The Health Consequences of Secondhand Smoke (Involuntary Exposure to Tobacco Smoke)

What Is Secondhand Smoke?

- 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).
- While secondhand smoke has been referred to as environmental tobacco smoke (ETS) in the past, the term “secondhand” smoke better captures the involuntary nature of the exposure.
- The 2006 Surgeon General’s report uses the term “involuntary” in the title because most nonsmokers do not want to breathe tobacco smoke. The term “involuntary” was also used in the title of the 1986 Surgeon General’s report on secondhand smoke.
- Cigarette smoke contains more than 4,000 chemical compounds.
  - Secondhand smoke contains many of the same chemicals that are present in the smoke inhaled by smokers.
  - Because sidestream smoke is generated at lower temperatures and under different conditions than mainstream smoke, it contains higher concentrations of many of the toxins found in cigarette smoke.
- The National Toxicology Program estimates that at least 250 chemicals in secondhand smoke are known to be toxic or carcinogenic.
- Secondhand smoke has been designated as a known human carcinogen (cancer-causing agent) by the U.S. Environmental Protection Agency, the National Toxicology Program, and the International Agency for Research on Cancer, and an occupational carcinogen by the National Institute for Occupational Safety and Health.
  - Secondhand smoke contains more than 50 cancer-causing chemicals.
  - When nonsmokers are exposed to secondhand smoke, they inhale many of the same cancer-causing chemicals that smokers inhale.

The Surgeon General has concluded that:

- There is no risk-free level of exposure to secondhand smoke: even small amounts of secondhand smoke exposure can be harmful to people’s health.
- Many millions of Americans continue to be exposed to secondhand smoke.
- A smoke-free environment is the only way to fully protect nonsmokers from the dangers of secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposure of nonsmokers to secondhand smoke.

6 Major Conclusions of the Surgeon General Report

Smoking is the single greatest avoidable cause of disease and death. In this report, The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General, the Surgeon General has concluded that:

1. **Many millions of Americans, both children and adults, are still exposed to secondhand smoke in their homes and workplaces despite substantial progress in tobacco control.**

Supporting Evidence

- Levels of a chemical called cotinine, a biomarker of secondhand smoke exposure, fell by 70 percent from 1988-91 to 2001-02. In national surveys, however, 43 percent of U.S. nonsmokers still have detectable levels of cotinine.
2. **Secondhand smoke exposure causes disease and premature death in children and adults who do not smoke.**

**Supporting Evidence**

- Secondhand smoke contains hundreds of chemicals known to be toxic or carcinogenic (cancer-causing), including formaldehyde, benzene, vinyl chloride, arsenic, ammonia, and hydrogen cyanide.
- Secondhand smoke has been designated as a known human carcinogen (cancer-causing agent) by the U.S. Environmental Protection Agency, National Toxicology Program and the International Agency for Research on Cancer (IARC). The National Institute for Occupational Safety and Health has concluded that secondhand smoke is an occupational carcinogen.

3. **Children exposed to secondhand smoke are at an increased risk for sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, and more severe asthma. Smoking by parents causes respiratory symptoms and slows lung growth in their children.**

**Supporting Evidence**

- Children who are exposed to secondhand smoke are inhaling many of the same cancer-causing substances and poisons as smokers. Because their bodies are developing, infants and young children are especially vulnerable to the poisons in secondhand smoke.
- Both babies whose mothers smoke while pregnant and babies who are exposed to secondhand smoke after birth are more likely to die from sudden infant death syndrome (SIDS) than babies who are not exposed to cigarette smoke.
- Babies whose mothers smoke while pregnant or who are exposed to secondhand smoke after birth have weaker lungs than unexposed babies, which increases the risk for many health problems.
- Among infants and children, secondhand smoke cause bronchitis and pneumonia, and increases the risk of ear infections.
- Secondhand smoke exposure can cause children who already have asthma to experience more frequent and severe attacks.

4. **Exposure of adults to secondhand smoke has immediate adverse effects on the cardiovascular system and causes coronary heart disease and lung cancer.**

**Supporting Evidence**

- Concentrations of many cancer-causing and toxic chemicals are higher in secondhand smoke than in the smoke inhaled by smokers.
- Breathing secondhand smoke for even a short time can have immediate adverse effects on the cardiovascular system and interferes with the normal functioning of the heart, blood, and vascular systems in ways that increase the risk of a heart attack.
Nonsmokers who are exposed to secondhand smoke at home or at work increase their risk of developing heart disease by 25–30 percent. Nonsmokers who are exposed to secondhand smoke at home or at work increase their risk of developing lung cancer by 20–30 percent.

5. **The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke.**

**Supporting Evidence**

- Short exposures to secondhand smoke can cause blood platelets to become stickier, damage the lining of blood vessels, decrease coronary flow velocity reserves, and reduce heart rate variability, potentially increasing the risk of a heart attack.
- Secondhand smoke contains many chemicals that can quickly irritate and damage the lining of the airways. Even brief exposure can result in upper airway changes in healthy persons and can lead to more frequent and more asthma attacks in children who already have asthma.

6. **Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke. Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate exposures of nonsmokers to secondhand smoke.**

**Supporting Evidence**

- Conventional air cleaning systems can remove large particles, but not the smaller particles or the gases found in secondhand smoke.
- Routine operation of a heating, ventilating, and air conditioning system can distribute secondhand smoke throughout a building.
- The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the preeminent U.S. body on ventilation issues, has concluded that ventilation technology cannot be relied on to control health risks from secondhand smoke exposure.

**Secondhand Smoke Is Toxic and Poisonous**

- The National Toxicology Program estimates that at least 250 chemicals in secondhand smoke are known to be toxic or carcinogenic (cancer causing).
- Secondhand smoke contains a number of poisonous gases and chemicals, including hydrogen cyanide (used in chemical weapons), carbon monoxide (found in car exhaust), butane (used in lighter fluid), ammonia (used in household cleaners), and toluene (found in paint thinners).
- Some of the toxic metals contained in secondhand smoke include arsenic (used in pesticides), lead (formerly found in paint), chromium (used to make steel), and cadmium (used to make batteries).
- There are more than 50 cancer-causing chemicals in secondhand smoke that fall into different chemical classes, including:
  - Polynuclear aromatic hydrocarbons (PAHs) (such as Benzo[a]pyrene)
  - N-Nitrosamines (such as tobacco-specific nitrosamines)
  - Aromatic amines (such as 4-aminobiphenyl)
  - Aldehydes (such as formaldehyde)
  - Miscellaneous organic chemicals (such as benzene and vinyl chloride) and
  - Inorganic compounds (such as those containing metals like arsenic, beryllium, cadmium, lead, nickel and radioactive polonium-210).
• Eleven compounds in tobacco smoke (2-naphthylamine, 4-aminobiphenyl, benzene, vinyl chloride, ethylene oxide, arsenic, beryllium, nickel compounds, chromium, cadmium and polonium-210) have been identified by the International Agency for Research on Cancer as Group 1 (known human carcinogen) carcinogens.

• Secondhand smoke has been designated as a known human carcinogen (cancer-causing agent) by the U.S. Environmental Protection Agency, National Toxicology Program and the International Agency for Research on Cancer (IARC). The National Institute for Occupational Safety and Health has concluded that secondhand smoke is an occupational carcinogen.

• 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). Because sidestream smoke is generated at lower temperatures and under different conditions than mainstream smoke, it contains higher concentrations of many of the toxins found in inhaled cigarette smoke.

There is No Risk-Free Level of Exposure to Secondhand Smoke

The U.S. Surgeon General has concluded that breathing even a little secondhand smoke poses a risk to your health.

• Scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke. Breathing even a little secondhand smoke can be harmful to your health.

Secondhand smoke causes lung cancer.

• Secondhand smoke is a known human carcinogen and contains more than 50 chemicals that can cause cancer.
• Concentrations of many cancer-causing and toxic chemicals are potentially higher in secondhand smoke than in the smoke inhaled by smokers.

Secondhand smoke causes heart disease.

• Breathing secondhand smoke for even a short time can have immediate adverse effects on the cardiovascular system, interfering with the normal functioning of the heart, blood, and vascular systems in ways that increase the risk of heart attack.
• Even a short time in a smoky room can cause your blood platelets to become stickier, damage the lining of blood vessels, decrease coronary flow velocity reserves, and reduce heart rate variability.
• Persons who already have heart disease are at especially high risk of suffering adverse affects from breathing secondhand smoke, and should take special precautions to avoid even brief exposure.

Secondhand smoke causes acute respiratory effects.

• Secondhand smoke contains many chemicals that can quickly irritate and damage the lining of the airways.
• Even brief exposure can trigger respiratory symptoms, including cough, phlegm, wheezing, and breathlessness.
• Brief exposure to secondhand smoke can trigger an asthma attack in children with asthma.
• Persons who already have asthma or other respiratory conditions are at especially high risk for being affected by secondhand smoke, and should take special precautions to avoid secondhand smoke exposure.

Secondhand smoke can cause sudden infant death syndrome and other health consequences in infants and children.

• Smoking by women during pregnancy has been known for some time to cause SIDS.
• Infants who are exposed to secondhand smoke after birth are also at greater risk of SIDS.
• Children exposed to secondhand smoke are also at an increased risk for acute respiratory infections, ear problems, and more severe asthma. Smoking by parents causes respiratory symptoms and slows lung growth in their children.

_Separating smokers from nonsmokers, cleaning the air, and ventilating buildings cannot eliminate secondhand smoke exposure._

• The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the preeminent U.S. standard-setting body on ventilation issues, has concluded that ventilation technology cannot be relied on to completely control health risks from secondhand smoke exposure.
• Conventional air cleaning systems can remove large particles, but not the smaller particles or the gases found in secondhand smoke.
• Operation of a heating, ventilating, and air conditioning system can distribute secondhand smoke throughout a building.

_Children are Hurt by Secondhand Smoke_

• Secondhand smoke contains more than 250 chemicals known to be toxic or carcinogenic (cancer-causing), including formaldehyde, benzene, vinyl chloride, arsenic, ammonia, and hydrogen cyanide. Children who are exposed to secondhand smoke are inhaling many of the same cancer-causing substances and poisons as smokers.

_Health Effects of Secondhand Smoke in Children_

• Because their bodies are developing, infants and young children are especially vulnerable to the poisons in secondhand smoke.
• Both babies whose mothers smoke while pregnant and babies who are exposed to secondhand smoke after birth are more likely to die from sudden infant death syndrome (SIDS) than babies who are not exposed to cigarette smoke.
• Mothers who are exposed to secondhand smoke while pregnant are more likely to have lower birth weight babies, which makes babies weaker and increases the risk for many health problems.
• Babies whose mothers smoke while pregnant or who are exposed to secondhand smoke after birth have weaker lungs than other babies, which increases the risk for many health problems.
• Secondhand smoke exposure causes acute lower respiratory infections such as bronchitis and pneumonia in infants and young children.
• Secondhand smoke exposure causes children who already have asthma to experience more frequent and severe attacks.
• Secondhand smoke exposure causes respiratory symptoms, including cough, phlegm, wheeze, and breathlessness, among school-aged children.
• Children exposed to secondhand smoke are at increased risk for ear infections and are more likely to need an operation to insert ear tubes for drainage.

_Exposure to Secondhand Smoke Among Children_

• The Surgeon General has concluded that there is no risk-free level of secondhand smoke exposure. Even brief exposures can be harmful.
• On average, children are exposed to more secondhand smoke than nonsmoking adults.
• Based on levels of cotinine (a biological marker of secondhand smoke exposure), an estimated 22 million children aged 3-11 years and 18 million youth aged 12-19 years, were exposed to secondhand smoke in the United States in 2000.
• Children aged 3-11 years and youth aged 12-19 years are significantly more likely than adults to live in a household with at least one smoker.
Children aged 3-11 years have cotinine levels more than twice as high as nonsmoking adults.
Children who live in homes where smoking is allowed have higher cotinine levels than children who live in homes where smoking is not allowed.

How to Protect Yourself and Your Loved Ones from Secondhand Smoke

- The Surgeon General has concluded that there is no risk-free level of exposure to secondhand smoke. Breathing even a little secondhand smoke can be harmful.
- The Surgeon General has concluded that the only way to fully protect yourself and your loved ones from the dangers of secondhand smoke is through 100% smoke-free environments.
- Opening a window, sitting in a separate area, or using ventilation, air conditioning, or a fan cannot eliminate secondhand smoke exposure.
- You can protect yourself and your loved ones by:
  - Making your home and car smoke-free.
  - Asking people not to smoke around you and your children.
  - Making sure that your children’s day care center or school is smoke-free.
  - Choosing restaurants and other businesses that are smoke-free. Thanking businesses for being smoke-free. Letting owners of businesses that are not smoke-free know that secondhand smoke is harmful to your family’s health.
  - Teaching children to stay away from secondhand smoke.
  - Avoiding secondhand smoke exposure especially if you or your children have respiratory conditions, if you have heart disease, or if you are pregnant.
  - Talking to your doctor or healthcare provider more about the dangers of secondhand smoke.
- If you are a smoker, the single best way to protect your family from secondhand smoke is to quit smoking. In the meantime, you can protect your family by making your home and vehicles smoke-free and only smoking outside. A smoke-free home rule can also help you quit smoking.
  - Join the national trend. Take the Smoke-free Home Pledge by calling the toll-free Smoke-free Home Pledge Hotline at 1-866-SMOKE-FREE (1-866-766-5337) or visiting www.epa.gov/smokefree.
  - To access a telephone quitline serving your area, call 1-800-QUIT-NOW (1-800-784-8669) or visit www.smokefree.gov.

The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General was prepared by the Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC). The Report was written by 22 national experts who were selected as primary authors. The Report chapters were reviewed by 40 peer reviewers, and the entire Report was reviewed by 30 independent scientists and by lead scientists within the Centers for Disease Control and Prevention and the Department of Health and Human Services. Throughout the review process, the Report was revised to address reviewers’ comments.

Citation

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