


**TABLE 54-1 GENETIC TESTING FOR SELECTED HEREDITARY CANCER SYNDROMES**

TYPE OF CANCER AND INVOLVED GENES	PREVENTION MEASURES
<b>BREAST</b>	
<i>BRCA1, BRCA2</i> <i>PTEN, STK11, TP53</i>	Prophylactic mastectomy Selective estrogen receptor modulators Lifestyle measures Increased intensity of screening, including breast MRI
<b>LOBULAR BREAST CANCER AND GASTRIC CANCER</b>	
<i>CDH1</i> (E-cadherin)	Prophylactic gastrectomy Prophylactic mastectomy Increased intensity of screening, including breast MRI Selective estrogen receptor modulators
<b>OVARIAN</b>	
<i>BRCA1, BRCA2</i>	Prophylactic oophorectomy Oral contraceptives
<b>COLON</b>	
Familial adenomatous polyposis (FAP) <i>APC</i>	Prophylactic colectomy NSAIDs Lifestyle measures
Hereditary nonpolyposis colon cancer (HNPCC) <i>MLH1, MSH2</i> <i>MSH6, PMS2</i>	Lifestyle measures NSAIDs Increased surveillance Prophylactic total abdominal hysterectomy and oophorectomy
MYH-associated polyposis <i>MYH</i>	Lifestyle measures NSAIDs Prophylactic colectomy
<b>UTERINE</b>	
<i>PTEN, MLH1, MSH2, MSH6, PMS2</i>	Prophylactic hysterectomy Increased surveillance

MRI, Magnetic resonance imaging; MYH, mutY homologue; NSAIDs, nonsteroidal anti-inflammatory drugs.

**TABLE 54-2 CANCER RISK FACTORS**

LIFESTYLE FACTOR	ASSOCIATED CANCERS
Tobacco	Lung, bronchus, esophagus, head and neck, stomach, pancreas, kidney, bladder, cervix
High alcohol consumption	Liver, rectum, breast, oral cavity, pharynx, larynx, esophagus
Obesity, high dietary fat	Colon, breast, endometrium, kidney, pancreas, esophagus, prostate
Low dietary fiber	Colon
Sedentary lifestyle	Colon, breast
Environmental exposures	
Human papillomavirus: types 16, 18	Cervical
Hepatitis B and C viruses	Liver and hepatocellular cancers
Asbestos	Mesothelioma and other types of lung cancer
Radon	Lung
Ultraviolet radiation	Melanoma, basal and squamous cell carcinomas
Ionizing radiation	Leukemia, thyroid, lung, breast

with nasopharyngeal cancer and Burkitt's lymphoma) and human T-cell leukemia virus type I (HTLV-I). Patients with the acquired immunodeficiency syndrome, which is associated with the human immunodeficiency virus (HIV), are at increased risk for Kaposi's sarcoma, non-Hodgkin's lymphoma, and

anogenital squamous cell carcinoma. Chronic hepatitis B and C viral infections have been linked with the development of hepatocellular carcinoma. Human papillomaviruses 16 and 18 have been linked with cervical cancer, and vaccines against these virus strains and those causing genital warts are now on the market.

## Radiation

### Non-ionizing Radiation

Ultraviolet (UV) radiation is unquestionably associated with an increase risk of skin cancers, including basal and squamous cell carcinomas as well as cutaneous melanoma, with observed rates increasing directly with the amount of daily sunlight exposure. Most of the harmful effects from sun exposure are related to direct DNA damage associated with exposure to intermediate-wavelength UVB. The use of tanning beds and frequent exposure to sunlight are of particular concern given the rapid increase in rates of melanoma among younger individuals.

### Ionizing Radiation

Ionizing radiation is an extensively studied carcinogen; it is unequivocally associated with an increased risk for both hematologic malignancies and various solid tumors in humans. Radiation-induced malignancies including leukemia and solid tumors have been most extensively studied in occupational settings among radiation workers and miners, among survivors of the atomic weapons used in Hiroshima and Nagasaki in World War II, and among those exposed to radiation for medical indications. Excess cancer risk from radiation exposure has a latency period ranging from a few years (leukemia) to decades (solid tumors) and correlates with the cumulative exposure dose. As the survivors of the atomic bombing of Japan age, estimates of the associated risk of cancer have continued to increase.

Natural sources account for at least 80% of human exposure to radiation, most notably from radon. Radon exposure is estimated to be the second leading cause of lung cancer due to widespread low-level exposure in the residential setting. In the occupational setting, there is a strong interaction between smoking and radon, such that most radon-induced lung cancers occur among smokers. Medical exposure accounts for most of the remaining average annual radiation exposure in the United States. Repeated exposure to radiation from multiple imaging studies (e.g., CT scans), especially at a young age, is associated with an increased risk of cancer later in life.

### Chemicals

Various pharmacologic agents have been associated with an increased risk for specific cancers. As with radiation, these agents may be used in the occupational setting, for diagnostic or therapeutic medical use, and for various purposes in the home setting. Organic and inorganic chemical compounds linked to human cancers include benzene (leukemia), benzidine (bladder), arsenic, soot and coal tars (lung and skin), and wood dusts (nasal). Arguably, asbestos is the most common cause of occupational cancer because of its link with the development of mesothelioma and other types of lung cancer. Almost all mesotheliomas diagnosed in the United States are associated with prior asbestos