THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXTENSION SERVICE
SP508 I

TENNESSEE

Home•A•Syst

Assessing Your Indoor Air Quality

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The goal of *Home•A•Syst* is to protect your health and the environment from pollutants in and around your home.

The following checklist is designed to help you pinpoint potential problem areas in your home that may affect the quality of the air you breathe. If a statement reflects the current situation in your household, check "Agree." If the statement does not describe your household, check "Disagree."

If you disagree with any of the following statements, or if you are unsure, you may have a situation in your home that could affect the environment or your

Agree	Disagree	
O	O	1. I have my heating system inspected at least once a year.
O	O	2. I replace air filters and cleaners when they become dirty or clogged.
O	O	3. I have carbon-monoxide detectors installed in appropriate areas of my home.
O	O	4. I don't allow smoking inside my home, or if I do, I limit it to well-ventilated areas.
O	O	5. I don't have any pressed- or manufactured-wood products in my home, or if I do, they are properly sealed.
O	O	6. I keep all carpets clean and dry.
O	O	7. I don't store paint, varnish, or other surface finishes in the house.
O	O	8. There are no asbestos products (such as roofing shingles, siding, insulation, or decorative items) in my home.
O	O	9. I don't store **hazardous** household chemicals (products that may be harmful to your health or the environment if used or disposed of improperly, such as paint strippers and some cleaners) inside my house.

Continued on p.2

Agree	Disagree	
O	O	10. I dust regularly.
O	O	11. I don't have recurrent moisture problems in the home such as standing water or leaks.
O	O	12. I have had my home tested for radon.
O	O	13. My house is well-ventilated, with exhaust fans in the kitchen and bathroom.
O	O	14. The air inside my home is relatively dry and odor-free.

health. Refer to the fact section with the same number as that statement (under the heading, "What you should know about . . .") for more information.

Don't be alarmed if you disagreed with many or even all of these statements. That does not automatically mean you have an air-quality problem. It may, however, tell you that change is needed to avoid potential problems. In the same way, agreeing with every statement does not mean you are *not* at risk or cannot make improvements.

Why should you be concerned?

The quality of your family's health is directly related to the quality of the air inside your home. Air-quality problems can present both minor and serious health hazards. Improving the air you breathe involves tackling air-quality problems one pollutant at a time. The physical source of each specific pollutant must be tracked down and investigated to determine what steps will eliminate the problem.

There are five major sources of indoor air pollution: combustion by-products, building materials, household products and chemicals, biological contaminants, and radon.

Combustion (burning) by-products are the gases and particles produced naturally from fuel-burning products. Almost every home has some level of air pollution caused by combustion. If you have an oil or gas furnace, a wood or gas stove, a fireplace, a kerosene or gas space heater, a gas range, a gas cooktop, a gas water heater, or an automobile, you face the risk of air pollution from combustion by-products. These devices all produce pollutants such as carbon monoxide, nitrogen and sulfur oxides, formaldehyde, smoke, and tiny breathable particles that can lodge in the lungs.

Building materials often release hazardous emissions into the air, both when they are new and as they deteriorate. High humidity and temperatures can worsen the problem. These materials include pressed-wood products, carpet, paint, varnish, and asbestos.

Household products and chemicals constitute a broad category of products that are potentially harmful to the air you breathe. They can release pollutants as they are used, while they are drying or curing, or as they age. They include furniture waxes, paint strippers, adhesives, some cleaning products, disinfectants, degreasers, cosmetics, and hobby supplies.

Biological contaminants (those that come from living or dead organisms) include animal hair, dander (tiny scales), saliva, or feces; molds or other fungi; pollen; dust mites; and microscopic organisms. Not only can they can cause odors and damage household materials, but they can also lead to allergic reactions, respiratory problems, or infectious disease. Every person has a different level of sensitivity to biological contaminants. Their presence cannot be eliminated completely, but keeping surfaces clean and dry limits their ability to spread.

Radon is a naturally occurring radioactive gas that originates in rocks and soil. It enters the home through cracks or openings–in a basement, for example–that are in contact with the ground. Radon is invisible, has no odor, and causes no immediate symptoms. Over time, however, radon causes lung cancer, and is a special risk to any smokers in the household.

Clearing up the air in your home requires examining your living space in regard to each of the above categories of contaminants.

Home•A•Syst is only for your own use and benefit. It is a voluntary program intended to provide general information about protecting your health and the environment. Information from a *Home•A•Syst* assessment will not be collected by Extension or any other outside agency and should remain in your private records.

What you should know about . . .

1. Heating systems

Yearly inspection by a trained heating professional is recommended for most heating systems. Just like your car, your furnace needs cleaning and tune-ups to keep it in good condition. Even a system that is heating properly is a hazard if the chimney or flue is blocked and gases cannot escape. These gases, such as carbon monoxide and nitrogen, will accumulate indoors and contaminate the air. This can produce a wide variety of health symptoms (headaches, dizziness, etc.) which are often mistaken for signs of other illnesses.

Backdrafting, a phenomenon that occurs when indoor air pressure is lower than outdoor air pressure, sucks combustion gases back into your home instead of allowing them to be released to the outside through your ventilation system. Backdrafting is especially likely in homes that have been sealed for energy efficiency, because air flowing out the ventilation system is not completely replaced by new fresh air, thereby lowering the air pressure in the home. If you suspect that you may have a backdrafting problem, have your home inspected by a professional.

Space heaters and gas stoves that are designed for use without a chimney or flue require extra ventilation to the outside.

2. Air filters and cleaners

The air filters in your heating/cooling system should be regularly replaced as they become dirty. Dirty or clogged filters not only limit the efficiency of the equipment, but they can actually contribute to air-quality problems. Remember that air filters in your heating/cooling system are designed to remove only certain kinds of pollutants–usually particles such as dust, smoke, pollen, and some microorganisms. Harmful gases, on the other hand, generally pass right through air filters.

If you use an air cleaner, it will require regular maintenance as well.

3. Carbon monoxide

A combustion by-product of special concern is carbon monoxide. This colorless, odorless gas can build up to deadly levels inside your home. Symptoms of exposure include headaches, dizziness, and nausea, and are often mistaken for symptoms of other illnesses. A malfunctioning furnace or blocked flue pipe can produce fatal levels of carbon monoxide in your home. Carbon-monoxide detectors can give a warning when levels of the gas in your home are too high, and some experts recommend that they be installed in any home that has a combustion appliance. However, they are not intended to take the place of proper system maintenance.

The product instructions will help you install your carbon-monoxide detector in the appropriate place.

4. Smoking

The smoke from cigarettes, cigars, and pipes contains many throat and lung irritants, as well as carcinogens (cancer-causing agents). Smoking threatens not only the health of the smoker, but also of anyone who breathes the smoky air. If you permit smoking in your house, insist that it be done in a well-ventilated area.

5. Pressed- or manufactured-wood products

Pressed- or manufactured-wood products made from wood chips or sawdust are widely used in home construction for flooring, sheathing, shelving, cabinets, and furniture. Concern about these products stems from the formaldehyde used in the glues that hold the materials together. Formaldehyde is a pungent, irritating gas that is released gradually into the air from these products, especially when they are new.

Sealing the surfaces of wood products containing formaldehyde with varnish, paint, or shellac will reduce emissions. Some manufactured-wood products with low formaldehyde emissions are also available.

6. Carpeting

It's important to keep the carpets in your home clean and dry. Carpets can trap or absorb chemical or biological contaminants which are carried in the air or are tracked in from outside. Damp, dirty carpet promotes the spread of biological contaminants. Carpets

require regular vacuuming and cleaning to stem air pollution.

New carpets can release **volatile** chemicals–that is, chemicals that can vaporize at relatively low temperatures–from the backing, padding, and fibers. Antistatic and soil-release finishes are also contributors to air pollution. The carpet industry is searching for ways to reduce emissions; the Carpet and Rug Institute (CRI), an industry trade group, now certifies low-emissions carpeting.

If you're planning to install new carpeting, choose a carpet that is certified by CRI as a **low-VOC(volatile organic compound)-emitting** carpet. If you are especially sensitive to the irritants emitted by new carpet, ask the dealer to unroll your carpet and leave it in a well-ventilated area for at least 48 hours before it is brought to your home. Open windows during and immediately after installation. Thoroughly vacuum the old carpet before removal.

7. Paint, varnish, and other surface finishes

Products used to finish, protect, and beautify materials in the home are potential sources of indoor air pollutants because they contain VOCs. Products that are oil-, solvent-, or alkyd-based release more harmful vapors than water-based products. Provide plenty of ventilation when finishes are newly applied, or apply them outside the home and wait until they are dry to bring them inside.

Lead, a highly toxic substance, was once a common ingredient in household paint. Many homes, especially those built before 1978, still have lead-based paint. Lead dust can be released into the air as the paint ages or during renovations. SP508L, *Assessing Your Household's Sources of Lead*, addresses this topic in greater detail.

8. Asbestos

Until about 1980, asbestos, a mineral that readily separates into long fibers and is non-flammable, was widely used in building materials to provide strength, heat insulation, and fire resistance. It was common in roof shingles, siding, soundproofing materials, insulation around pipes, heating ducts and flues, and decorative finishes. As asbestos ages, it can crumble and release tiny fibers into the air. Over time, these fibers can accumulate in the lungs and cause serious respiratory problems.

If your home was built before 1980, make sure that any asbestos inside is isolated from areas of heavy traffic, and check regularly to see that it is intact.

9. Hazardous household chemicals

Classifying household chemicals as "hazardous" means that the products can cause personal injury or illness during normal handling or use. They may be flammable, corrosive, explosive, reactive, toxic, or radioactive. The containers of hazardous household chemicals typically read *Caution, Warning, or Danger–Poison*, depending on the degree of hazard.

You probably use a wide variety of potentially hazardous chemical products in your home for cleaning, maintenance, personal grooming, and hobbies. These products can release chemicals or particles into the air during use (as with spray cans), as the product dries or cures (glues and caulking), or from gas release as the product ages (plastics and air fresheners, for example). Potentially hazardous products include furniture waxes, paint strippers, adhesives, some cleaning products (like ammonia or bleach), disinfectants, degreasers, cosmetics, and hobby supplies. Products that contain petroleum distillates or other VOCs emit more unhealthful pollutants than do water-based products.

Always follow label directions and provide adequate ventilation when using potentially hazardous household chemicals. Buy only what you need so that you will use all the product; give away the leftovers or dispose of them in a way that protects the environment. (SP508C, *Assessing Hazardous Products in Your Household*, offers more information on this topic.) Give quick attention to spills and stains and remove food wastes quickly so that chemicals will not have to be used for cleanup or odor / pest control.

10. Dust

Household dust includes some biological contaminants which are common allergens. Animal dander, for example, is shed from skin, hair, and feathers. Dust mites are microscopic "bugs" whose feces are easily airborne and are a common irritant. Dust is also composed of dirt, hair, lint, clothing fibers, and countless other tiny particles.

Only regular cleaning–dusting, vacuuming, damp cleaning, or washing with hot soapy water–can control the contaminants found in dust. If dust-related allergies are a problem in your household, limit the use of carpeting, upholstered furnishings, window blinds, and knickknacks.

11. Moisture

Most biological contaminants multiply in damp, humid conditions. Controlling moisture in your home will prevent having to use chemical products like pesticides and disinfectants, which are themselves pollutants. Mold on your furniture or other possessions is a sign that you have a moisture problem.

Prevent standing water in your home by fixing leaks or seepage problems immediately. Seal basements and pumps, and turn gutter downspouts away from the house. Use drip pans under the refrigerator and empty them regularly. Put a vapor-proof ground cover in crawl spaces to reduce moisture coming up from the ground. Use exhaust fans when bathing, showering, or cooking, and remove excess moisture from the air with a dehumidifier in warm, humid weather. Don't use a humidifier unless it is necessary for medical reasons or for your personal comfort.

12. Radon

Different parts of the country have different levels of radon. If your neighbors have detected high levels of radon in their homes, you should be concerned. However, since every home is built differently and the underlying geology can vary, levels in neighboring homes can differ drastically. Radon commonly enters homes through cracks in solid floors, construction joints, cracks in walls, gaps in suspended floors, gaps around service pipes, cavities inside walls, and the water supply. The only way to be sure of the level of radon in your home is by testing. The generally accepted safe level of radon is four **picoCuries** per liter (pCi/L) of air. A picoCurie, named for French physicist and radioactivity research pioneer Marie Curie, is a measurement of radioactive decay equal to about two atoms per minute.

The label of your radon test kit should read, "Meets EPA requirements." An inexpensive screening test (usually $10 to $15 at hardware stores) can tell you generally how much radon is in your home. Close all windows and doors before you conduct the test. Since sealed linoleum floors can inhibit the movement of radon, don't test in the kitchen or bathroom, where you'll get a reading that can differ greatly from a reading elsewhere in the house. Also, the readings can vary with the season; basement readings taken in the winter are usually the highest. For information about a professional test, contact the Radon Program Coordinator at the Tennessee Department of Environment and Conservation (TDEC), at (800)232-1139.

If you detect an unsafe level of radon in your home, there are several steps you can take to reduce it. One is to plug the leaks which allow radon inside your house, such as cracks in the basement walls, and another is to change the ventilation patterns in your house so that radon is not drawn inside. Check with your state radon office, local contractors, or health agencies for advice.

13. Ventilation

Even homes with relatively few sources of contamination need fresh air. This is especially true during seasons when windows and doors are kept shut. Many homes have air leaks, which help maintain freshness, but newer homes use tighter construction methods which make it easier for pollutants to build up to dangerous levels. Tight homes are also susceptible to moisture problems.

Always use exhaust fans in the kitchen and bathroom to keep air circulating.

14. Odors

Odors are a classic warning signal that your home is not properly ventilated. Persistent mustiness or smells of chemicals, mildew, or tobacco smoke in the house indicate a problem. Lingering odors of grease and food may mean that your kitchen needs more ventilation.

Make a note:

The table on page 6 of SP508M, *Assessing Your Homesite*, provides a space for you to list all the problem areas in your home that you find while completing *Home•A•Syst*. Take a few minutes now to list any problems you discovered as you completed *Assessing Your Indoor Air Quality*. Later, when you complete *Assessing Your Homesite*, you will include these items on the map you draw of your property. Potential items from this factsheet include:

- dirty air filters
- asbestos products
- moisture or standing water
- stored paint or varnish
- poorly ventilated workshop or garage

Remember:

- Provide extra ventilation for combustion-powered space heaters and gas stoves that are designed for use without a chimney or flue.
- Have your heating system inspected yearly.
- Be alert to the possibility of backdrafting.
- Replace air filters regularly.
- Install carbon-monoxide detectors in appropriate areas of your home. Test the batteries regularly.
- Limit tobacco smoke in your home; encourage any smokers to use well-ventilated areas.
- Seal the surfaces of products made from manufactured wood to limit the release of formaldehyde gas.
- Purchase manufactured-wood products that are already labeled as low-emissions products.
- Keep carpets clean and dry.
- Purchase new carpet that is certified by the CRI as low-emissions carpeting. When installing it, provide extra ventilation in the house.
- Thoroughly vacuum old carpet before removing it.
- Apply paint or varnish outside; wait until the product dries before bringing the item inside the house. If finishing must be done inside, provide plenty of ventilation.
- Make sure that no lead-based paint is chipping or disintegrating in your house, especially if you have children.
- Keep any asbestos products you have isolated, or have them removed from your home by a qualified professional.
- Control moisture in your home by preventing standing water, fixing leaks, using exhaust fans when bathing or cooking, and/or using a dehumidifier.
- Dust and vacuum regularly.
- Always follow label directions and ventilate adequately when using household chemicals. Buy only the amount you need, and give away leftovers to someone who can use them.
- Never mix household chemicals unless specifically instructed to do so, since additional toxic chemicals may be released into the air through chemical reaction.
- Test your home for radon.
- Use your eyes and nose to test your indoor air quality. Watch for signs of mold or standing water, and investigate persistent smells.

If you want more information . . .

Contact:

- Your local Extension office
- Tennessee Department of Environment and Conservation
  (Radon Program Coordinator)
  8th Floor, L&C Annex
  401 Church Street
  Nashville, TN 37243-1551
  (800)232-1139
- Indoor Air Quality Information Clearinghouse
  (IAQ INFO)
  P O Box 37133
  Washington DC 20013-7133
  (800)438-4318
  (toll-free, M-F, 9:00 a.m. to 5:00 p.m. EST)
  or
  (301)588-3408
  Ask for their list of materials currently available.
- National Radon Hotline
  (800)SOS-RADON (toll-free)
  Recorded information available 24 hours a day.
- Clean Air Council
  135 S 19th Street, Suite 300
  Philadelphia PA 19103
  (215)567-4004
  E-mail: office@cleanair.org
  Call or e-mail for information on services, contacts, and testing procedures.

• American Lung Association
(800)LUNG-USA (toll-free)
Or contact your local chapter.

• Carpet and Rug Institute
Indoor Air Quality Testing Program
P O Box 2048
Dalton GA 30722-2048
(800)882-8846 (toll-free)
or (402)278-3176

Read:

• *The Inside Story.*
Environmental Protection Agency, 32 pp.
$44 per package of 25
To order:
Superintendent of Documents
P O Box 371954
Pittsburgh PA 15250-7954
or fax at (202)512-2250
Identifies problems and control methods for indoor air pollutants, including radon, tabocco smoke, lead, and household products. Applies to all regions of the U.S. When ordering, mention order-processing code #3136.

• *Household Care Products.*
• *Indoor Air Quality.*

The above brochures are available by writing to

Chemical Specialties Manufacturers Association
ATTN: CTIF
1913 Eye St NW
Washington DC 20006
Free single copies are available.

Download:

• http://funnelweb.utcc.utk.edu/~utext
The University of Tennessee Agricultural Extension Service home page.

• http://www.logicnet.com/cathy.kitlar/world.htm
Site recommended by Infoseek with links to information about recycling, composting, lead poisoning, ozone, acid rain, and more.

• http://oncolink.upenn.edu/pdq/600352.html
The National Cancer Institute's FAQ about radon and cancer risks.

• http://www.epa.gov
The U.S. Environmental Protection Agency's home page. Use their search function to find information about radon, including the EPA's radon home page. Choose "Search" and type "radon" in the query box.

• http://sedwww.cr.usgs.gov:8080/radon/radonhome.html
The U.S. Geological Survey's radon page. Contains a map highlighting which areas of the country have the highest potential for radon problems.

• http://www.homesafe.com/coalert/index.html
Carbon Monoxide Alert. A complete guide to the dangers of carbon monoxide, backdrafting, and more.

• http://www.csia.org
The Chimney Safety Institute of America's home page.

• http://www.cpco.com/energyedu/safety3.html
Consumers Energy: Energy Safety. Includes information about carbon monoxide, including the steps to take if your carbon-monoxide detector sounds an alarm.

• http://www.webdirectory.com
Comprehensive environmental search engine/bulletin board–a great way to find information about any environmental topic.

This *Home•A•Syst* assessment does not cover all potential health or environmental risks related to indoor air quality. It is meant to be a starting point for identifying and addressing the most apparent risks.

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Billy G. Hicks, Dean