How Indoor Air Pollution Works

by Jennifer Horton

Introduction to How Indoor Air Pollution Works

The air we breathe leaves much to be desired. Coal plants belch harmful CO2, 18-wheelers spew filthy exhaust and cows add methane to the mix. Sometimes just looking out your window at all the pollution may be enough to make you shun the outdoors.

But what's inside may be even worse. Indoor air pollution, the degradation of indoor air quality by harmful chemicals and other materials, can be up to 10 times worse than outdoor air pollution [source: Dunn]. This is because contained areas enable potential pollutants to build up more than open spaces do. You can easily visualize this if you think about dumping a gallon of oil into the ocean versus dumping a gallon into your bathtub. The oil in the ocean will dissipate and be diluted within the massive volume of water. That same oil in your bathtub will linger because it has nowhere else to go. The same thing happens with pollutants released into a small enclosed area, like your home or office.

You may think indoor air pollution doesn't apply to you. After all, you live nowhere near a highway, farm or industrial plant. You don't smoke and you don't use a wood-burning stove.

But indoor air pollution comes from some places you wouldn't normally think of, like your house, the land it's sitting on and everyday items you can purchase at the store. In addition, if you consider that people spend approximately 90 percent of their time indoors, and around 65 percent inside their homes in particular, you can see why indoor air pollution is an important issue [source: Dunn].

Some of the side effects caused by indoor air pollution are little worse than those of the common cold, but long-term exposure can lead to a coma, lung cancer, and death. Got your attention, yet? Learn more about some of the causes of indoor air pollution next.

INDOOR AIR POLLUTION METERS

Human beings love tests, and to satisfy that craving, indoor air pollution meters on the market claim to measure the levels of pollutants in your home. One of these is TenEssentials' Home Air Quality Test Kit, which tests for the presence of mold, fungus, bacteria, formaldehyde, carbon monoxide and carbon dioxide. You also can have professionals do the testing for you.

Causes of Indoor Air Pollution

Formaldehyde, PCB, asbestos: These are words that you don't want associated with your living space. Yet odds are that you encounter at least one of these chemicals in your home every day. If not, you're not out of the woods just yet. Indoor air pollutants can be released at high levels in short bursts, like when you use spray paint, or at lower levels over time, like chemicals leaching out of your carpet.

Both the formaldehyde and polychlorinated biphenyl (PCB) mentioned are found in common household products. PCB was banned from production in the U.S. in 1970 but persists in wire coatings, sealants, paints and wood floor finishes. Asbestos, another source of indoor air pollution that has been banned from widespread use, also still lingers in older homes, insulation materials, textured paints and floor tiles.

Formaldehyde is widely used by industries that make building materials and household goods. It is most commonly found in pressed wood products that are used for things like subflooring, shelving, cabinets and furniture, but it is also common in permanent-press fabrics, adhesives and paints.

Let's look at a few of the other causes of indoor air pollution and see where they originate:

- Radon: often found in the bedrock underneath a home and in building materials
- Environmental tobacco smoke: the combination of smoke coming from the burning end of a cigarette, pipe or cigar, as well as the smoke exhaled by the smoker
- Biological contaminants: bacteria, mold, mildew, viruses, animal dander, dust mites, cockroaches and pollen. Many of these grow in damp, warm environments or are brought in...
You can learn more about many of these pollutants in the HowStuffWorks articles A Guide to Home Safety and How to Allergy-Proof Your Home. Learn about ways to

**Sick Building Syndrome and Other Health Effects**

Many people left homeless by Hurricane Katrina in 2005 survived that storm only to suffer another setback. Soon after moving into government-provided trailers, they began experiencing a range of health problems, from headaches and runny noses to difficulty breathing. Upon further exploration, tests revealed that the trailers had levels of formaldehyde as high as 50 times the U.S. Environmental Protection Agency’s “elevated” level of 5 parts per million [source: Brunker]. It seems that the carcinogen was leaching from the composite wood and plywood panels used in the trailers. After years of insisting that the trailers were safe, the U.S. Federal Emergency Management Agency finally had the residents evacuated in early 2008.

Similar, though less attention-grabbing, occurrences happen every day. Health effects from indoor air pollution can be immediate and short-lived, or they may be severe and not show up until years after repeated exposures. The most common symptoms are sore throat, headache and persistent cough, as well as itchy, running eyes and nose. More severe symptoms include chronic breathing problems, heart disease and cancer.

Perhaps one of the most visible indoor air pollutants is environmental tobacco smoke, or secondhand smoke, which contains 200 known poisons and at least 43 compounds known to cause cancer. Even if you don’t smoke, you may be subject to secondhand smoke if you live or work with someone who does. So-called “passive smoking” is responsible for around 3,000 lung cancer deaths and 35,000 to 50,000 heart disease deaths each year in nonsmoking adults. It also causes between 150,000 and 300,000 respiratory infections in infants each year and worsens the asthma of up to 1 million asthmatics [source: American Lung Association, EPA].

Other indoor air pollutants, like the ones in the following list, are largely invisible, but just as dangerous. Consider:

- **Indoor radon exposure** is the second-leading cause of lung cancer in the U.S., causing between 15,000 and 21,000 deaths each year [source: American Lung Association]. Radon can enter your house through the foundation.
- **Exposure to formaldehyde** irritates the mucous membranes and eyes, and can provoke asthma and impair the central nervous system.
- **Biological contaminants** can transmit illnesses like the flu and measles, trigger allergic reactions and cause digestive problems.
- **Combustion gases** impede the flow of oxygen through your body. High levels can cause unconsciousness and death, while lower levels create headaches, dizziness, weakness, confusion and fatigue. Some can lead to lung diseases like emphysema.
- **High exposure to chemicals in household products and pesticides** can irritate the respiratory tract; cause headaches, dizziness and vision problems; impair memory function and may cause cancer.

Find out how living in a poorly ventilated, contaminated indoor air space affects you on the next page.

**POLLUTION AT 30,000 FEET?**

You might think that if indoor air pollution is a problem in an enclosed place like your house, then it must be even worse in an airplane. Research has shown, however, that the ventilation systems used by commercial aircraft may actually reduce the spread of airborne organisms by as much as 63 percent [source: Dooley]. So unless the sneezing, coughing person sitting next to you insists on holding your hand, sit back and enjoy the flight.

People living in government-provided trailers after Hurricane Katrina suffered from symptoms of formaldehyde exposure such as burning eyes, respiratory distress and nausea. 

The common household contains many potential sources of indoor air pollutants.
Opening the windows can improve indoor air quality.

Jack Wild/Getty Images

MCS, SBS AND BRIS

Just when you think the acronym soup couldn't get any worse, out come the two BRIs (building-related illnesses): MCS and SBS. MCS stands for multiple chemical sensitivity, while SBS is shorthand for sick building syndrome. Sick building syndrome, which involves symptoms such as headache, fatigue and muscle pain, is milder than MCS and usually goes away within a few hours or days upon leaving the infected building. In contrast, MCS is a lifelong condition, and common symptoms may include fatigue, depression and difficulty concentrating. MCS isn't recognized by all doctors as a legitimate illness.

Solutions to Indoor Air Pollution

If you suspect your living space is polluted, don't despair. You can easily implement several solutions. If you're unsure of whether your home has a problem, ask yourself these questions:

- Do you suffer from any of the symptoms listed on the previous page when in your home, but feel better soon after leaving?
- Are many of the potential sources of indoor air pollution found in your home?
- Is the air in your house poorly ventilated, humid, or smelly and stuffy?

Answering "yes" to these questions doesn't necessarily mean you have indoor air pollution, but it's a good indication. An easy experiment is to try some of the solutions for indoor air pollution listed on this page and see if you notice a difference.

As you might expect, one of the cheapest and most effective ways to reduce indoor air pollution is to attack the problem at its source. Some sources, like those that contain asbestos, can simply be sealed to prevent exposure, while others, like pesticides, you may want to eliminate.

Some polluting sources like a gas-cooking stove or fuel-burning space heater may not be feasible for you to remove, but you can minimize your risk by always operating those devices according to the manufacturer's directions and being sure to ventilate well.

In fact, as you learned on the first page, ventilation is helpful at decreasing all indoor pollutants. Since most heating and cooling systems simply recirculate air rather than bring in fresh air, you'll want to open windows and doors when the weather is nice, operate window or attic fans, and run bathroom and kitchen fans that exhaust outdoors. You especially want to follow these steps when you're using items with potentially harmful chemicals like paints.

Increasing ventilation does have one caveat. If you live in a place with high outdoor humidity or high concentrations of outdoor pollutants, increased ventilation may actually worsen indoor air pollution. If the outdoor air you're pulling in is filtered to remove harmful particles, you have little to worry about. If it's not, you may want to settle on moderate ventilation rates.

Aside from ventilation, you can minimize the biological contaminants in your home by maintaining a humidity level of 30 to 50 percent. Higher levels encourage dust mites and mold growth. Keeping carpets clean and dry, and simply maintaining a clean house also discourage biological contaminants.

If you're worried about the potential harm from household cleaners, you have two options. The first is to carefully follow the instructions on the label, use them in well-ventilated areas, and store and dispose of them safely. The second is to pick a product that is made with benign ingredients. If you're unsure, read the label: If a product doesn't list its ingredients or has any "warnings," it's probably not safe.

The sources of indoor air pollution are many and varied, but so are the solutions. To learn more about this topic, be sure to look into the links on the following page.

IONIZING AIR CLEANERS

If you've thought about buying an ionizing air cleaner to zap your indoor air pollutants, you may want to do some research first. Consumer Reports magazine tested several models and found that not only did they do a bad job of cleaning the air, but they actually emit relatively high levels of ozone, which can worsen asthma and cause chest pain and difficulty breathing.