



Figure 9-11 Summary of the adverse effects of smoking: those that are more common are in boldface.

smoking by delivering vaporized nicotine and flavorings, which are rising in popularity. As of 2013, however, the WHO has not indicated if these devices are effective in helping smokers to quit or if they have adverse health effects of their own.

KEY CONCEPTS

Health Effects of Tobacco

- Smoking is the most prevalent preventable cause of human death.
- Tobacco smoke contains more than 2000 compounds. Among these are nicotine, which is responsible for tobacco addiction, and potent carcinogens—mainly, polycyclic aromatic hydrocarbons, nitrosamines, and aromatic amines.
- Approximately 90% of lung cancers occur in smokers. Smoking is also associated with an increased risk of cancers of the oral cavity, larynx, esophagus, stomach, bladder, and kidney, as well as some forms of leukemia. Cessation of smoking reduces the risk of lung cancer.
- Smokeless tobacco use is an important cause of oral cancers. Tobacco consumption interacts with alcohol in multiplying the risk of oral, laryngeal, and esophageal cancer and increases the risk of lung cancers from

occupational exposures to asbestos, uranium, and other agents.

- Tobacco use is an important risk factor for development of atherosclerosis and myocardial infarction, peripheral vascular disease, and cerebrovascular disease. In the lungs, in addition to cancer, it predisposes to emphysema, chronic bronchitis, and chronic obstructive disease.
- Maternal smoking increases the risk of abortion, premature birth, and intrauterine growth retardation.

Effects of Alcohol

Ethanol consumption in moderate amounts is generally not injurious (and may even protect against some disorders), but in excessive amounts alcohol causes serious physical and psychological damage. In this section we describe the steps of alcohol metabolism and the major health consequences associated with alcohol abuse.

Despite all the attention given to illicit drugs such as cocaine and heroin, alcohol abuse is a far more widespread hazard and claims many more lives. Fifty percent of adults in the Western world drink alcohol, and about 5% to 10% have chronic alcoholism. It is estimated that there are more than 10 million chronic alcoholics in the United States and that alcohol consumption is responsible for more than 100,000 deaths annually. More than 50% of these deaths result from accidents caused by drunken driving and alcohol-related homicides and suicides, and about 15,000 annual deaths are a consequence of cirrhosis of the liver. Worldwide, alcohol accounts for approximately 1.8 million deaths per year (3.2% of all deaths).

After consumption, ethanol is absorbed unaltered in the stomach and small intestine. It is then distributed to all the tissues and fluids of the body in direct proportion to the blood level. Less than 10% is excreted unchanged in the urine, sweat, and breath. The amount exhaled is proportional to the blood level and forms the basis of the breath test used by law enforcement agencies. A concentration of 80 mg/dL in the blood constitutes the legal definition of drunk driving in the United States. For an average individual, this alcohol concentration may be reached after consumption of three standard drinks, about three (12 ounce) bottles of beer, 15 ounces of wine, or 4 to 5 ounces of 80 proof distilled spirits. Drowsiness occurs at 200 mg/dL, stupor at 300 mg/dL, and coma, with possible respiratory arrest, at higher levels. The rate of metabolism affects the blood alcohol level. Chronic alcoholics can tolerate levels of up to 700 mg/dL, a situation that is partially explained by accelerated ethanol metabolism caused by a fivefold to 10-fold induction of liver CYPs (discussed later). The effects of alcohol also vary by age, sex, and body fat.

Most of the alcohol in the blood is oxidized to *acetaldehyde* in the liver by three enzyme systems consisting of alcohol dehydrogenase, the microsomal ethanol-oxidizing system, and catalase (Fig. 9-12). The main enzyme system involved in alcohol metabolism is alcohol dehydrogenase, located in the cytosol of hepatocytes. At high blood alcohol levels, the microsomal ethanol-oxidizing system participates in its metabolism. Catalase, which uses hydrogen peroxide as its substrate, is of minor importance, metabolizing no more than 5% of ethanol in the liver. Acetaldehyde