

## Secondhand Smoke: Questions and Answers

### Key Points

- Secondhand smoke, also called environmental tobacco smoke (ETS), is the combination of smoke emitted from the burning end of a cigarette, cigar, or pipe, and smoke exhaled by the smoker (see Question 1).
- Secondhand smoke contains more than 50 carcinogens (substances that cause cancer) (see Question 2).
- The known health effects of exposure to secondhand smoke include lung cancer, nasal sinus cancer, respiratory tract infections, and heart disease (see Question 3).
- Separating smokers and nonsmokers within the same air space may reduce, but does not eliminate, nonsmokers' exposure to secondhand smoke (see Question 4).

### 1. What is secondhand smoke?

Secondhand smoke, also called environmental tobacco smoke (ETS), is the combination of two forms of smoke from burning tobacco products: sidestream smoke and mainstream smoke. Sidestream smoke, which makes up about half of all secondhand smoke, comes from the burning end of a cigarette, cigar, or pipe (1, 2, 3, 4). Mainstream smoke is exhaled by the smoker. Exposure to secondhand smoke is also called involuntary smoking or passive smoking (1, 2, 3).

### 2. What chemicals are present in secondhand smoke?

Many factors affect what chemicals are present in secondhand smoke. These factors include the type of tobacco, the chemicals added to the tobacco, how the product is smoked, and the paper in which the tobacco is wrapped (1, 3). More than 4,000 chemicals have been identified in mainstream tobacco smoke; however, the actual number may be more than 100,000 (1). Of the chemicals identified in secondhand smoke, more than 50 are carcinogens (substances that



cause cancer), such as formaldehyde. Six other substances, including nicotine and carbon monoxide, interfere with normal cell development (2, 4). Some of the compounds present in secondhand smoke become carcinogenic only after they are activated by specific enzymes (proteins that control chemical reactions) in the body. After these compounds are activated, they can then become part of a cell's DNA and may interfere with the normal growth of cells (5). In 1993, the U.S. Environmental Protection Agency (EPA) determined that there is sufficient evidence that secondhand smoke causes cancer in humans and classified it as a Group A carcinogen (2, 6). In 2000, the U.S. Department of Health and Human Services (DHHS) formally listed secondhand smoke as a known human carcinogen in *The U.S. National Toxicology Program's 10th Report on Carcinogens*. The most recent report can be found at <http://ntp.niehs.nih.gov/ntp/roc/toc11.html> on the Internet.

Scientists do not know what amount of exposure to secondhand smoke, if any, is safe. Because it is a complex mixture of chemicals, measuring secondhand smoke exposure is difficult and is usually determined by testing blood, saliva, or urine for the presence of nicotine, particles inhaled from indoor air, or cotinine (the primary product resulting from the breakdown of nicotine in the body) (1, 3). Nicotine, carbon monoxide, and other evidence of secondhand smoke exposure have been found in the body fluids of nonsmokers exposed to secondhand smoke. Nonsmokers who live with smokers in homes where smoking is allowed are at the greatest risk for suffering the negative health effects of secondhand smoke exposure (5).

### **3. What are the health effects of exposure to secondhand smoke?**

Secondhand smoke exposure is a known risk factor for lung cancer (1, 3, 4, 6, 7). Approximately 3,000 lung cancer deaths occur each year among adult nonsmokers in the United States as a result of exposure to secondhand smoke (2). Secondhand smoke is also linked to nasal sinus cancer (1, 4). Some research suggests an association between secondhand smoke and cancers of the cervix, breast, and bladder. However, more research is needed in order to confirm a link to these cancers (3, 4, 8).

Secondhand smoke is also associated with the following noncancerous conditions:

- Chronic coughing, phlegm, and wheezing (4, 6).
- Chest discomfort (4).
- Lowered lung function (4, 6).
- Severe lower respiratory tract infections, such as bronchitis or pneumonia, in children (4, 6).
- More severe asthma and increased chance of developing asthma in children (6).
- Eye and nose irritation (4).

- Severe and chronic heart disease (4).
- Middle ear infections in children (4, 6).
- Sudden infant death syndrome (SIDS) (4).
- Low birthweight or small size at birth for babies of women exposed to secondhand smoke during pregnancy (4).

Certain other noncancerous health conditions may also be associated with secondhand smoke. However, more research is needed in order to confirm a link between these conditions and secondhand smoke. These conditions include:

- Spontaneous abortion (miscarriage) (4).
- Adverse effect on cognition and behavior in children (4).
- Worsening of cystic fibrosis (a disease that causes excessive mucus in the lungs) (4).

#### **4. What is being done to reduce nonsmokers' exposure to secondhand smoke?**

In January 2000, the DHHS launched *Healthy People 2010*, a comprehensive, nationwide health promotion and disease prevention agenda designed to help improve the health of all people in the United States during the first decade of the 21st century (9). Several objectives of this program relate to tobacco use and exposure to secondhand smoke, including the goal of reducing the proportion of nonsmokers exposed to secondhand smoke from 65 percent to 45 percent by 2010 (9). More information about this program is available on the Healthy People 2010 Web site at <http://www.healthypeople.gov/> on the Internet (9).

Studies have shown that even small amounts of secondhand smoke exposure can be harmful to people's health. The only way to fully protect nonsmokers from secondhand smoke exposure is to eliminate smoking in indoor spaces. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot completely eliminate secondhand smoke exposure (7). Individuals can reduce their exposure to secondhand smoke by not allowing smoking in their home or car. Educational, clinical, and policy interventions have also been shown to reduce secondhand smoke exposure (9). Such policies include adoption of worksite restrictions, passage of clean indoor air laws, and enforcement of smoking restrictions in shared environments (9).

On the national level, several laws restricting smoking in public places have been passed. For instance, effective January 1, 2005, smoking is banned in all DHHS buildings. In other Federal office buildings, smoking is limited to designated areas. Smoking is also banned on all domestic airline flights and nearly all flights between the United States and foreign destinations. All interstate bus travel is smoke free. Smoking is also prohibited or restricted to specially designated areas on trains traveling within the United States.

Many states and local governments have passed laws prohibiting smoking in public facilities such as schools, hospitals, airports, and bus terminals. Some states also require private employers to create policies that protect employees who do not smoke, and several local communities have enacted nonsmokers' rights laws, most of which are stricter than state laws. More information about state-level tobacco regulations is available through the Centers for Disease Control and Prevention's (CDC) State Tobacco Activities Tracking and Evaluation (STATE) System Web site. The STATE System is a database containing up-to-date and historical state-level data on tobacco use prevention and control. This resource is available at <http://apps.nccd.cdc.gov/statesystem/> on the Internet. Although it is still a significant public health concern, nonsmoker exposure to secondhand smoke declined by more than 70 percent from 1988–1991 to 1999–2000 (2). In 1999, nearly 7 out of every 10 U.S. workers reported having a smoke-free policy in their workplace (2).

## 5. Where can people find more information about research on secondhand smoke?

The following resources provide additional information about secondhand smoke and its health effects:

- *Health Effects of Exposure to Environmental Tobacco Smoke: The Report of the California Environmental Protection Agency*, published by the National Cancer Institute, provides a broad review of secondhand smoke covering the major health endpoints potentially associated with secondhand smoke exposure. It is available at <http://cancercontrol.cancer.gov/tcrb/monographs/10/> on the Internet (4).
- *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General* is a detailed review of the health effects resulting from nonsmoker exposure to secondhand smoke (7).
- The EPA publication *Respiratory Health Effects of Passive Smoking (Also Known as Exposure to Secondhand Smoke or Environmental Tobacco Smoke—ETS)* describes the EPA's assessment of the respiratory health risks associated with exposure to secondhand smoke. It is available at <http://cfpub2.epa.gov/ncea/cfm/recordisplay.cfm?deid=2835> on the Internet (6). The EPA can be contacted at:

Address: Environmental Protection Agency  
Ariel Rios Building  
1200 Pennsylvania Avenue, NW.  
Washington, DC 20460

Telephone: 202–272–0167 (main number)  
1–800–438–4318 (toll-free) (Indoor Air Quality  
Information Clearinghouse)

- The International Agency for Research on Cancer's (IARC) Monographs on the Evaluation of Carcinogenic Risks to Humans publishes independent assessments of the carcinogenic risks posed to humans by a variety of agents, mixtures, and exposures. The IARC monograph *Tobacco Smoke and Involuntary Smoking* is available at <http://monographs.iarc.fr/ENG/Monographs/vol83/volume83.pdf> on the Internet. The IARC Web site can be found at <http://www.iarc.fr/index.html> on the Internet.
- The CDC's Tobacco Information and Prevention Source (TIPS) Web site is the home page of the CDC's Office on Smoking and Health. This site offers links to information about the prevention of tobacco use among youth, smoking cessation, and tobacco-related statistics. It is available at <http://www.cdc.gov/tobacco/> on the Internet. The Office on Smoking and Health can be contacted at:

Address: Office on Smoking and Health  
National Center for Chronic Disease Prevention  
and Health Promotion  
Centers for Disease Control and Prevention  
Mail Stop K-50  
4770 Buford Highway, NE.  
Atlanta, GA 30341-3717

Telephone: 770-488-5705  
1-800-CDC-INFO (1-800-232-4636) (toll-free)

Fax: 770-234-6502

E-mail: [tobaccoinfo@cdc.gov](mailto:tobaccoinfo@cdc.gov)

- The Occupational Safety and Health Administration (OSHA) is responsible for health and safety regulations in the workplace. Secondhand smoke meets OSHA's criteria for classification as a potential occupational carcinogen. More information is available on the OSHA Web site at <http://www.osha.gov/> on the Internet. OSHA can be contacted at:

Address: U.S. Department of Labor  
Occupational Safety and Health Administration  
200 Constitution Avenue, NW.  
Washington, DC 20210

Telephone: 1-800-321-OSHA (1-800-321-6742) (toll-free)

- The National Institute for Occupational Safety and Health (NIOSH) conducts research related to secondhand smoke, evaluates work sites for possible health hazards, and makes safety recommendations. NIOSH recommends that secondhand smoke be regarded as a potential occupational carcinogen and that exposures to secondhand smoke be reduced to the lowest possible levels. More information is available on the NIOSH Web site at <http://www.cdc.gov/niosh/homepage.html> on the Internet. NIOSH can be contacted at:

Address: NIOSH  
 Hubert H. Humphrey Bldg.  
 200 Independence Avenue, SW.  
 Room 715H  
 Washington, DC 20201

Telephone: 202-401-6997  
 1-800-35-NIOSH (1-800-356-4674) (toll-free)

### Selected References

1. U.S. Department of Health and Human Services. *Report on Carcinogens. 11th Edition*. U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, 2005.
2. National Cancer Institute. *Cancer Progress Report 2003*. Public Health Service, National Institutes of Health, U.S. Department of Health and Human Services, 2004.
3. International Agency for Research on Cancer (2002). *Tobacco Smoke and Involuntary Smoking*. Lyon, France. Retrieved August 25, 2004, from <http://monographs.iarc.fr/ENG/Monographs/vol83/volume83.pdf>.
4. National Cancer Institute. *Smoking and Tobacco Control Monograph 10: Health Effects of Exposure to Environmental Tobacco Smoke*. Bethesda, MD: National Cancer Institute, 1999.
5. Koh HK, Kannler C, Geller AC. Cancer prevention: Preventing tobacco-related cancers. In: DeVita VT Jr., Hellman S, Rosenberg SA, editors. *Cancer: Principles and Practice of Oncology*. Vol. 1 and 2. 6<sup>th</sup> ed. Philadelphia: Lippincott Williams and Wilkins, 2001.
6. U.S. Environmental Protection Agency. *Respiratory Health Effects of Passive Smoking (Also Known as Exposure to Secondhand Smoke or Environmental Tobacco Smoke--ETS)*. U.S. Environmental Protection Agency, 1992.
7. U.S. Surgeon General (2006). *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General*. Rockville, MD: Public

Health Service, U.S. Department of Health and Human Services.  
[http://www.cdc.gov/tobacco/sgr/sgr\\_2006/index.htm](http://www.cdc.gov/tobacco/sgr/sgr_2006/index.htm).

8. Reynolds P, Hurley S, Goldberg DE, et al. Active smoking, household passive smoking, and breast cancer: Evidence from the California Teachers Study. *Journal of the National Cancer Institute* 2004; 96(1):29–37.
9. U.S. Department of Health and Human Services. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: U.S. Government Printing Office, 2000.

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### **Related Resources**

#### **Publications (available at <http://www.cancer.gov/publications>)**

- National Cancer Institute Fact Sheet 10.14, *Cigarette Smoking and Cancer: Questions and Answers*
- National Cancer Institute Fact Sheet 10.16, *Questions and Answers About Cigar Smoking and Cancer*
- *Smoking and Tobacco Control Monograph 10: Health Effects of Exposure to Environmental Tobacco Smoke*

### **National Cancer Institute (NCI) Resources**

#### **Cancer Information Service (toll-free)**

Telephone: 1–800–4–CANCER (1–800–422–6237)

TTY: 1–800–332–8615

#### **Online**

NCI's Web site: <http://www.cancer.gov>

*LiveHelp*, NCI's live online assistance:

<https://cissecure.nci.nih.gov/livehelp/welcome.asp>

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