

Indoor Air Quality: Combustion By-products

What are combustion by-products?

Combustion (burning) by-products are gases and small particles. They are created by incompletely burned fuels such as oil, gas, kerosene, wood, coal and propane.

The type and amount of combustion by-product produced depends on the type of fuel and the combustion appliance. How well the appliance is designed, built, installed and maintained affects the by-products it creates. Some appliances receive certification depending on how clean burning they are. The Canadian Standards Association (CSA) and the Environmental Protection Agency (EPA) certify wood stoves and other appliances.

Examples of combustion by-products include: particulate matter, carbon monoxide, nitrogen dioxide, carbon dioxide, sulphur dioxide, water vapor and hydrocarbons.

Where do combustion by-products come from?

Combustion by-products come from wood heaters and wood stoves, furnaces, gas ranges, gas heaters, generators, fireplaces, vehicle exhaust and unvented kerosene heaters, stoves and other sources. Second-hand tobacco smoke also contains combustion by-products.

What are some health concerns of combustion by-products?

Carbon monoxide (CO) reduces the blood's ability to carry oxygen. Recent exposure may cause tiredness, headaches, nausea, flu-like symptoms, dizziness, impaired vision and confusion. If you have heart disease, it may cause chest pain. Very high levels of carbon

monoxide exposure can cause loss of consciousness and death.

Nitrogen dioxide (NO₂) can irritate your eyes, nose, throat and lungs. You may have shortness of breath. If you have a respiratory illness, you may be at higher risk of experiencing health effects from nitrogen dioxide exposure.

Particulate matter (PM) forms when materials burn. Tiny airborne particles can irritate your eyes, nose and throat. They can also lodge in the lungs, causing irritation or damage to lung tissue. Inflammation due to particulate matter exposure may cause heart problems. Some combustion particles may contain cancer-causing substances.

Carbon dioxide (CO₂) occurs naturally in the air. Human health effects such as headaches, dizziness and fatigue can occur at high levels but rarely occur in homes. Carbon dioxide levels are sometimes measured to find out if enough fresh air gets into a room or building. Although carbon dioxide and carbon monoxide are both combustion by-products, the presence of carbon dioxide does not necessarily mean the highly toxic compound, carbon monoxide, is also present.

What can I do to prevent or limit health concerns?

Controlling the source, improving ventilation and using carbon monoxide (CO) detectors will help limit health concerns. Using an air cleaner may further improve air quality.

Control the source:

- Follow the manufacturers' instructions for all combustion appliances
- Regularly service and clean appliances, and vents such as chimneys
- Use only fuels recommended for each appliance
- Make sure that wood stoves are installed and maintained correctly. Doors should be tight fitting to prevent leakage
- Use only aged or dried wood, not pressure treated or painted wood that may form more toxic compounds when burned
- Inspect furnace and flues, and repair cracks and damaged parts. Open the flue when using your fireplace. Do not let a fire within a wood heater smolder, especially just before opening the firebox
- Change your furnace and air conditioning filters every couple of months if using them often. Consider using a more effective furnace filter
- Never allow smoking in or near the home
- Reduce the use of candles and incense in the home

Improve ventilation:

- Use a stove hood and fan that vents outside when cooking with gas stoves and ranges
- When you need to replace a space heater, buy a vented heater
- Make sure enough fresh air gets into your home from the outdoors, especially when using combustion appliances
- Make sure fresh air intake vents are not blocked or covered
- Do not have air intake vents coming into your home from your garage. Never idle a vehicle in an attached garage

Use carbon monoxide (CO) detectors:

Carbon monoxide detectors are readily available and cheap to install. Like smoke detectors, they need regular testing to make sure they are working properly. You can check with a consumer guide to find a carbon monoxide detector that best meets your needs.

Use air cleaners:

Air cleaners may reduce levels of pollutants in indoor air if used along with source control and improved ventilation. Air cleaners use electrical attraction, mechanical filters or ion generation to remove particles from the air. They vary in their cost and how well they work. No air cleaners will remove all pollutants from indoor air. Some air cleaners may produce harmful levels of ozone. This can cause adverse health effects. Look for air cleaners that are certified to release low amounts of ozone. For more information, see Residential Air Cleaner Use to Improve Indoor Air Quality and Health at www.ncceh.ca/sites/default/files/Air_Cleaners_Oct_2010.pdf (PDF 162 KB).

If you plan to buy an air cleaning system, make sure you get the device that best meets your needs.

For More Information

For more information about indoor air quality and your health, visit:

- Health Canada - Air Quality www.canada.ca/en/health-canada/services/air-quality.html
- The B.C. Lung Association - Air Quality <https://bc.lung.ca/protect-your-lungs/air-quality-lung-health> or call toll-free 1 800 665-LUNG (5864).



BC Centre for Disease Control
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