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# Harmful Chemicals in Tobacco Products

## Tobacco smoke

Cigarettes, cigars, and pipe tobacco are made from dried tobacco leaves. Other substances are added for flavor and to make smoking more pleasant. The smoke from these products is a complex mixture of chemicals produced by burning tobacco and its additives.

Tobacco smoke is made up of thousands of chemicals, including at least 70 known to cause cancer. These cancer-causing chemicals are referred to as *carcinogens*. Some of the chemicals found in tobacco smoke include:

- Nicotine (the addictive drug that produces the effect people are looking for and one of the harshest chemicals in tobacco smoke)
- Hydrogen cyanide
- [Formaldehyde](#)<sup>1</sup>
- [Lead](#)<sup>2</sup>
- [Arsenic](#)<sup>3</sup>
- Ammonia
- Radioactive elements, such as uranium (see below)
- [Benzene](#)<sup>4</sup>
- Carbon monoxide
- Nitrosamines
- Polycyclic aromatic hydrocarbons (PAHs)

[Many of these substances cause cancer](#)<sup>5</sup>. Some can cause heart disease, lung disease, or other serious health problems, too. Most of the substances come from the burning tobacco leaves themselves, not from additives included in cigarettes (or other tobacco

products).

## Radioactive materials in tobacco smoke

Radioactive materials are in the tobacco leaves used to make cigarettes and cigars. These materials come from the fertilizer and soil used to grow the tobacco leaves, so the amount in tobacco depends on the soil the plants were grown in and the type of fertilizers used. These radioactive materials are given off in the smoke when tobacco is burned, which smokers take into their lungs as they inhale. This may be another key factor in smokers getting lung cancer.

## Is cigar smoke different?

Cigar smoke pretty much has the same toxic and carcinogenic compounds as cigarette smoke, but some of them are present at different levels.

Because of the aging process used to make cigars, cigar tobacco has high concentrations of some nitrogen compounds (nitrates and nitrites). When the fermented cigar tobacco is smoked, these compounds give off several tobacco-specific nitrosamines (TSNAs), some of the most potent cancer-causing substances known.

Also, because the cigar wrapper is less porous than a cigarette wrapper, the tobacco doesn't burn as completely. This results in higher concentrations of nitrogen oxides, ammonia, carbon monoxide, and tar – all very harmful substances.

## Smokeless tobacco products

Smokeless tobacco products include snuff and chewing tobacco that is put into the mouth or nose but is not burned like cigarettes or cigars. Still, smokeless products in the United States contain a variety of potentially harmful chemicals, including high levels of TSNAs.

There are also other cancer-causing agents in smokeless tobacco, such as benzo[a]pyrene and other polycyclic aromatic hydrocarbons (PAHs). These carcinogens are absorbed through the mouth and may be why [several types of cancer](#)<sup>6</sup> are linked to the use of smokeless tobacco. Like other forms of tobacco, smokeless tobacco also contains radioactive substances.

Snus (pronounced 'snoose') is a type of moist snuff that does not require spitting. It was first used in Sweden and Norway, but it is now available in the United States as well. Snus generally has lower levels of nicotine and TSNAs than traditional moist snuff

brands, but can still be addictive and has been linked to some types of cancer.

### **Which is riskier? Smokeless tobacco or cigarette smoking?**

Smokeless tobacco products are less deadly than cigarettes. On average, they kill fewer people than cigarettes. Smokeless products are often promoted as a less harmful alternative to smoking, but they are still linked with cancer and can still be deadly. And they have not been proven to help smokers quit.

### **E-cigarettes and similar devices**

E-cigarettes and other electronic nicotine delivery systems (ENDS) are often used as substitutes for cigarettes or other tobacco products.

Marketers of e-cigarettes and other ENDS often claim the ingredients are safe. But the aerosols these products produce can contain addictive nicotine, flavorings, and a variety of other chemicals, some known to be toxic or to cause cancer. The levels of many of these substances appear to be lower than in traditional cigarettes, but the amounts of nicotine and other substances in these products can vary widely because they are not standardized. The long-term health effects of these devices are not known, but they are being studied.

### **Hyperlinks**

1. [www.cancer.org/cancer/cancer-causes/formaldehyde.html](http://www.cancer.org/cancer/cancer-causes/formaldehyde.html)
2. [www.cancer.org/cancer/cancer-causes/lead.html](http://www.cancer.org/cancer/cancer-causes/lead.html)
3. [www.cancer.org/cancer/cancer-causes/arsenic.html](http://www.cancer.org/cancer/cancer-causes/arsenic.html)
4. [www.cancer.org/cancer/cancer-causes/benzene.html](http://www.cancer.org/cancer/cancer-causes/benzene.html)
5. [www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/health-risks-of-smoking-tobacco.html](http://www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/health-risks-of-smoking-tobacco.html)
6. [www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/health-risks-of-smoking-tobacco.html](http://www.cancer.org/cancer/cancer-causes/tobacco-and-cancer/health-risks-of-smoking-tobacco.html)

### **References**

Baker F, Ainsworth SR, Dye JT, et al. Health risks associated with cigar smoking. *JAMA*. 2000;284:735-740.

Harrell PT, Simmons VN, Correa JB, Padhya TA, Brandon TH. Electronic nicotine

delivery systems ("e-cigarettes"): Review of safety and smoking cessation efficacy. *Otolaryngol Head Neck Surg.* 2014;151:381-393.

Herrington JS, Myers C. Electronic cigarette solutions and resultant aerosol profiles. *J Chromatogr A.* 2015;1418:192-199.

Karagueuzian HS, White C, Sayre J, Norman A. Cigarette smoke radioactivity and lung cancer risk. *Nicotine Tob Res.* 2012;14:79-90.

· Leon ME, Peruga A, et al. European Code against Cancer, 4th Edition: Tobacco and cancer. *Cancer Epidemiol.* 2015;39 Suppl 1:S20-33.

National Cancer Institute. Smokeless Tobacco and Cancer. 2010. Accessed at [www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/smokeless-fact-sheet](http://www.cancer.gov/about-cancer/causes-prevention/risk/tobacco/smokeless-fact-sheet) on January 4, 2017.

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;122:1520-1544.

Shousha HA, Ahmad F. Natural radioactivity contents in tobacco and radiation dose induced from smoking. *Radiat Prot Dosimetry.* 2012;150:91-95.

Stepanov I, Jensen J, Hatsukami D, Hecht SS. New and traditional smokeless tobacco: Comparison of toxicant and carcinogen levels. *Nicotine Tob Res.* 2008;10:1773-1782.

US Centers for Disease Control and Prevention. Cigarette Smoking and Radiation. 2015. Accessed at [www.cdc.gov/nceh/radiation/smoking.htm](http://www.cdc.gov/nceh/radiation/smoking.htm) on January 4, 2017.

US 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.* 2010. Accessed at [www.ncbi.nlm.nih.gov/books/NBK53017/](http://www.ncbi.nlm.nih.gov/books/NBK53017/) on September 16, 2016.

US Department of Health and Human Services. *The Health Consequences of Smoking--50 Years of Progress: A Report of the Surgeon General.* 2014. Accessed at [www.surgeongeneral.gov/library/reports/](http://www.surgeongeneral.gov/library/reports/) on September 16, 2016.

US Department of Health and Human Services. *Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General.* 2012. Accessed at [www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/index.html](http://www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/index.html) on September 16, 2016.

US Food and Drug Administration. Harmful and Potentially Harmful Constituents in Tobacco Products and Tobacco Smoke: Established List. April 2012. Accessed at [www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm297786.htm](http://www.fda.gov/TobaccoProducts/GuidanceComplianceRegulatoryInformation/ucm297786.htm) on September 16, 2016.

Last Medical Review: March 12, 2017 Last Revised: April 5, 2017

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