

Asthma, Allergies and Indoor Air Quality

We've sealed ourselves indoors with a toxic stew of gases, dust and mould. Home is just not so sweet any more.

By Claire Gagné

Photography by Eden Robbins

AS A KID, Michele Chase had severe asthma attacks, which her family put down to the polluted air in Mississauga, a suburb of Toronto. But when, at the age of 10, she moved with her family to Fredericton, New Brunswick, a city with a population of only 50,000, Chase's bouts of asthma surprisingly did not improve. Her chest would become tight and she'd wheeze so hard she couldn't catch a breath, despite a daily course of medication. Her family became acquainted with the local ER department.

But there was a difference in Fredericton: many of her asthma flareups started within the family home. For years, she couldn't figure out the exact trigger. But Chase, now 28, today is certain she knows the spark for her childhood agony.

Three years ago she helped her mother renovate the family home. As they were replacing the gyprock and paneling in the basement, they made an unsettling discovery. Thick, oozing black fungus had completely covered the back side of the gyprock and had permeated the insulation. While they knew the basement was always damp, they had been completely unaware of the health hazard hidden behind the walls. Chase is thankful her bedroom was not in the basement, but notes, "if it's in the home, it's still in what you breathe."

In Ottawa, Susan Clemens can relate. She watched with increasing distress as Angela,* her young daughter, suffered frightening asthma attacks between the years 2002 and 2004. The family was living in a "maisonette" with 12 apartments connected to a central hallway. The building's owners were busily renovating units, and every time a tenant moved out, they would resurface the floor in the vacated unit. Chemical fumes permeated the building, and the Clemens' immediate neighbour was a smoker, so the family was also breathing in second-hand smoke.

Angela was not a wheezer, but during attacks the skin between the toddler's ribs and collarbone would suck in as she struggled to breathe. Her lips would turn blue, and she'd break into a sweat. Angela was diagnosed with asthma at 12 months, but didn't see a respirologist until she was 3. He questioned Clemens and her husband about their lifestyle. When they explained about the apartment renovations, he immediately connected that to their daughter's health. "That's one of your big problems," she recalls him saying. And then the life-changing words: "You have to move."

Asthma is responsible for 10 per cent of all hospital admissions for children under the age of 4. It's sobering to think that our homes, our safe havens, are partly to blame.

Such instances are far from unique. While most North Americans still think of smog as the most serious form of air pollution, a more toxic chemical stew is often found in the air we breathe inside our homes. The U.S. Environmental Protection Agency labels indoor air one of the Top Five environmental health risks, up there with polluted drinking water. The bad environment in our households starts with polluted air from the outdoors, which is often not cycled effectively in and out of tightly sealed and energy-efficient homes. Trapped, “the pollutant levels may be two to five times higher inside than outside, and in some cases, 100 times higher,” says Tom Kelly, director of the EPA’s Indoor Environments Division.

Then the homeowners mix in other chemicals: pesticides, perhaps cigarette smoke, air fresheners, hairspray, perfume and cleaning supplies. Thrown into the invisible concoction are the gases given off by furnishings or paint. Add animal dander, dust mites and mould – those ubiquitous biological allergy triggers – and suddenly there’s new meaning to the term “the fresh outdoors.” Polluted indoor air “can be a very high risk for children, for elderly people, and for folks with diseases such as asthma,” says Kelly. In Canada, asthma is responsible for 10 per cent of all hospital admissions for children under the age of 4. The thought that our homes, our safe havens, can at times be to blame, is sobering.

TO GET A READING on just how bad household air is becoming a company that designs indoor air monitors, AirAdvice, worked with a network of heating, air conditioning, and air quality professionals to collect and analyze about 1.3 billion air samples from nearly 50,000 homes in the U.S. and Canada between 2004 and 2006. Its survey showed 96.7 per cent of the homes generating an “alert”, that is, a level outside the recommended range for one of: particle allergens (dust, dander and pollen); chemical pollutants; carbon dioxide; temperature; humidity; and carbon monoxide. Eighty-three per cent of the homes had two or more alerts. Of concern for individuals with asthma and allergies: the most common problems were high levels of particle allergens and chemical pollutants.

Poor indoor air quality has been linked to a number of health effects. Chemicals and airborne allergens can trigger wheezing, shortness of breath, itchy eyes and runny noses. Nitrogen dioxide, from second-hand smoke and unvented gas stoves and furnaces, leads to eye, nose and throat irritation as well as respiratory infections in young children. Formaldehyde can cause breathing distress and can nauseate, as can pesticides. Some chemicals, in instances of high-level exposure, can be cancer-causing.

So how did our homes get so polluted? The North American lifestyle is much to blame. We spend on average about 90 per cent of our time indoors, and 65 per cent of our time in our own residences. “Home air” is what we breathe most often, and which we readily (and naively) pollute with products used to keep ourselves primped and our homes polished. Anything with an added scent – from shampoo to laundry detergent, fabric softener and all-purpose cleanser – releases chemicals that hang on you and your clothes and linger in the air. That bouquet of lemon

or citrus in products used to make our home sparkle in some cases will also mask dangerous chemicals in the cleaner, such as formaldehyde and ammonia.

Prone to being house proud, we renovate and decorate, and that means fresh paint, new carpets and pressed-wood products (such as kitchen cabinets, countertops and furniture). These usually emit gases called volatile organic compounds, such as formaldehyde. People sensitive to VOCs, including asthma sufferers, may react to very small concentrations.

Then we shower often and don't always use exhaust fans when cooking, creating humid environments in which mould and dust mites thrive. On the surface our surroundings are clean and comfortable. But like the walls in Michele Chase's home, it's what is going on unseen that becomes the cause for concern.

THE EXPLOSION of asthma and environmental allergies in the past two decades has grabbed the attention of scientists, environmentalists and government, and they are examining the connection of that phenomenon with the air in our homes.

In September, the National Institute of Environmental Health Sciences in the United States released an analysis of 14 studies, concluding that measures to reduce exposure to house dust were associated with a 26 per cent reduction in asthma. Then in October, the *American Journal of Respiratory and Critical Care Medicine* published a study that found people regularly exposed to cleaning sprays and air fresheners were between 30 and 50 per cent more likely to develop asthma.

Meantime, late this past summer, a researcher at the Lawrence Berkeley National Laboratory in California examined 21 studies that looked at the relationship between chemicals and asthma in children, and found the studies identified formaldehyde (or being exposed to particleboard), phthalate dust (or being in the presence of plastic surfaces) and recently applied paint as risk factors for asthma in children. Renovation and cleaning, new furniture, carpets and textile wallpaper also appeared to increase the triggering of asthma. However, the author cautioned that more study was needed – and more investigation into what was actually causing the asthma in these kids.

Understanding the interaction between environmental exposures and genetic factors in allergies and asthma is part of the mission of AllerGen, Canada's allergy, genes and environment network, and its ambitious CHILD cohort study. That project is designed to follow thousands of children and their families from birth to determine what role environments (indoor and outdoor) and genetics play in the development of allergies. Dr. Tim Takaro, a physician-scientist and associate professor at Simon Fraser University in Vancouver, is involved in CHILD and has already contributed research from his own studies of indoor air quality in homes in the United States.

Though the research is young, his and others' early findings are profound – suggesting that combinations of allergens and particulate matter may actually unite and become a bigger beast. “For example, diesel smoke and dust mite allergen, when they're combined, are much more potent than either one alone,” says Takaro. He says it's important for consumers to think of

indoor air pollution as whole, rather than its parts, to see an improvement in symptoms such as asthma flaring or wheezing episodes. “Go after all of the chemicals, go after all of the allergens and you’ll have a more healthy home,” he counsels.

Researcher Dr. Tim Takaro thinks of indoor air pollution, not as its separate components, but as a whole – as a bigger beast. Go after all of the chemicals, go after all of the allergens and you'll have a healthier home," he says.

YET IN CANADA AND the United States, there is still a lot of confusion among consumers and controversy among researchers, industry and government over exactly which substances are potentially harmful, and at what levels. Jay Kassirer, managing director of Healthy Indoors Partnership (HIP), a Toronto-based not-for-profit that brings together government, industry and non-governmental organizations, says there needs to be a clear message from Ottawa about what Canadians are supposed to do. In the U.S., while the EPA does not have authority to set rules for indoor air – the way it does for outdoor air – it can make recommendations and educate.

But a problem, as Kassirer sees it from the Canadian perspective, is that “we don’t want to just scare people. We want to give them information that’s helpful.” HIP and other stakeholders have been pressing the Canadian government to make indoor air quality a political priority, and to expedite a long process of scientific reviews to determine safe exposures. Fortunately, the feds have begun to act.

At Health Canada, staff are reviewing and revising all of the dated residential indoor air guidelines, and so far have released new ones for mould and formaldehyde. (The recommended limit for an eight-hour exposure to formaldehyde was reduced to 40 ppb, down from 100 ppb, a level set 20 years ago.)

Nicolas Gilbert, the head of Health Canada’s Indoor Air Quality section, says he and his colleagues are also developing a list of additional substances for which guidelines need to be set. That list has been through a round of consultations with the federal and provincial governments, and will likely be released to the public this winter. But work on creating the new guidelines for those substances won’t begin until the review of existing ones on carbon monoxide, ozone, nitrogen dioxide and particulates are completed.

Gilbert says Health Canada develops guidelines, rather than regulations, because it would be impossible to police unacceptable chemical concentrations in a family’s household. But he says: “What we can regulate is sources.” Future plans call for studies in Canadians’ homes to determine whether certain sources, for instance paint, are causing the most problems. If so, Gilbert’s staff could provide recommendations for enforceable regulations for such products.

Over at Environment Canada, regulations are being developed to target the content of VOCs in consumer and commercial products. The department hopes to have them in effect in 2008. These regulations would apply to products such as air fresheners, household cleaners, hairsprays, deodorants, automotive products and detergents. The department also has completed a lengthy process of categorizing about 23,000 substances introduced before existing environmental legislation came into being in 1986.

Through this review, about 200 chemicals have been identified as “highest priority”, and the government is trying to figure out exactly what risks these chemicals might pose and how to deal with them, perhaps to the extent of eliminating them completely. Among the 200 substances are peroxides; vinyl acetate, which is used in a range of products such as perfumes, paint, adhesives and as a base in chewing gum; and C.I. Pigment Yellow 34, used as a colorant in some plastics, inks and paints.

ACTION FROM THE GOVERNMENT cannot come soon enough. For all the mounting evidence, most people are still blissfully unaware that the air in their homes can pose a threat to their health. “People think of their home as something they have a lot of control over, and they underestimate the dangers,” says Kassirer. Kelly of the EPA notes that people also have a much greater awareness of a home’s cosmetics. “They are much more likely to be concerned about changing the kitchen cabinets than they are with improving their exhaust system and ventilation.”

However, once aware, the individual can take control over the air in his or her own living space. Virginia Salares, a researcher at the Canada Mortgage and Housing Corp., notes that if you found a dead animal in the house, you’d “get rid of it.” In the same way, a homeowner should know what is causing indoor air pollution, and either stop bringing it into the house or remove it when possible. Ventilation is an alternative strategy.

Specifically, a person could choose to stop using pesticides and cleaning supplies with harsh chemicals, eliminate scented personal care products, ensure that bathrooms and kitchens are properly vented to the outside so humidity doesn’t build up. “Basements and crawl spaces are often sources of mould problems,” Salares says, adding that homeowners should control moisture by dehumidifying in warm months, and noting that humidifiers should only be used in winter when “absolutely necessary”.

Back in Fredericton, Michele Chase, now a mother of three, still has to manage asthma. Her 8-year-old daughter, Cara, is also asthmatic. She keeps them both under control with daily medication and by meticulously cleaning their home to avoid triggers. She washes bedding every couple of days, her curtains once a week and uses a dry mop on her hardwood floors daily. She shies away from pesticides, and any cleaning products with harsh chemicals.

The Clemens family certainly made radical changes to their home life. For the sake of their daughter’s health, they moved into a small townhouse, where they ripped out all carpets to avoid the allergens they would harbour, and replaced them with laminate flooring. They put in a central air conditioner so they could keep the windows closed and the pollen out. Angela, now 6, has only had one asthma attack in the past three years.

Although the federal government is taking some positive steps in identifying troublesome substances, Clemens, for one, finds even the new formaldehyde guidelines confusing. She doesn’t believe Health Canada is doing a good enough job of educating the public and communicating the dangers of polluted indoor air: “Issues regarding secondhand smoke and children have been successful, but I really haven’t heard about much else.” As a parent of a child with asthma, she would welcome further guidance.

When it comes to the risk of allergies and asthma, the statistics released by the Public Health Agency of Canada show the pressing need for government to finalize guidelines and to communicate what actions homeowners should take. By 2000, 15.6 per cent of children in Canada aged 4 to 11 had been diagnosed with asthma – and some of these cases will have developed in their own homes. Chase and Clemens are two who have gone to great lengths to manage their children’s health, with success. They illustrate the good news when it comes to indoor air pollution: if we are part of the problem, we can also be part of the solution.

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