



WHAT IS IN SECONDHAND SMOKE?

To understand secondhand smoke and get a better understanding of the harms it causes, it is important to know both what is in a cigarette and what, in turn, is in cigarette smoke.

What is in a cigarette?¹

To know what is in secondhand smoke, we first have to know what is in a cigarette. To that end, the following is a basic description of what is found in most cigarettes sold in the United States:

- Tobacco for “American blend” cigarettes – the type of cigarettes sold and consumed in the United States and becoming increasingly popular worldwide -- is blended from two main leaf varieties: Virginia tobacco that contains 2.5-3% nicotine; and ‘burley’ tobacco that has a higher nicotine content (3.5-4%). U.S. blends also contain up to 10% of imported ‘oriental’ tobacco that is aromatic but relatively low in nicotine (less than 2%).
- In addition to the leaf blend, cigarettes contain ‘fillers’ which are made from the stems and other bits of tobacco that would otherwise be waste products. These are mixed with water and various flavorings and additives. The ratio of filler varies among brands.
- Additives are used to make tobacco products more acceptable to the consumer. They include humectants (moisturizers) to prolong shelf life; sugars to make the smoke seem milder and easier to inhale; and flavorings such as chocolate and vanilla.
- Additives are used to make cigarettes that provide high levels of ‘free’ nicotine that increases the addictive ‘kick’ of the nicotine. Ammonium compounds can fulfill this role by raising the alkalinity of smoke.
- Additives are used to enhance the taste of tobacco smoke, to make the product more desirable to consumers. Although seemingly innocuous, the addition of flavorings making the cigarette ‘attractive’ and ‘palatable’ is in itself cause for concern. Furthermore, sweeteners and chocolate may help to make cigarettes more palatable to children and first time users; eugenol and menthol numb the throat so the smoker cannot feel the smoke’s aggravating effects. Also, additives such as cocoa may be used to dilate the airways allowing the smoke an easier and deeper passage into the lungs exposing the body to more nicotine and higher levels of tar.

What is in Cigarette Smoke?

Cigarette smoke is toxic soup of more than 4,000 known chemical compounds.² Secondhand smoke is composed of sidestream smoke (the smoke released from the burning end of a cigarette) and exhaled mainstream smoke (the smoke exhaled by the smoker).³ Tobacco smoke contains thousands of different chemicals that are released into the air as particles and gases. The particulate phase of cigarette smoke includes nicotine, “tar” (itself composed of many chemicals), benzene and benzo(a)pyrene. The gas phase includes carbon monoxide, ammonia, dimethylnitrosamine, formaldehyde, hydrogen cyanide and acrolein. According to a November 2001 report issued by the National Cancer Institute⁴, there are 69 known or probable carcinogens in cigarette smoke⁵. The complete list of these carcinogens appears in the table below.

LIST OF KNOWN, PROBABLE, & POSSIBLE CANCER CAUSING CHEMICALS IN SECONDHAND SMOKE	
<u>Polycyclic Aromatic Hydrocarbons</u> Benz(a)anthracene Benzo(b)fluoranthene Benzo(j)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Dibenz(a,h)anthracene Dibenzo(a,l)pyrene Dibenzo(a,e)pyrene Indeno(1,2,3-cd)pyrene 5-Methylchrysene	<u>Miscellaneous Organic Compounds</u> Acetamide Acrylonitrile DDT Catechol 1,1-Dimethylhydrazine 2-Nitropropane Ethyl carbamate Ethylene oxide Propylene oxide Methyleugenol MeAaC (2-amino-3-methyl-9-H-pyrido[2,3-b]indole)
<u>N-Nitrosamines</u> N-Nitrosodimethylamine N-Nitrosoethylmethylamine N-Nitrosodiethylamine N-Nitrosodi-n-propylamine N-Nitroso-di-n-butylamine N-Nitrosopyrrolidine N-Nitrosopiperidine N-Nitrosodiethanolamine N-Nitrososornicotine 4-(Methylnitrosamino)-1-(3pyridyl)-1-butanone	<u>Inorganic Compounds</u> Hydrazine Arsenic Beryllium Nickel Chromium (only hexavalent) Cadmium Cobalt Lead Polonium-210
<u>N-Heterocyclic Amines</u> AaC IQ Trp-P-1 Trp-P-2 Glu-P-1 Glu-P-2 PhIP	<u>Aldehydes</u> Formaldehyde Acetaldehyde
<u>Volatile Hydrocarbons</u> 1,3-Butadiene Isoprene Benzene Styrene	<u>Heterocyclic Compounds</u> Quinoline Dibenz(a,h)acridine Dibenz(a,j)acridine Dibenzo(c,g)carbazole Benzo(b)furan Furan
<u>Aromatic Amines</u> 2-Toluidine 2,6- Dimethylaniline 2-Naphthylamine 4-Aminobiphenyl	

Not surprisingly, given these ingredients, the scientific evidence on the health risks associated with exposure to secondhand smoke is clear, convincing, and overwhelming. Secondhand smoke (also referred to as involuntary smoking, environmental tobacco smoke, and passive smoking) is a known

cause of lung cancer, heart disease, low birth-weight births, and chronic lung ailments such as bronchitis and asthma (particularly in children), as well as other health problems. In fact, exposure to secondhand smoke has been estimated to result in the deaths of about 50,000⁶ adult non-smokers each year in the United States and over one million illnesses in children.⁷

¹ This section is largely based from a document prepared by Action on Smoking and Health/United Kingdom entitled, *Fact Sheet No. 12, What's In A Cigarette?*, August 2001, <http://www.ash.org.uk/html/factsheets/html/fact12.html>.

² National Cancer Institute. *Risks Associated with Smoking Cigarettes with Low Machine-Measured Yields of Tar and Nicotine*. Smoking and Tobacco Control Monograph No. 13. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 02-5074, October 2001. http://dcccps.nci.nih.gov/tcrb/monographs/13/m13_5.pdf; personal communication, dated October 28, 2003, from Dietrich Hoffmann, Ph.D., Associate Director, Institute for Cancer Prevention, co-author of Chapter 5 of NCI Monograph 13, clarifying that Table 5.4 of the Monograph (that lists the 69 carcinogens) is missing a carcinogen, namely MeAaC (2-amino-3-methyl-9-Hpyrido[2,3-b]indole, and it should be inserted under "under "Miscellaneous Organic Compounds".

³ U.S. Department of Health and Human Services. *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. 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, 2006.

⁴ National Cancer Institute. *Risks Associated with Smoking Cigarettes with Low Machine-Measured Yields of Tar and Nicotine*. Smoking and Tobacco Control Monograph No. 13. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 02-5074, October 2001. http://dcccps.nci.nih.gov/tcrb/monographs/13/m13_5.pdf.

⁵ National Cancer Institute. *Risks Associated with Smoking Cigarettes with Low Machine-Measured Yields of Tar and Nicotine*. Smoking and Tobacco Control Monograph No. 13. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 02-5074, October 2001. http://dcccps.nci.nih.gov/tcrb/monographs/13/m13_5.pdf.

⁶ CDC, "Annual Smoking-Attributable Mortality, Years of Potential Life Lost, and Productivity Losses -- United States 2000-2004," *MMWR* 57(45), November 14, 2008 <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm>. See also, California EPA, *Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant*, June 24, 2005.

⁷ National Cancer Institute. *Health Effects of Exposure to Environmental Tobacco Smoke: The Report of the California Environmental Protection Agency. Smoking and Tobacco Control Monograph no. 10*. Bethesda, MD. U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute, NIH Pub. No. 99-4645, 1999, http://cancercontrol.cancer.gov/tcrb/nci_monographs/MONO10/MONO10.HTM.