

Fighting Asthma in Your House

Asthma, an inflammatory disorder of the airways, is one of the most common chronic respiratory conditions affecting Canadians. Physicians have diagnosed more than 2.3 million Canadians as being asthmatic—8.4 per cent of adults (Statistics Canada, 2009) and 13.4 per cent of Canadian children (Garner, 2008).

While the exact cause of asthma is unknown, it appears to result from a complex interaction of predisposing factors (tendency to have allergies), causal factors that may sensitize the airways (such as animal dander, dust mites, mold, cockroaches and workplace contaminants) and contributing factors, such as tobacco smoke during pregnancy and childhood, respiratory infections and indoor and outdoor air quality (National Asthma Control Task Force, 2000).

Management of asthma involves the individual, his family and his

physician. Asthma specialists recognize the importance of avoiding or controlling known environmental factors, or “triggers”, that aggravate asthma. Triggers include biological pollutants, such as mold, house dust mites and pollen, as well as irritating pollutants, such as nitrogen oxide, ozone and formaldehyde (Canadian Asthma Consensus Group, 1999). For some individuals, avoiding allergens (substances that produce allergic reactions) can be the most important element of asthma management. The National Asthma Control Task Force recommends a management plan that includes reduction of aeroallergens, molds, tobacco smoke, vehicle and industry emissions, noxious odours and scents that can trigger asthma episodes. *The Canadian asthma consensus report, 1999* says that increasing medication should not be a substitute for avoiding exposure to allergens and irritants.

This *About Your House* deals with reducing your exposure to causal and contributing factors in the home. It provides a global approach consistent with the recommendations of the National Asthma Control Task Force and the *Canadian asthma consensus report, 1999*. The recommendations are aimed at reducing exposure to allergens and other substances that are known to have a potential impact on respiratory health and indoor air quality. When allergens are involved, elimination is preferable to reduction, since even very small amounts can provoke symptoms. Although evidence of an association between the development or worsening of asthma and some non-allergenic contaminants, such as volatile organic compounds (VOCs), is lacking, the Institute of Medicine (2000) suggests that it is prudent to limit exposure where practical.

The importance of thorough vacuuming

House dust is a reservoir of dust mites, fungal glucans (cell wall components) and bacterial endotoxins. As exposure to these potential allergens occurs when house dust becomes airborne, it is important to reduce house dust as much as possible. A recent CMHC study demonstrated that this can be challenging.

The study found that four to five successive vacuuming sessions with a High-Efficiency Particulate Air (HEPA) filter-equipped vacuum cleaner, at a rate of one minute per square metre for carpets and half a minute for non-carpeted areas, were required to significantly reduce the amount of fine dust in the homes tested.

ALLERGEN REDUCTION

Dust mites

Dust mites are microscopic bugs that live on pillows, mattresses, bedding, stuffed toys, upholstered furniture, fabrics and carpets. They feed on skin flakes from people and thrive in humid environments. They can trigger asthma symptoms and can cause asthma in children with no previous asthma symptoms (United States Environmental Protection Agency, 2008). Strategies to control dust mites include:

- Reducing the relative humidity (RH) in your house to reduce dust mites and mold. Dust mites need RH above 55 per cent to grow. The most effective way to

prevent the growth of dust mites is to reduce the RH of your house in the winter. The *Canadian asthma consensus report, 1999* recommends humidity levels below 50 per cent.

- Vacuuming thoroughly and often, since dust mites are a component of household dust. Use a vacuum cleaner with a HEPA filter or a central vacuum that exhausts to the outside.
- Wearing an N95 respirator while vacuuming. Sensitive individuals and children should keep away from the immediate area. This will help reduce exposure to dust mites that become airborne with fine dust.
- Properly maintaining furnace filters. This can reduce fine particles in your air distribution system that can be a home for dust mites (see CMHC's *About Your House* fact sheet *Your Furnace Filter*). To further reduce the amount of dust circulated by your air distribution system, regularly vacuum as far as you can reach into air registers and return ducts. If you find that the return air ducts are dirty, or if the ducts have not been cleaned since the house was built or you moved in, have your ducts cleaned. Ensure that the contractor does not spray chemicals, such as fungicides, disinfectants or essential oils into the ducts.
- Reducing the amount of particulates you bring into the house by taking off your shoes upon entry and using washable doormats.
- Dusting with a HEPA vacuum or a damp cloth instead of dry dusting to help control dust (Canadian Partnership for Children's Health & Environment, 2005).
- Reducing the amount of upholstered furnishings and fabric coverings in your bedroom that can provide a home for dust mites.
- Vacuuming upholstered furnishings with a HEPA vacuum while wearing an N95 respirator.
- Avoiding carpets—they are good dust collectors that can hold dust mites.

Sleeping area strategies include:

- Changing bedding frequently.
- Washing bedding in warm water. Contrary to popular belief that hot water is needed to kill dust mites, a warm water wash with pre-soaking is effective at controlling dust mites (Vyszynski-Moher, Arlian & Neal, 2002).
- Using washable linens such as cotton with small enough pore size (for example, 200 thread count). Washing bedding frequently is more important than encasing a mattress with a cover that cannot be removed easily for cleaning.

- Vacuuming mattresses with a HEPA vacuum periodically.
- Replacing pillows at least once a year.
- Avoiding the use of “acaricides”—pesticides that kill dust mites.
- Allowing bedding to dry by keeping beds uncovered when you get out of bed.

Mattress covers

Typical recommended measures for avoiding dust mites include encasing mattresses, box springs and possibly pillows with mite- and allergen-impermeable covers (Health Canada, 2007). Impermeable covers will protect new mattresses from infestation and keep mites already contained in older mattresses from passing through to the surface. However, everyday use leaves skin flakes on surfaces, on which dust mites feed. Exposure to dust mites can be reduced by frequently changing the bedding and vacuuming the mattress.

Molds

Molds are microscopic organisms that grow on wet or damp surfaces. Under normal circumstances, preventing moisture from reaching high levels in your house is the only way of limiting mold growth. To control the growth of molds, the RH should be low enough to prevent moisture condensation on windows. This may mean 35 per cent RH or less.

Exposure to indoor mold is associated with an increased prevalence of asthma-related symptoms, such as chronic wheezing, irritation symptoms and non-specific symptoms. Asthma-like responses, inflammatory responses in the lungs of rodents and severe histological and biochemical changes have been observed in laboratory animal studies.

Health Canada considers mold growth a health hazard and recommends controlling dampness and cleaning up mold regardless of the type of mold. CMHC’s *About Your House* fact sheet *Fighting Mold—The Homeowners’ Guide* will help you understand why mold grows and what you can do if you find mold in your house.

There are several no-cost and low-cost measures:

- If your house has a crawl space with a dirt floor, cover the floor with a continuous sheet of 6–12 mil (0.15–0.30 mm) polyethylene. Signs of potential moisture and rodent problems are more visible on opaque sheets of white polyethylene than on clear or black ones. Overlap and tape any seams.
- Make sure water from your roof runs away from your house by having downspouts lead away from the foundation.
- Ensure that the ground around your house slopes away from the house.

- Run a dehumidifier in your basement, even if you have an air conditioner. An air conditioner dehumidifies only when it is running, which may be only a small fraction of the time. See CMHC’s *About Your House* fact sheet *Choosing a Dehumidifier* for more information.
- Do not keep mold-susceptible items, such as paper, cardboard and clothing, in your basement. They absorb moisture and can grow mold.
- Carpets in the basement or bathroom are likely places for molds to grow. It is best not to have carpets in these areas.
- Do not hang clothes to dry in the basement. Use a clothes dryer vented to the outside.
- Do not store firewood inside the house.
- Reduce the number of house plants. Watering them is a source of moisture. The soil can be a source of molds.
- Do not humidify unless absolutely necessary. First, measure the RH with a hygrometer. Readings of 25 to 35 per cent in the winter are generally acceptable. For information about buying and using a hygrometer, see CMHC’s *About Your House: Measuring Humidity in Your Home*.

- If you need humidity at night, use a portable humidifier in your bedroom. Monitor the RH and cycle the unit on and off as necessary. Air the room out to dry during the day. Clean the humidifier after each use. Check windows for condensation and wipe up as necessary.
- When you shower or bathe, use the bathroom fan and let it run for 15 minutes or longer after you are finished.
- Bathroom and kitchen fans should exhaust outside.
- When cooking, use the kitchen fan to get rid of moisture and odours.
- Do not leave areas of the house unheated. Cold, unheated or damp areas in the house are likely to get moldy. Excessive thermostat setbacks at night may also encourage mold growth.
- Act immediately if there is a leak or a flood. Solve the problem, then remove and dry wet flooring, walls, furnishings and other belongings. Discard what you cannot dry.
- Clean up small areas of mold yourself, following the measures provided in CMHC's *Clean-up Procedures for Mold in Houses* or the *About Your House* fact sheet *Fighting Mold—The Homeowners' Guide*.
- Get professional help if there is a lot of mold.
- Consult CMHC's *Clean Air Guide* to deal with dirt floors, crawl spaces and cold cellars.
- Keep potentially mold-laden dust to a minimum by vacuuming with a HEPA vacuum or central vacuum exhausted to the outside.

Animal dander

Some people with asthma are allergic to animal dander, which comes from the saliva and the oil glands of fur-bearing animals, such as dogs, cats, hamsters, gerbils and mice. Even short-haired cats and dogs produce dander.

- The most effective way of dealing with animal dander is not to have pets in your home. The *Canadian asthma consensus report, 1999* says reducing exposure to pet allergens cannot be effective without removing the pet from the home. After a cat is removed, cat dander decreases steadily over six months. Restricting a pet's access to your bedroom and living areas does not rival the effectiveness of not having the pet in your house. Reducing pet dander by washing pets is only a temporary solution.
- Consider housing pets outdoors.

Cockroaches

Cockroaches are a recognized source of allergens that can trigger asthma reactions in cockroach-sensitive people with asthma.

- Remove open sources of food and water.
- Use non-toxic baits.
- Use a HEPA vacuum in areas that may hold reservoirs of allergens.
- Refer to CMHC's *Farewell to Cockroaches* for ways to prevent cockroaches.

Outdoor pollen

Outdoor pollens (tree, grass, ragweed and other weeds) can trigger asthma in people who are allergic to pollen. Pollen concentrations are highest early in the morning. Keep the windows closed at nights.

- Make your house airtight to reduce pollen entry. Natural Resources Canada maintains a list of residential energy advisors who can conduct a test of your home to identify air leakage pathways and suggest ways of making your house more airtight (see "References" on page 6).
- Air conditioners can be beneficial in warm weather. However, check that the air-conditioning unit is not a source of mold. A moldy smell detected when the

unit is turned on may come from somewhere in the house or from the air-conditioning system. Have the air-conditioning coils inside your furnace plenum inspected and, if necessary, cleaned. Ensure the drain pan under the coils is clean and drains properly.

- Ensure that your air distribution system has a filter, such as a pleated paper filter. A HEPA filter may be more effective in capturing pollen particles, but it requires special installation and is costly to replace.
- When the pollen levels are high, you may need to turn off your Heat Recovery Ventilator (HRV) and other outdoor air intake systems, to prevent them from bringing pollen-laden air into your house. HRVs are also called air-to-air heat exchangers.

OTHER RESPIRATORY IRRITANTS

Tobacco smoke

The most significant respiratory irritant is environmental tobacco smoke (ETS). Exposure to ETS is associated with increased frequency and severity of asthma and the development of asthma in predisposed infants and young children.

Volatile organic compounds

While other contaminants in the home have not been linked to asthma, they may act as respiratory irritants. Please refer to the *About Your House* fact sheet *How to Reduce Chemical Contaminants in Your Home*.

Nitrogen dioxide, gas stoves, wood smoke

A study found that women who used mainly gas for cooking reported higher asthma-like symptoms such as wheezing, waking with shortness of breath, asthma attacks and reduced lung function (Jarvis, Chinn, Luczynska & Burney, 1996). If you have a gas stove, install a range hood exhausted outdoors and use it when cooking.

Wood smoke is an irritant for people with asthma. If you are using a wood stove, ensure there is no backdrafting. If neighbours use wood-heating systems, you may have to make your house more airtight to prevent the smoke from entering your home.

Air purifiers

Ozone generators are not recommended (Health Canada, 2000), since ozone is an irritant that may aggravate asthma. Furthermore, ozone effectiveness in controlling mold and other pollutants is questionable. Ozone can be produced as a by-

product of negative ionizers and improperly wired electrostatic filters.

Most portable air cleaners have a filter to remove particulates and a carbon filter (usually a cloth or membrane) to remove gases. The unit passes the room air through the filters to remove the pollutants. Several air purifiers have been shown to reduce the level of irritants in test chambers, but the health benefits have yet to be demonstrated consistently. The effectiveness of an air cleaner depends on several factors:

- The amount of air the unit can pull through. Small tabletop units have limited use in larger areas.
- The effectiveness of the filters. This refers not only to the appropriateness of the filter (a particulate filter will not remove a gaseous pollutant) but also to how much the filter is capable of removing before it is replaced. A carbon cloth or membrane can adsorb (hold) only so much gaseous contaminant, after which the filter will return removed contaminants to the air.
- The rate pollutants are being generated in the room or space. If there is a continuous source of pollutants, their production rate may be greater than the air purifier's removal rate.

- The size of the room. A room air filter may have only a limited impact on the air in a large room with many pollutant sources. It may also have a limited impact in a small room that is well connected to the rest of the house by doors, ducts, leaks, etc., as pollutants will continue to move into the space.

The recommended approach is to find the sources of contaminants and remove or reduce them. A portable air purifier may be an option when source control is not possible.

To help identify indoor air contaminants in your home, refer to CMHC's *Clean Air Guide*.

Professional help

If you are not sure how to reduce factors that can cause or trigger asthma in your home, consider hiring a professional. For the names of people who have completed CMHC's Residential Indoor Air Quality Investigator Training Program, call CMHC at 1-800-668-2642.

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Websites

Health Canada—Environmental and Workplace Health: Asthma (March 2009)
<http://www.hc-sc.gc.ca/ewh-semt/air/in/qual/asthm-eng.php>

Natural Resources Canada—Office of Energy Efficiency (March 2009)
www.oee.nrcan.gc.ca

United States Environmental Protection Agency—Indoor Environmental Asthma Triggers (March 2009)
<http://www.epa.gov/asthma/triggers.html>

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