Sure Death

The anti-smoking cartoon in Figure \(\PageIndex{1}\) clearly makes the point that smoking causes death. The cartoon is not using hyperbole, because smoking actually is deadly. It causes about six million deaths each year and is the single greatest cause of preventable death worldwide. As many as half of all people who smoke tobacco die from it. As a result of smoking’s deadly effects, the life expectancy of long-term smokers is significantly less than that of non-smokers. In fact, long-term smokers can expect their lifespan to be reduced by as much as 18 years, and they are three times as likely to die before the age of 70 as non-smokers.

**Figure \(\PageIndex{1}\):** Have another! Sure death
Why Is Smoking Deadly?

As shown in Figure \(\PageIndex{2}\), tobacco smoking has adverse effects on just about every bodily system and organ. The detrimental health effects of smoking depend on the number of years that a person smokes and how much the person smokes. Contrary to popular belief, all forms of tobacco smoke — including smoke from cigars and tobacco pipes — have similar health risks as those of cigarette smoke. Smokeless tobacco may be less of a danger to the lungs and heart, but it too has serious health effects. It significantly increases the risk of cancers of the mouth and throat, among other health problems.

Even non-smokers may not be spared the deadly risks of tobacco smoke. If you spend time around smokers either at home or on the job, then you are at risk of the dangers of secondhand smoke. Secondhand smoke enters the air directly from burning cigarettes (and cigars and pipes) and indirectly from the lungs of smokers. This smoke may linger in indoor air for hours and increase the risk of a wide range of adverse health effects. For example, non-smokers who are exposed to secondhand smoke may have as much as a 30 percent increase in their risk of lung cancer and heart disease. The 2014 U.S. Surgeon General’s Report concluded that there is no established risk-free level of exposure to secondhand smoke.

Tobacco contains nicotine, which is a psychoactive drug. Although nicotine in tobacco smoke does not directly cause cancer or most of the other health risks of smoking, it is a highly addictive drug. In fact, nicotine is even more addictive than cocaine or heroin. The addictive nature of nicotine explains why it is so difficult for smokers to quit the habit even when they know the health risks and really want to stop smoking. The good news is that if someone does stop smoking, his or her risks of smoking-related diseases and death soon start to fall. For example, by one year after quitting, the risk of heart disease drops to only half of that of a continuing smoker.

Figure \(\PageIndex{2}\): Smoking is known to cause many different cancers and chronic diseases such as stroke, blindness, gum infection, aortic rupture, heart disease, pneumonia, hardening of the arteries, chronic lung diseases, reduced fertility, and hip fracture.
Smoking and Cancer

One of the main health risks of smoking is cancer, particularly cancer of the lung. Because of the increased risk of lung cancer with smoking, the risk of dying from lung cancer before age 85 is more than 20 times higher for a male smoker than for a male non-smoker. As the rate of smoking increases, so does the rate of lung cancer deaths, although the effects of smoking on lung cancer deaths can take up to 20 years to manifest themselves, as shown in Figure \(\PageIndex{3}\).

Besides lung cancer, several other forms of cancer are also significantly more likely in smokers than non-smokers, including cancers of the kidney, larynx, mouth, lip, tongue, throat, bladder, esophagus, pancreas, and stomach. Unfortunately, many of these cancers have extremely low cure rates.

When you consider the composition of tobacco smoke, it’s not surprising that it increases the risk of cancer. Tobacco smoke contains dozens of chemicals that have been proven to be carcinogens or causes of cancer. Many of these chemicals bind to DNA in a smoker’s cells and may either kill the cells or cause mutations. If the mutations inhibit programmed cell death, the cells can survive to become cancer cells. Some of the most potent carcinogens in tobacco smoke include benzopyrene, acrolein, and nitrosamines. Other carcinogens in tobacco smoke are radioactive isotopes, including lead-210 and polonium-210.

Respiratory Effects of Smoking

Long-term exposure to the compounds found in cigarette smoke, such as carbon monoxide and cyanide, is thought to be responsible for much of the lung damage caused by smoking. These chemicals reduce the elasticity of alveoli, leading to chronic obstructive pulmonary disease (COPD). COPD is a permanent, incurable, and often fatal reduction in...
the capacity of the lungs, reducing the ability of the lungs to fully exhale air. The chronic inflammation that is also present in COPD is exacerbated by the tobacco smoke carcinogen acrolein and its derivatives. COPD is almost completely preventable simply by not smoking and by also avoiding secondhand smoke.

Cardiovascular Effects of Smoking

Inhalation of tobacco smoke causes several immediate responses in the heart and blood vessels. Within one minute of inhalation of smoke, the heart rate begins to rise, increasing by as much as 30 percent during the first 10 minutes of smoking. Carbon monoxide in tobacco smoke binds with hemoglobin in red blood cells, thereby reducing the blood’s ability to carry oxygen. Hemoglobin bound to carbon monoxide forms such a stable complex that it may result in a permanent loss of red blood cell function. Several other chemicals in tobacco smoke lead to the narrowing and weakening of blood vessels and an increase in substances that contribute to blood clotting. These changes increase blood pressure and the chances of a blood clot forming and blocking a vessel, thereby elevating the risk of heart attack and stroke. A recent study found that smokers are five times more likely than non-smokers to have a heart attack before the age of 40.

Smoking has also been shown to have a negative impact on the levels of blood lipids. Total cholesterol levels tend to be higher in smokers than non-smokers. Ratios of “good” cholesterol to “bad” cholesterol tend to be lower in smokers than in non-smokers.

Additional Adverse Health Effects of Smoking

A wide diversity of additional adverse health effects are attributable to smoking. Here are just a few of them:

- Smokers are at a significantly increased risk of developing chronic kidney disease (in addition to kidney cancer). For example, smoking hastens the progression of kidney damage in people with diabetes.
- People who smoke, especially the elderly, have a greater risk of influenza and other infectious diseases than non-smokers. Smoking more than 20 cigarettes a day has been found to increase the risk of infectious diseases by as much as four times the risk in non-smokers. These effects occur because of damage to both the respiratory system and the immune system.
- In addition to oral cancer, smoking causes other oral problems including periodontitis (gum disease). Roughly half of the cases of gum inflammation are attributable to current or former smoking. Such inflammation increases the risk of tooth loss, which is also higher in smokers than non-smokers. In addition, smoking stains the teeth and causes halitosis (bad breath).
- Smoking is a key cause of erectile dysfunction (ED), probably because it leads to narrowing of arteries in the penis as it does elsewhere in the body. The incidence of ED is about 85 percent higher in males who smoke than it is in non-smokers.
- Smoking also has adverse effects on the female reproductive system, potentially causing infertility, in part because it interferes with the body’s ability to produce estrogen. Female smokers are about 60 percent more likely to be infertile than non-smokers. Pregnant women who smoke or are exposed to secondhand smoke have a higher risk of miscarriages and low-birth-weight infants.
- Certain therapeutic drugs, including some antidepressants and anticonvulsants, are less effective in smokers than in non-smokers. This occurs because smoking increases levels of liver enzymes that break down the drugs.
- Smoking causes an estimated 10 percent of all deaths due to fires worldwide. Smokers are also at greater risk of dying in motor vehicle crashes and other accidents.
Smoking leads to an increased risk of bone fractures, especially of the hip. It also leads to slower wound healing after surgery and an increased rate of postoperative complications.

Feature: Human Biology in the News

The item in Figure \(\PageIndex{4}\) looks like a regular cigarette, but it’s actually an electronic cigarette or e-cigarette. E-cigarettes are battery-powered devices that change flavored liquids and nicotine into a vapor that is inhaled by the user. E-cigarettes are often promoted as being safer than traditional tobacco products and their use is touted as a good way to quit smoking. They are often not banned in smoke-free areas where it is illegal to smoke tobacco cigarettes.

A study completed in 2015 by researchers at the Harvard School of Public Health and widely reported in the mass media found that e-cigarettes may in fact be very harmful to the user’s health. E-cigarettes contain nicotine and cancer-causing chemicals such as formaldehyde. According to the study, about three-quarters of flavored e-cigarettes also contain a chemical named diacetyl that causes an incurable and potentially fatal disorder of the lungs, commonly called “popcorn lung” (bronchiolitis obliterans). In this disorder, the bronchioles compress and narrow due to the formation of scar tissue. This greatly diminishes the breathing capacity of people with the disorder. Popcorn lung gained its common name in 2004 when it was diagnosed in workers at popcorn factories. The buttery flavoring used in the factories contained diacetyl.

Some manufacturers of e-cigarettes and flavorings advertise that their products are now free of diacetyl. However, because e-cigarettes are not currently regulated by the FDA, there is no way of knowing for sure whether the products are actually safe. Equally disturbing is the appeal of flavored e-cigarettes to teens and the attempts of producers to specifically market their products to this age group. Flavors such as “cotton candy,” “Katy Perry’s cherry,” and “alien blood” are obviously marketed to youth. Not surprisingly, the use of e-cigarettes is on the rise in middle and high school students, who are more likely to use them than regular cigarettes. Public health officials fear that e-cigarettes will be a gateway for teens to move on to smoking tobacco cigarettes. Some states have recently passed laws prohibiting minors from buying e-cigarettes. As more questions are raised about their potential negative health effects, it is likely that more laws will be passed to regulate them. Watch the news for updates on this issue.

Review

1. What percentage of people who smoke are likely to die from it?
2. Contrast the life expectancy of long-term smokers and non-smokers.

3. What factors related to smoking determine how smoking affects a smoker’s health?

4. What are the two sources of secondhand cigarette smoke? How does exposure to secondhand smoke affect non-smokers?

5. Why is it so difficult for smokers to quit the habit? How is their health likely to be affected by quitting?

6. List five types of cancer that are significantly more likely in smokers than non-smokers.

7. Why does smoking cause cancer?

8. Explain how smoking causes COPD.

9. Identify some of the adverse effects of smoking on the cardiovascular system.

10. Give three examples of additional adverse health effects that are more likely with smoking.

11. Do you think e-cigarettes can be addictive? Explain your reasoning.

12. People who smoke are more likely to get ___________ than people who do not smoke.
   
   A. lung cancer
   
   B. influenza
   
   C. kidney disease
   
   D. All of the above

13. Name three toxic chemicals present in tobacco smoke.

14. **True or False.** Nicotine is more addictive than heroin.

15. **True or False.** Smoking has many negative effects on the respiratory and cardiovascular systems, but not on other systems of the body.

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