

Table 7-3 Occupational Cancers

Agents or Groups of Agents	Human Cancers for Which Reasonable Evidence Is Available	Typical Use or Occurrence
Arsenic and arsenic compounds	Lung carcinoma, skin carcinoma	By-product of metal smelting; component of alloys, electrical and semiconductor devices, medications and herbicides, fungicides, and animal dips
Asbestos	Lung, esophageal, gastric, and colon carcinoma; mesothelioma	Formerly used for many applications because of fire, heat, and friction resistance; still found in existing construction as well as fire-resistant textiles, friction materials (i.e., brake linings), underlayment and roofing papers, and floor tiles
Benzene	Acute myeloid leukemia	Principal component of light oil; despite known risk, many applications exist in printing and lithography, paint, rubber, dry cleaning, adhesives and coatings, and detergents; formerly widely used as solvent and fumigant
Beryllium and beryllium compounds	Lung carcinoma	Missile fuel and space vehicles; hardener for lightweight metal alloys, particularly in aerospace applications and nuclear reactors
Cadmium and cadmium compounds	Prostate carcinoma	Uses include yellow pigments and phosphors; found in solders; used in batteries and as alloy and in metal platings and coatings
Chromium compounds	Lung carcinoma	Component of metal alloys, paints, pigments, and preservatives
Nickel compounds	Lung and oropharyngeal carcinoma	Nickel plating; component of ferrous alloys, ceramics, and batteries; by-product of stainless-steel arc welding
Radon and its decay products	Lung carcinoma	From decay of minerals containing uranium; potentially serious hazard in quarries and underground mines
Vinyl chloride	Hepatic angiosarcoma	Refrigerant; monomer for vinyl polymers; adhesive for plastics; formerly inert aerosol propellant in pressurized containers

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than do their slimmer counterparts; it follows that approximately 14% of cancer deaths in men and 20% in women can be attributed to obesity.

- **Reproductive history.** There is strong evidence that life-long cumulative exposure to estrogen stimulation, particularly if unopposed by progesterone, increases the risk of cancers of the breast and endometrium, tissues that are responsive to these hormones. Indeed, some of the differences in breast cancer incidence that are seen across the world are believed to be related to cultural mores that affect the timing and number of pregnancies a woman has during her lifetime.
- **Environmental carcinogens.** There is no paucity of well-characterized environmental carcinogens: they lurk in the ambient environment, in the workplace (Table 7-3), in food, and in personal practices. Individuals may be exposed to carcinogenic factors when they go outside (e.g., ultraviolet [UV] rays, smog), drink well water (e.g., arsenic, particularly in Bangladesh), take certain medications (e.g., methotrexate), go to work (e.g., asbestos), or even while lounging at home (e.g., grilled meat, high-fat diet, alcohol).

It appears that almost everything one does to earn a livelihood or for pleasure is fattening, immoral, illegal, or, even worse, carcinogenic!

Age

Age has an important influence on the likelihood of being afflicted with cancer. Most carcinomas occur in the later years of life (>55 years). Cancer is the main cause of death among women aged 40 to 79 and among men aged 60 to 79; the decline in deaths after age 80 is due to the lower number of individuals who reach this age. The rising incidence of cancer with age is likely explained by the accumulation of somatic mutations associated with

the emergence of malignant neoplasms (discussed later). The decline in immune competence that accompanies aging may also be a factor.

Tragically, children are not spared; cancer accounts for slightly more than 10% of all deaths in children younger than age 15 in the United States, second only to accidents. However, the types of cancers that predominate in children are significantly different from those seen in adults. Carcinomas, the most common general category of tumor in adults, are extraordinarily rare among children. Instead, acute leukemia and distinctive neoplasms of the central nervous system are responsible for approximately 60% of childhood cancer deaths. The common neoplasms of infancy and childhood include the so-called small round blue cell tumors such as neuroblastoma, Wilms tumor, retinoblastoma, acute leukemias, and rhabdomyosarcomas. These are discussed in Chapter 10 and elsewhere in the text.

Acquired Predisposing Conditions

Acquired conditions that predispose to cancer can be divided into chronic inflammations, precursor lesions, and immunodeficiency states. Chronic inflammatory disorders and precursor lesions span a diverse set of conditions that are all associated with increased cellular replication, which appears to create a “fertile” soil for the development of malignant tumors. Indeed, repeated rounds of cell division may be required for neoplastic transformation, in that proliferating cells are the most at risk for accumulating the genetic lesions that lead to carcinogenesis. Tumors arising in the context of chronic inflammation are mostly carcinomas, but also include mesothelioma and several kinds of lymphoma. Immunodeficiency states predispose to virus-induced cancers. Each of these acquired predisposing conditions is described next.