NIH NATIONAL CANCER INSTITUTE

Harms of Cigarette Smoking and Health Benefits of Quitting

What harmful chemicals does tobacco smoke contain?

Tobacco smoke contains many chemicals that are harmful to both smokers and nonsmokers. Breathing even a little tobacco smoke can be harmful (1-4).

Of the more than 7,000 chemicals in tobacco smoke, at least 250 are known to be harmful, including hydrogen cyanide, carbon monoxide, and ammonia (1, 2, 5).

Among the 250 known harmful chemicals in tobacco smoke, at least 69 can cause cancer. These cancer-causing chemicals include the following (1, 2, 5):

- Acetaldehyde
- Aromatic amines
- Arsenic
- Benzene
- Beryllium (a toxic metal)
- 1,3–Butadiene (a hazardous gas)
- Cadmium (a toxic metal)
- Chromium (a metallic element)
- Cumene
- Ethylene oxide
- Formaldehyde
- Nickel (a metallic element)
- Polonium-210 (a radioactive chemical element)
- Polycyclic aromatic hydrocarbons (PAHs)
- Tobacco-specific nitrosamines
- Vinyl chloride

What are some of the health problems caused by cigarette smoking?

Smoking is the leading cause of premature, preventable death in this country. Cigarette smoking and exposure to tobacco smoke cause about 480,000 premature deaths each year in the United States (1). Of those premature

deaths, about 36% are from cancer, 39% are from heart disease and stroke, and 24% are from lung disease (1). Mortality rates among smokers are about three times higher than among people who have never smoked (6, 7).

Smoking harms nearly every bodily organ and organ system in the body and diminishes a person's overall health. Smoking causes cancers of the lung, esophagus, larynx, mouth, throat, kidney, bladder, liver, pancreas, stomach, cervix, colon, and rectum, as well as acute myeloid leukemia (1–3).

Smoking also causes heart disease, stroke, aortic aneurysm (a balloon-like bulge in an artery in the chest), chronic obstructive pulmonary disease (COPD) (chronic bronchitis and emphysema), diabetes, osteoporosis, rheumatoid arthritis, age-related macular degeneration, and cataracts, and worsens asthma symptoms in adults. Smokers are at higher risk of developing pneumonia, tuberculosis, and other airway infections (1–3). In addition, smoking causes inflammation and impairs immune function (1).

Since the 1960s, a smoker's risk of developing lung cancer or COPD has actually increased compared with nonsmokers, even though the number of cigarettes consumed per smoker has decreased (1). There have also been changes over time in the type of lung cancer smokers develop – a decline in squamous cell carcinomas but a dramatic increase in adenocarcinomas. Both of these shifts may be due to changes in cigarette design and composition, in how tobacco leaves are cured, and in how deeply smokers inhale cigarette smoke and the toxicants it contains (1, 8).

Smoking makes it harder for a woman to get pregnant. A pregnant smoker is at higher risk of miscarriage, having an ectopic pregnancy, having her baby born too early and with an abnormally low birth weight, and having her baby born with a cleft lip and/or cleft palate (1). A woman who smokes during or after pregnancy increases her infant's risk of death from Sudden Infant Death Syndrome (SIDS) (2, 3). Men who smoke are at greater risk of erectile dysfunction (1, 9).

The longer a smoker's duration of smoking, the greater their likelihood of experiencing harm from smoking, including earlier death (7). But regardless of their age, smokers can substantially reduce their risk of disease, including cancer, by quitting.

What are the risks of tobacco smoke to nonsmokers?

Secondhand smoke (also called environmental tobacco smoke, involuntary smoking, and passive smoking) is the combination of "sidestream" smoke (the smoke given off by a burning tobacco product) and "mainstream" smoke (the smoke exhaled by a smoker) (4, 5, 10, 11).

The U.S. Environmental Protection Agency, the U.S. National Toxicology Program, the U.S. Surgeon General, and the International Agency for Research on Cancer have classified secondhand smoke as a known human carcinogen (cancer-causing agent) (5, 11, 12). Inhaling secondhand smoke causes lung cancer in nonsmoking adults (1, 2, 4). Approximately 7,300 lung cancer deaths occur each year among adult nonsmokers in the United States as a result of exposure to secondhand smoke (1). The U.S. Surgeon General estimates that living with a smoker increases a nonsmoker's chances of developing lung cancer by 20 to 30% (4).

Secondhand smoke causes disease and premature death in nonsmoking adults and children (2, 4). Exposure to secondhand smoke irritates the airways and has immediate harmful effects on a person's heart and blood vessels. It increases the risk of heart disease by an estimated 25 to 30% (4). In the United States, exposure to secondhand smoke is estimated to cause about 34,000 deaths from heart disease each year (1). Exposure to

secondhand smoke also increases the risk of stroke by 20 to 30% (1). Pregnant women exposed to secondhand smoke are at increased risk of having a baby with a small reduction in birth weight (1).

Children exposed to secondhand smoke are at an increased risk of SIDS, ear infections, colds, pneumonia, and bronchitis. Secondhand smoke exposure can also increase the frequency and severity of asthma symptoms among children who have asthma. Being exposed to secondhand smoke slows the growth of children's lungs and can cause them to cough, wheeze, and feel breathless (2, 4).

Is smoking addictive?

Smoking is highly addictive. Nicotine is the drug primarily responsible for a person's addiction to tobacco products, including cigarettes. The addiction to cigarettes and other tobacco products that nicotine causes is similar to the addiction produced by using drugs such as heroin and cocaine (13). Nicotine is present naturally in the tobacco plant. But tobacco companies intentionally design cigarettes to have enough nicotine to create and sustain addiction.

The amount of nicotine that gets into the body is determined by the way a person smokes a tobacco product and by the nicotine content and design of the product. Nicotine is absorbed into the bloodstream through the lining of the mouth and the lungs and travels to the brain in a matter of seconds. Taking more frequent and deeper puffs of tobacco smoke increases the amount of nicotine absorbed by the body.

Are other tobacco products, such as smokeless tobacco or pipe tobacco, harmful and addictive?

Yes. All forms of tobacco are harmful and addictive (4, 11). There is no safe tobacco product.

In addition to cigarettes, other forms of tobacco include smokeless tobacco, cigars, pipes, hookahs (waterpipes), bidis, and kreteks.

- **Smokeless tobacco**: Smokeless tobacco is a type of tobacco that is not burned. It includes chewing tobacco, oral tobacco, spit or spitting tobacco, dip, chew, snus, dissolvable tobacco, and snuff. Smokeless tobacco causes oral (mouth, tongue, cheek and gum), esophageal, and pancreatic cancers and may also cause gum and heart disease (11, 14).
- **Cigars**: These include premium cigars, little filtered cigars (LFCs), and cigarillos. LFCs resemble cigarettes, but both LFCs and cigarillos may have added flavors to increase appeal to youth and young adults (15, 16). Most cigars are composed primarily of a single type of tobacco (air-cured and fermented), and have a tobacco leaf wrapper. Studies have found that cigar smoke contains higher levels of toxic chemicals than cigarette smoke, although unlike cigarette smoke, cigar smoke is often not inhaled (11). Cigar smoking causes cancer of the oral cavity, larynx, esophagus, and lung. It may also cause cancer of the pancreas. Moreover, daily cigar smokers, particularly those who inhale, are at increased risk for developing heart disease and other types of lung disease.
- **Pipes**: In pipe smoking, the tobacco is placed in a bowl that is connected to a stem with a mouthpiece at the other end. The smoke is usually not inhaled. Pipe smoking causes lung cancer and increases the risk of cancers of the mouth, throat, larynx, and esophagus (11, 17, 18).

- **Hookah or waterpipe** (other names include argileh, ghelyoon, hubble bubble, shisha, boory, goza, and narghile): A hookah is a device used to smoke tobacco (often heavily flavored) by passing the smoke through a partially filled water bowl before being inhaled by the smoker. Although some people think hookah smoking is less harmful and addictive than cigarette smoking (19), research shows that hookah smoke is at least as toxic as cigarette smoke (20–22).
- **Bidis**: A bidi is a flavored cigarette made by rolling tobacco in a dried leaf from the tendu tree, which is native to India. Bidi use is associated with heart attacks and cancers of the mouth, throat, larynx, esophagus, and lung (11, 23).
- **Kreteks**: A kretek is a cigarette made with a mixture of tobacco and cloves. Smoking kreteks is associated with lung cancer and other lung diseases (11, 23).

Is it harmful to smoke just a few cigarettes a day?

There is no safe level of smoking. Smoking even just one cigarette per day over a lifetime can cause smoking-related cancers (lung, bladder, and pancreas) and premature death (24, 25).

What are the immediate health benefits of quitting smoking?

The immediate health benefits of quitting smoking are substantial:

- Heart rate and blood pressure, which are abnormally high while smoking, begin to return to normal.
- Within a few hours, the level of carbon monoxide in the blood begins to decline. (Carbon monoxide reduces the blood's ability to carry oxygen.)
- Within a few weeks, people who quit smoking have improved circulation, produce less phlegm, and don't cough or wheeze as often.
- Within several months of quitting, people can expect substantial improvements in lung function (26).
- Within a few years of quitting, people will have lower risks of cancer, heart disease, and other chronic diseases than if they had continued to smoke.

What are the long-term health benefits of quitting smoking?

Quitting smoking reduces the risk of cancer and many other diseases, such as heart disease and COPD, caused by smoking.

Data from the U.S. National Health Interview Survey show that people who quit smoking, regardless of their age, are less likely to die from smoking-related illness than those who continue to smoke. Smokers who quit before age 40 reduce their chance of dying prematurely from smoking-related diseases by about 90%, and those who quit by age 45-54 reduce their chance of dying prematurely by about two-thirds (6).

Regardless of their age, people who quit smoking have substantial gains in life expectancy, compared with those who continue to smoke. Data from the U.S. National Health Interview Survey also show that those who quit between the ages of 25 and 34 years live about 10 years longer; those who quit between ages 35 and 44 live

about 9 years longer; those who quit between ages 45 and 54 live about 6 years longer; and those who quit between ages 55 and 64 live about 4 years longer (6).

Also, a study that followed a large group of people age 70 and older (7) found that even smokers who quit smoking in their 60s had a lower risk of mortality during follow-up than smokers who continued smoking.

Does quitting smoking lower the risk of getting and dying from cancer?

Yes. Quitting smoking reduces the risk of developing and dying from cancer and other diseases caused by smoking. Although it is never too late to benefit from quitting, the benefit is greatest among those who quit at a younger age (3).

The risk of premature death and the chances of developing and dying from a smoking-related cancer depend on many factors, including the number of years a person has smoked, the number of cigarettes smoked per day, and the age at which the person began smoking.

Is it important for someone diagnosed with cancer to quit smoking?

Quitting smoking improves the prognosis of cancer patients. For patients with some cancers, quitting smoking at the time of diagnosis may reduce the risk of dying by 30% to 40% (1). For those having surgery, chemotherapy, or other treatments, quitting smoking helps improve the body's ability to heal and respond to therapy (1, 3, 27). It also lowers the risk of pneumonia and respiratory failure (1, 3, 28). In addition, quitting smoking may lower the risk that the cancer will recur, that a second cancer will develop, or that the person will die from the cancer or other causes (27, 29–32).

Where can I get help to quit smoking?

NCI and other agencies and organizations can help smokers quit:

- Visit **Smokefree.gov** for access to free information and resources, including Create My Quit Plan, smartphone apps, and text message programs
- Call the **NCI Smoking Quitline** at **1–877–44U–QUIT** (**1–877–448–7848**) for individualized counseling, printed information, and referrals to other sources.
- See the NCI fact sheet Where To Get Help When You Decide To Quit Smoking.

Selected References

1. U.S. Department of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General, 2014*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014.
2. U.S. Department of Health and Human Services. *How Tobacco Smoke Causes Disease: The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General*. Atlanta, GA: U.S.

Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2010.

3. U.S. Department of Health and Human Services. *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2004.
4. U.S. Department of Health and Human Services. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.
5. National Toxicology Program. Tobacco-Related Exposures. In: *Report on Carcinogens. Fourteenth Edition.* U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, 2016.
6. Jha P, Ramasundarahettige C, Landsman V, et al. 21st-century hazards of smoking and benefits of cessation in the United States. *New England Journal of Medicine* 2013; 368(4):341–350. [PubMed Abstract]
7. Nash SH, Liao LM, Harris TB, Freedman ND. Cigarette smoking and mortality in adults aged 70 years and older: Results from the NIH-AARP cohort. *American Journal of Preventive Medicine* 2017; 52(3):276-283 [PubMed Abstract]
8. Hecht SS. Tobacco carcinogens, their biomarkers and tobacco-induced cancer. *Nature Reviews. Cancer.* 2003; 3(10):733-744. [PubMed Abstract]
9. Austoni E, Mirone V, Parazzini F, et al. Smoking as a risk factor for erectile dysfunction: Data from the Andrology Prevention Weeks 2001–2002. A study of the Italian Society of Andrology (S.I.A.). *European Urology* 2005; 48(5):810–818. [PubMed Abstract]
10. National Cancer Institute. *Cancer Trends Progress Report: Secondhand Smoke Exposure*. National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD, January 2017.
11. International Agency for Research on Cancer. Tobacco smoking, Second-hand tobacco smoke, and Smokeless tobacco. In: *Personal Habits and Indoor Combustions: A Review of Human Carcinogens.* IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 100E. Lyon, France: International Agency for Research on Cancer; 2012. p. 43-318.
12. U.S. Environmental Protection Agency. *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders.* Washington, DC: U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Office of Research and Development; 1992.
13. Hatsukami DK, Stead LF, Gupta PC. Tobacco addiction. *Lancet* 2008; 371(9629):2027–2038. [PubMed Abstract]
14. Piano MR, Benowitz NL, Fitzgerald GA, et al. Impact of smokeless tobacco products on cardiovascular disease: implications for policy, prevention, and treatment: a policy statement from the American Heart Association. *Circulation* 2010; 122(15):1520-1544. doi: 10.1161/CIR.0b013e3181f432c3.
15. Villanti AC, Richardson A, Vallone DM, Rath JM. Flavored tobacco product use among U.S. young adults. *American Journal of Preventive Medicine* 2013; 44(4):388-391. [PubMed Abstract]
16. Corey CG, Ambrose BK, Apelberg BJ, King BA. Flavored tobacco product use among middle and high school students--United States, 2014. *MMWR. Morbidity and Mortality Weekly Report* 2015; 64(38):1066-1070. [PubMed Abstract]

17. Henley SJ, Thun MJ, Chao A, Calle EE. Association between exclusive pipe smoking and mortality from cancer and other diseases. *Journal of the National Cancer Institute* 2004; 96(11):853–861. [PubMed Abstract]

18. Wyss A, Hashibe M, Chuang SC, et al. Cigarette, cigar, and pipe smoking and the risk of head and neck cancers: Pooled analysis in the International Head and Neck Cancer Epidemiology Consortium. *American Journal of Epidemiology* 2013; 178(5):679-690. [PubMed Abstract]

19. Smith-Simone S, Maziak W, Ward KD, Eissenberg T. Waterpipe tobacco smoking: Knowledge, attitudes, beliefs, and behavior in two U.S. samples. *Nicotine Tobacco Research* 2008; 10(2):393–398. [PubMed Abstract]

20. Knishkowy B, Amitai Y. Water-pipe (narghile) smoking: An emerging health risk behavior. *Pediatrics* 2005; 116(1):e113–119. [PubMed Abstract]

21. Cobb C, Ward KD, Maziak W, Shihadeh AL, Eissenberg T. Waterpipe tobacco smoking: An emerging health crisis in the United States. *American Journal of Health Behavior* 2010; 34(3):275–285. [PubMed Abstract]

22. World Health Organization (Tobacco Free Initiative): Advisory Note. Waterpipe Tobacco Smoking: Health Effects, Research Needs and Recommended Actions for Regulators, 2nd edition. 2015. (retrieved December 12, 2017, from http://www.who.int/tobacco/publications/prod_regulation/waterpipesecondedition/en/)

23. Prignot JJ, Sasco AJ, Poulet E, Gupta PC, Aditama TY. Alternative forms of tobacco use. *International Journal of Tuberculosis and Lung Disease* 2008; 12(7):718–727. [PubMed Abstract]

24. Inoue-Choi M, Liao LM, Reyes-Guzman C, et al. Association of long-term, low-intensity smoking with all-cause and cause-specific mortality in the National Institutes of Health-AARP Diet and Health Study. *JAMA Internal Medicine* 2017; 177(1):87-95. [PubMed Abstract]

25. Inoue-Choi M, Hartge P, Liao LM, Caporaso N, Freedman ND. Association between long-term low-intensity cigarette smoking and incidence of smoking-related cancer in the National Institutes of Health-AARP cohort. *International Journal of Cancer* 2018; 142(2):271-280. [PubMed Abstract]

26. U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation: A Report of the Surgeon General.* Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.

27. McBride CM, Ostroff JS. Teachable moments for promoting smoking cessation: The context of cancer care and survivorship. *Cancer Control* 2003; 10(4):325–333. [PubMed Abstract]

28. Peto R, Darby S, Deo H, et al. Smoking, smoking cessation, and lung cancer in the U.K. since 1950: Combination of national statistics with two case-control studies. *British Medical Journal* 2000; 321(7257):323–329. [PubMed Abstract]

29. Travis LB, Rabkin CS, Brown LM, et al. Cancer survivorship—genetic susceptibility and second primary cancers: Research strategies and recommendations. *Journal of the National Cancer Institute* 2006; 98(1):15–25. [PubMed Abstract]

30. Parsons A, Daley A, Begh R, Aveyard P. Influence of smoking cessation after diagnosis of early stage lung cancer on prognosis: Systematic review of observational studies with meta-analysis. *British Medical Journal* 2010; 340:b5569. [PubMed Abstract]

31. Warren GW, Kasza KA, Reid ME, Cummings KM, Marshall JR. Smoking at diagnosis and survival in cancer patients. *International Journal of Cancer* 2013; 132(2):401–410. [PubMed Abstract]

32. Walter V, Jansen L, Hoffmeister M, Brenner H. Smoking and survival of colorectal cancer patients: systematic review and meta-analysis. *Annals of Oncology* 2014; 25(8):1517–1525. [PubMed Abstract]

Related Resources

Cigar Smoking and Cancer

Handling Nicotine Withdrawal and Triggers When You Decide To Quit Tobacco

"Light" Cigarettes and Cancer Risk

Secondhand Smoke and Cancer

Smokeless Tobacco and Cancer

Reviewed: December 19, 2017
