Thirdhand Smoke Resource Center

What surfaces does thirdhand smoke stick to?

The Short Answer

Thirdhand smoke is the chemicals left behind when someone smokes tobacco. Thirdhand smoke is unhealthy for people and pets. It can stick around for a long time in homes and cars. It gets into your body if you inhale, swallow, or touch the chemicals. Getting rid of it is really hard and can cost a lot of money.

Thirdhand smoke sticks to:

Indoor Surfaces, such as:

- Walls
- Carpets
- Windows
- Doors

Household Objects, such as:

- Furniture
- Toys
- Books
- Dishes
- Bedding
- Curtains

People, including:

- Hair
- Skin
- Clothing

Thirdhand smoke can off-gas from these materials, and we can sometimes smell it as stale tobacco. The chemicals in thirdhand smoke can be spread by moving polluted objects from one place to another.

The Long Answer

Thirdhand smoke is the chemical residue left behind after secondhand tobacco smoke disappears from the air. Secondhand smoke is a combination of sidestream smoke from a cigarette and mainstream smoke exhaled by smokers. Thirdhand smoke is a mixture of toxic chemicals that sticks to surfaces, embeds in materials, and gathers in house dust. It embeds in carpets, walls, furniture, blankets, and toys. The toxic particles can re-emit from these contaminated surfaces into the air. Thirdhand smoke can linger indoors for years. People can be exposed to it by absorbing it through their skin, by consuming contaminated objects or dust, and by breathing polluted air.

The U.S. Surgeon General has concluded that there is no safe level of exposure to tobacco smoke. The California Air Resources Board has classified secondhand smoke as a toxic air contaminant. Many chemicals in secondhand smoke are also in thirdhand smoke, such as cancer-causing compounds, toxicants that harm reproductive organs, and toxicants that interfere with development (as defined by California's Proposition 65 and the International Agency for Cancer Research). Thirdhand smoke also contains additional toxic chemicals that are not found in secondhand smoke because they form when tobacco smoke chemically changes in the environment.

Do you have more questions about the toxic legacy of tobacco smoke, how it affects human health, and what we can do about it? Learn more here.

Updated January 2025

Sources:

California Environmental Protection Agency, Air Resources Board, Office of Environmental Health Hazard Assessment. Technical support document for the "Proposed Identification of Environmental Tobacco Smoke as a Toxic Air Contaminant, Part A." http://www.arb.ca.gov/regact/ets2006/ets2006.htm

Hua, M, Luo, W, Khachatoorian, C, et al. Exposure, Retention, Exhalation, Symptoms, and Environmental Accumulation of Chemicals During JUUL Vaping. *Chemical Research in Toxicology*. 2023;36(3). doi: 10.1021/acs.chemrestox.2c00390

Jacob, P, 3rd, Benowitz NL, Destaillats H, et al. 2017. Thirdhand Smoke: New Evidence, Challenges, and Future Directions. *Chemical Research in Toxicology.* 2016;30(1):270294. doi: 10.1021/acs.chemrestox.6b00343.

Matt, GE, Quintana PJE, Destaillats H, et al. Thirdhand tobacco smoke: Emerging evidence and arguments for a multidisciplinary research agenda, *Environmental Health Perspectives*. 2011;119(9):1218-1226. doi: 10.1289/ehp.1103500

Matt GE, Greiner L, Record RA, et al. Policy-relevant differences between secondhand and thirdhand smoke: Strengthening protections from involuntary exposure to tobacco smoke pollutants. *Tobacco Control.* 2024;33(6):798-806. doi: 10.1136/tc-2023057971

Sleiman M, Destaillats H, Smith JD, et al. Secondary organic aerosol formation from ozone-initiated reactions with nicotine and secondhand tobacco smoke. *Atmospheric Environment.* 2010;44:4191-4198. doi: 10.1016/j.atmosenv.2010.07.023

Son Y, Giovenco DP, Delnevo C, Khlystov A, Samburova V, Meng Q. Indoor Air Quality and Passive E-cigarette Aerosol Exposures in Vape-Shops. *Nicotine & Tobacco Research.* 2020;22(10):1772-1779. doi: 10.1093/ntr/ntaa094. PMID: 32445475; PMCID: PMC7542645.

State of California, Environmental Protection Agency. Chemicals Known to the State to Cause Cancer or Reproductive Toxicity. Office of Environmental Health Hazard Assessment. February 25, 2022. https://oehha.ca.gov/proposition-65/proposition-65-list

U.S. Department of Health and Human Services. 2006. The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General. Available: https://www.ncbi.nlm.nih.gov/books/NBK44324/