industrial processes may be exposed to mercury. Workers can be exposed to mercury in various forms when it is used to produce batteries, thermometers, and skin creams and ointments.

## Mercury

Pregnant women in a remote fishing village ate seafood contaminated by mercury discharged into Minamata Bay by a plastics factory.

The mothers were unharmed, but their children suffered profound mental retardation and neurological effects

## Formaldehyde

Formaldehyde is an IARC Group 1 human carcinogen for cancers of the nasal cavity and nasopharynx Individuals can be heavily exposed to formaldehyde in homes with newly installed plywood, particle board, and carpeting. environmental effects of fuel blends with 15 percent (E15) or greater ethanol content indicate that their combustion increases levels of formaldehyde and acetaldehyde, which EPA classifies as probable human carcinogens

The health effects of formaldehyde exposure gained national media attention when it was reported that Gulf Coast families who occupied new trailers provided by the Federal Emergency Management Agency (FEMA) as temporary housing following Hurricane Katrina were developing respiratory and other illnesses.

## Endocrine Disrupting Chemicals (EDCs)

EDCs affect hormone systems other than through thyroid and steroid receptor mechanism

Some in vitro studies have shown that EDCs can cause proliferation of human breast cells in culture. Animal studies show that EDCs can cause mammary cancer persistent organochlorides such as DDT/DDE, polychlorinated biphenyls, pesticides, polycyclic aromatic hydrocarbons, tobacco smoke, bisphenol A, some metals, phthalates, parabens, and growth promoters used in food production.

#### Nanomaterials

In August 2009, seven young Chinese women suffered permanent lung damage and two of them died after working for months without adequate protection in a paint factory using nanoparticles.

Once inhaled, nanoparticles that penetrate pulmonary epithelial cells or aggregate around red blood cell membranes cannot be removed.

#### Pesticides

Exposure to pesticides has been linked to brain/central nervous system (CNS), breast, colon, lung, ovarian (female spouses), pancreatic, kidney, testicular, and stomach cancers, as well as Hodgkin and non-Hodgkin lymphoma, multiple myeloma, and soft tissue sarcoma

#### DDT and Metabolites

DDT is believed to be an endocrine disruptor.

Girls exposed to elevated levels of DDT before puberty, when mammary cells are more susceptible to carcinogenic effects of chemicals, hormones, and radiation, are five times more likely to develop breast cancer in middle age

A recent study indicated that males exposed to DDT were 1.7 times more likely to develop testicular germ cell tumors (TGCT) than men not exposed

#### Nitrates

In humans, nitrosamines and NOCs are suspected brain and CNS carcinogens. In addition, a cohort study of older women in Iowa found that those whose drinking water had higher long-term average nitrate levels had an increased risk of bladder and ovarian cancers

#### FERTILIZERS

Phosphate fertilizers are often contaminated with cadmium and are responsible for significant cadmium soil and water contamination. In the food supply, cadmium is most highly concentrated in grains and seafood. For decades, residents of Southern Louisiana have had pancreatic cancer rates markedly higher than the national average.

Research has demonstrated an association of rural residence, dietary factors (high consumption of rice, seafood, and pork), and cigarette smoking with higher pancreatic cancer risk

#### Water Disinfection By-Products (DBP)

Disinfection of public water supplies has dramatically reduced the incidence of waterborne illnesses. Chemical by-products are formed when disinfectants such as chlorine react with organic matter, and long-term exposure to these chemicals may increase cancer risk. Hundreds of disinfection by-products have been identified; the most common of these are trihalomethanes (THMs, including chloroform, bromoform, and others) and haloacetic acid.

Electromagnetic fields (EMF)

radiofrequency radiation (RF) and extremely low frequency electromagnetic fields (ELF).

RF is emitted by cellular and cordless telephones, cellular antennas and towers, radar, and broadcast transmission towers. ELF comes from electric power lines and from electrical and electronic appliances.

### Medical Radiation

Chest x ray pa 0.02 mSv dose

Abdominal x ray 0.07mSv

Mammography 0.4

Ba enema 8.0

Head CT 2.0

Chest CT 7.0

CORONARY ANGIOGRAPHY CT 16.0

Interventional angiography 7.0

Nuclear medicine

cardiac stress thallium 40.7

PET CT 45.0

Effective radiation dose comparisons

- 1 chest X-ray (posterior/anterior) = 0.02 millisieverts (mSv)
- 1 average chest CT = ~350 chest X-rays = ~7 mSv
- 3 average CTs per patient/condition = 1,050 chest X-rays = ~21 mSv

**Average atomic bomb survivor radiation dose = 5–100 mSv**

Cancer & radiation

A recent large-scale study of 400,000 radiation workers in the nuclear industry who were exposed to an average cumulative effective dose of approximately 20 mSv reported a significant association between radiation dose and mortality from cancer.

Risk of cancer among these workers, who received doses of 5–100 mSv, was quantitatively consistent with that reported for atomic bomb survivors.

Such studies provide direct evidence that the radiation doses associated with CT scans are associated with increased cancer risk.

64 SLICE CT

According to a recent market research report, the number of 64-slice scanners has more than doubled in the past 2 years when physicians have financial interests in imaging facilities, they may tend to refer patients for more scans than those who do not have such an incentive.

**...a third of all CT scans practically could be replaced by other approaches or don't have to be performed at all. But it's going to be really hard to target this one-third because there are so many pressures on physicians to do CT scans**

#### RADIATION

By one estimate, a 45-year-old adult who plans to undergo annual full-body CT examinations up to age 75 (30 examinations) would increase his or her lifetime overall risk of dying from cancer by almost two percent (lifetime attributable risk of mortality).

At the population level, if many people made the same decision to have annual full-body CT scans, the result could be a significant number of additional new cancer cases.

#### Pediatrics CT

**Pediatric CT usage is increasing very rapidly in children and generally speaking, children are more sensitive to radiation than adults** a 1-year-old is 10–15 times more likely than a 50-year-old to develop a malignancy from the same dose of radiation