‘SICK BUILDING SYNDROME’ CAN BE PRODUCED BY WET WALL FUNGI

Airborne fungal toxins from wallpaper create indoor health risk

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A new study suggests that wallpaper may contribute to "sick building syndrome." When toxins from fungi growing on wallpaper become airborne, they can create an indoor health risk.

Jean-Denis Bailly, DVM, Ph.D., a Professor of Food Hygiene at the National Veterinary School of Toulouse, France, along with a team of researchers demonstrated that mycotoxins could be transferred from a moldy material to air, under conditions that may be encountered in buildings.

The research findings suggest that aerosolization of toxins from fungi growing on wallpaper can have a negative impact on human health, and demonstrates the need for a thorough risk assessment related to fungal contamination of indoor environments.

The study, "Aerosolization of mycotoxins after growth of toxinogenic fungi on wallpaper," was published in Applied and Environmental Microbiology, a journal of the American Society for Microbiology.

Aspergillus fumigatus is a fungus of the genus Aspergillus, and is one of the most common Aspergillus species to cause disease in individuals with an immunodeficiency.

US Department of Health and Human Services

The research was prompted by a number of studies that suggested there was a health risk from mycotoxins produced by fungi growing indoors. In the controlled laboratory environment, the team was able to demonstrate how mycotoxins could be transferred from a moldy material to air, under conditions that may be encountered in buildings, according to WebMD.
"Sick building syndrome" is a very broad label that covers a variety of symptoms believed to be triggered by a particular building's indoor environment. Most often, no specific illness or cause can be identified, according to the U.S. National Institutes of Health, however, symptoms can range from allergies to aches and pains.

The researchers simulated air flow normally found in homes and buildings over a piece of wallpaper contaminated with three species of fungi, Penicillium brevicompactum, Aspergillus versicolor, and Stachybotrys chartarum. The three fungi have long been studied as food contaminants and are also frequently associated with indoor air contamination.

The results from the study raised two important questions: First, "There is almost no data on the toxicity of mycotoxins following inhalation," with most research today focusing on food contamination. And secondly, because the mycelial elements of the different fungi studied behaved differently in how they became airborne, further studies could help in prioritizing the species based on their mycotoxins.

Apartments, offices + other buildings, including homes are becoming more energy-efficient.

Cacophony

"Thus, mycotoxins can be inhaled and should be investigated as parameters of indoor air quality, especially in homes with visible fungal contamination," Bailey said.

The study notes that with the move to creating more energy-efficient living spaces, we are painting ourselves into a corner if we don't consider the health risks associated with toxins in our indoor air. The study also pointed out that colonization by toxic fungi is easily accomplished in the presence of moisture, such as is seen in building and homes where mold is found.

Today, many homes "are strongly isolated from the outside to save energy," but with the number of water-using appliances such as coffee makers and other appliances in use today, this "could lead to favorable conditions for fungal growth," notes Bailey.

According to a new study, the mold that grows on walls releases toxins into the air, and these chemicals can be bad for the health of people and pets, especially if they are already allergic to particular types of fungi. The effects of wallpaper fungi are one of the causes of the sick building syndrome.

It wasn't really evident how the mold growing on the buildings could sicken people. However, French researchers said that they tested three common types of fungi that are usually found somewhere in buildings. The team stated that the fungi are harmful because they release mycotoxins that just disappear into the air.
“These toxins can subsequently be aerosolized, at least partly, from moldy materials,” the scientists wrote in the journal Applied and Environmental Microbiology, published by the American Society for Microbiology.

What to know about the sick building syndrome
The sick building syndrome (SBS) helps explain the situation where the people that live or occupy a building start to show acute health effects that are directly related to the time they spend in that space. It doesn't produce a specific illness, nor the specific causes of it have been identified yet. However, this feeling of sickness tends to decrease the productivity of the building occupants. The complaints may come from one particular area of the building, but it can spread to the entire structure. Most of the complaints reported by the people affected are somewhat relieved once they leave the contaminated area of the building, although the effects of neurotoxins can remain in the organism.

The sick building syndrome causes a lot of symptoms, for example, headaches, sensitivity to odors, nausea, irritation of the eyes, nose, and throat, and dizziness. It can also produce dry coughs, chest pain, shortness of breath, flu-like symptoms. Its symptoms can get to be very severe since it can also lead to cancers, asthma, pregnancy issues and miscarriages and personality changes.

20 to 40 percent of buildings have visible fungal growth
This syndrome is a concerning issue for current building occupants. According to Jean-Denis Bailly of the University of Toulouse in France and its colleagues, 20 to 40 percent of the
buildings in Northern Europe and North America show fungal growth that is entirely visible to the human eye.

These scientists tested three species that are very likely to grow in buildings. These were Penicillium brevicompactum, Aspergillus Versicolor, and Stachybotrys chartarum, all of which were set to grow on a wallpaper in the lab, all of them producing mycotoxins. However, these various indoor contaminants release different mycotoxins and their mycelia – which is the part of the fungi that tries to find sources for nutrition from the environment – also differs depending on the fungi; therefore, the amount of mycotoxins that they release into the air varies too.

“Aspergillus Versicolor, a potent producer of sterigmatocystin (STG), is one of the most frequent fungal contaminants of indoor environments that can be found together in building materials, in dust or in the air samples.” Image Credit: MYCOTA

They wanted to know if any interference was needed for the fungi on the wallpapers to contaminate the air. They found that the transfer of toxins into the air requires air velocities
that are always present in real life conditions in every building. They came to this conclusion after they simulated airflow into a moldy piece of wallpaper, including the three species they analyzed. During this experiment, they controlled and used different speeds and directions of the air.

“We demonstrated that mycotoxins could be transferred from a moldy material to air, under conditions that may be encountered in buildings,” Bailly said in a statement. “For instance, Aspergillus Versicolor, a potent producer of sterigmatocystin (STG), is one of the most frequent fungal contaminants of indoor environments that can be found together in building materials, in dust or in the air samples.”

The toxins that these fungi release are so small – smaller than spores – that people can easily inhale them and they can penetrate into the respiratory tract.

Levels of toxins released by wallpaper fungi must be a parameter of indoor air quality

The presence of mycotoxins is commonly associated with contaminated food. However, it is important to raise awareness about the incidence of mycotoxins in small particles such as dust and on wallpapers, and how they can readily affect people just by breathing.

“It seems important to take these data in consideration for risk assessment related to fungal contamination of the indoor environment and the possible toxicity associated with inhalation of these toxins” is stated on the report of the research.

Even if there are many benefits to living in an energy-efficient house, Bailly and his colleagues also highlighted the fact that these fungus-associated threats are quite bigger in these type of houses because they are isolated from the outside to save energy. Isolated water-using appliances – for example, coffee makers – provide the perfect conditions for fungi to grow.

**Signs and symptoms**

Human exposure to bioaerosols has been documented to give rise to a variety of adverse health effects.[5] Building occupants complain of symptoms such as sensory irritation of the eyes, nose, or throat; neurotoxic or general health problems; skin irritation; nonspecific hypersensitivity reactions; infectious diseases;[6] and odor and taste sensations.[7] Exposure to poor lighting conditions has led to general malaise.[8]

Extrinsic allergic alveolitis has been associated with the presence of fungi and bacteria in the moist air of residential houses and commercial offices.[9]

The WHO has classified the reported symptoms into broad categories, including: mucous membrane irritation (eye, nose, and throat irritation), neurotoxic effects (headaches, fatigue, and irritability),...
asthma and asthma-like symptoms (chest tightness and wheezing), skin dryness and irritation, gastrointestinal complaints and more.[10]

Several sick occupants may report individual symptoms which do not appear to be connected. The key to discovery is the increased incidence of illnesses in general with onset or exacerbation within a fairly close time frame—usually within a period of weeks. In most cases, SBS symptoms will be relieved soon after the occupants leave the particular room or zone.[11] However, there can be lingering effects of various neurotoxins, which may not clear up when the occupant leaves the building. In some cases—particularly in sensitive individuals—there can be long-term health effects.

**Cause**

It has been suggested[by whom?] that sick building syndrome could be caused by inadequate ventilation, deteriorating fiberglass duct liners, chemical contaminants from indoor or outdoor sources, and biological contaminants, air recycled using fan coils, traffic noise, poor lighting, and buildings located in a polluted urban area.[8] Many volatile organic compounds, which are considered chemical contaminants, can cause acute effects on the occupants of a building. "Bacteria, molds, pollen, and viruses are types of biological contaminants" and can all cause SBS. In addition, pollution from outdoors, such as motor vehicle exhaust, can contribute to SBS.[8] Adult SBS symptoms were associated with a history of allergic rhinitis, eczema and asthma.[12]

A 2015 study concerning the association of SBS and indoor air pollutants in office buildings in Iran found as CO2 levels increase in a building, symptoms like nausea, headaches, nasal irritation, dyspnea, and throat dryness have also been shown to increase.[8] Certain work conditions have been found to be correlated with specific symptoms. For example, higher light intensity was significantly related to skin dryness, eye pain, and malaise.[8] Higher temperature has also been found to correlate with symptoms such as sneezing, skin redness, itchy eyes and headache, while higher relative humidity has been associated with sneezing, skin redness, and pain of the eyes.[8]

ASHRAE has recognized that polluted urban air, designated within the United States Environmental Protection Agency (EPA)’s air quality ratings as unacceptable requires the installation of treatment such as filtration for which the HVAC practitioners generally apply carbon impregnated filters and their like.

In 1973, in response to the 1973 oil crisis and conservation concerns, ASHRAE Standards 62-73 and 62-81 reduced required ventilation from 10 CFM (4.76 L/S) per person to 5 CFM (2.37 L/S) per person, but this was found to be a contributing factor to sick building syndrome.[13] As of the 2016 revision, ASHRAE ventilation standards call for 5 to 10 CFM of ventilation per occupant (depending on the occupancy type) in addition to ventilation based on the zone floor area delivered to the breathing zone.[14]

**Psychological factors**

One study looked at commercial buildings and their employees, comparing some environmental factors suspected of inducing SBS to a self-reported survey of the occupants,[15] finding that the measured psycho-social circumstances appeared more influential than the tested environmental factors.[16] The list of environmental factors in the study can be found here.[17] Limitations of the study include that it only measured the indoor environment of commercial buildings, which have different building codes than residential buildings, and that the assessment of building environment was based on layman observation of a limited number of factors.

Research has shown that SBS shares several symptoms common in other conditions thought to be at least partially caused by psychosomatic tendencies. The umbrella term autoimmune/inflammatory syndrome induced by adjuvants' has been suggested. Other members of the suggested group include Silicosis, Macrophagic myofascitis, The Gulf War syndrome, Post-vaccination phenomena.[18]
Workplace

Greater effects were found with features of the psychosocial work environment including high job demands and low support. The report concluded that the physical environment of office buildings appears to be less important than features of the psychosocial work environment in explaining differences in the prevalence of symptoms. However, there is still a relationship between sick building syndrome and symptoms of workers regardless of workplace stress.[14]

Excessive work stress or dissatisfaction, poor interpersonal relationships and poor communication are often seen to be associated with SBS, recent studies show that a combination of environmental sensitivity and stress can greatly contribute to sick building syndrome.

Specific work-related stressors are related with specific SBS symptoms. Workload and work conflict are significantly associated with general symptoms (headache, abnormal tiredness, sensation of cold or nausea). While crowded workspaces and low work satisfaction are associated with upper respiratory symptoms.[19]

Engineers are often affected by Sick Building Syndrome. One studied case is that of Stephen Danielson, who typically has the ailment for 6 months out of the year. It manifests as a wheeze, commonly known as the Danielson Wheeze.[21]

Specific careers are also associated with specific SBS symptoms. Transport, communication, healthcare, and social workers have highest prevalence of general symptoms. Skin symptoms such as eczema, itching, and rashes on hands and face are associated with technical work. Forestry, agriculture, and sales workers have the lowest rates of sick building syndrome symptoms.[22]

Milton et al. determined the cost of sick leave specific for one business was an estimated $480 per employee, and about five days of sick leave per year could be attributed to low ventilation rates. When comparing low ventilation rate areas of the building to higher ventilation rate areas, the relative risk of short-term sick leave was 1.53 times greater in the low ventilation areas.[23]

Work productivity has been associated with ventilation rates, a contributing factor to SBS, and there’s a significant increase in production as ventilation rates increase, by 1.7% for every two-fold increase of ventilation rate.[24]

Home

Sick building syndrome can also occur due to factors of the home. Laminated flooring can cause more exposure to chemicals and more resulting SBS symptoms compared to stone, tile, and cement flooring.[12] Recent redecorating and new furnishings within the last year were also found to be associated with increased symptoms, along with dampness and related factors, having pets, and the presence of cockroaches.[12] The presence of mosquitoes was also a factor related to more symptoms, though it is unclear if it was due to the presence of mosquitoes or the use of repellents.[12]

Diagnosis

While sick building syndrome (SBS) encompasses a multitude of non-specific symptoms, building-related illness (BRI) comprises specific, diagnosable symptoms caused by certain agents (chemicals, bacteria, fungi, etc.). These can typically be identified, measured, and quantified.[25] There are usually 4 causal agents in BRI; 1.) Immunologic, 2.) Infectious, 3.) toxic, and 4.) irritant.[25] For instance, Legionnaire’s disease, usually caused by Legionella pneumophilia, involves a specific organism which could be ascertained through clinical findings as the source of contamination within a building. SBS does not have any known cure; alleviation consists of removing the affected person from the building associated with non-specific symptoms. BRI, on the other hand, utilizes treatment appropriate for the contaminant identified within the building (e.g., antibiotics for Legionnaire’s disease). In most cases, simply improving the indoor air quality (IAQ) of a particular building will attenuate, or even eliminate, the acute symptoms of SBS, while removal of the source
contaminant would prove more effective for a specific illness, as in the case of BRI. Building-Related Illness is vital to the overall understanding of Sick Building Syndrome because BRI illustrates a causal path to infection, theoretically. Office BRI may more likely than not be explained by three events: “Wide range in the threshold of response in any population (susceptibility), a spectrum of response to any given agent, or variability in exposure within large office buildings.” Isolating any one of the three aspects of office BRI can be a great challenge, which is why those who find themselves with BRI should take three steps, history, examinations, and interventions. History describes the action of continually monitoring and recording the health of workers experiencing BRI, as well as obtaining records of previous building alterations or related activity. Examinations go hand in hand with monitoring employee health. This step is done by physically examining the entire workspace and evaluating possible threats to health status among employees. Interventions follow accordingly based off the results of the Examination and History report.

**Prevention**

- Roof shingle non-pressure cleaning for removal of algae, mold, and *Gloeocapsa magma*.
- Using ozone to eliminate the many sources, such as VOCs, molds, mildews, bacteria, viruses, and even odors however numerous studies identify High-ozone shock treatment as ineffective despite commercial popularity and popular belief.
- Replacement of water-stained ceiling tiles and carpeting.
- Use of paints, adhesives, solvents, and pesticides in well-ventilated areas and use of these pollutant sources during periods of non-occupancy.
- Increasing the number of air exchanges; the American Society of Heating, Refrigeration and Air-Conditioning Engineers recommend a minimum of 8.4 air exchanges per 24-hour period.
- Proper and frequent maintenance of HVAC systems.
- UV-C light in the HVAC plenum.
- Installation of HVAC Air Cleaning systems or devices to remove VOC’s, bioeffluents (people odors) from HVAC systems conditioned air.
- Regular vacuuming with a HEPA filter vacuum cleaner to collect and retain 99.97% of particles down to and including 0.3 micrometers.
- Place bedding in sunshine, which is related to a study done in a high-humidity area where damp bedding was common and associated with SBS. Increased ventilation rates that are above the minimum guidelines.
- Lighting in the workplace should be designed to give individuals control, and be natural when possible.

**Epidemiology**

Some studies have shown a small difference between genders, with women having slightly higher reports of SBS symptoms compared to men. However, many other studies have shown an even higher difference in the report of sick building syndrome symptoms in women compared to men. It is not entirely clear, however, if this is due to biological, social, or occupational factors.

A 2001 study published in the Journal Indoor Air 2001 gathered 1464 office-working participants to increase the scientific understanding of gender differences under the Sick Building Syndrome phenomenon. Using questionnaires, ergonomic investigations, building evaluations, as well as physical, biological, and chemical variables, the investigators obtained results that compare with past studies of SBS and gender. The study team found that across most test variables, prevalence
rates were different in most areas, but there was also a deep stratification of working conditions between genders as well. For example, men's workplace tend to be significantly larger and have all around better job characteristics. Secondly, there was a noticeable difference in reporting rates, finding that women have higher rates of reporting roughly 20% higher than men. This information was similar to that found in previous studies, indicating a potential difference in willingness to report. [29]

There might be a gender difference in reporting rates of sick building syndrome because women tend to report more symptoms than men do. Along with this, some studies have found that women have a more responsive immune system and are more prone to mucosal dryness and facial erythema. Also, women are alleged by some to be more exposed to indoor environmental factors because they have a greater tendency to have clerical jobs, wherein they are exposed to unique office equipment and materials (example: blueprint machines), whereas men often have jobs based outside of offices. [30]

History

In the late 1970s, it was noted that nonspecific symptoms were reported by tenants in newly constructed homes, offices, and nurseries. In media it was called “office illness”. The term "Sick Building Syndrome" was coined by the WHO in 1986, when they also estimated that 10-30% of newly built office buildings in the West had indoor air problems. Early Danish and British studies reported symptoms.

Poor indoor environments attracted attention. The Swedish allergy study (SOU 1989:76) designated "sick building" as a cause of the allergy epidemic as was feared. In the 1990s, therefore, extensive research into "sick building" was carried out. Various physical and chemical factors in the buildings were examined on a broad front.

The problem was highlighted increasingly in media and was described as a “ticking time bomb”. Many studies were performed in individual buildings.

In the 1990s "sick buildings" were contrasted against "healthy buildings". The chemical contents of building materials were highlighted. Many building material manufacturers were actively working to gain control of the chemical content and to replace criticized additives. The ventilation industry advocated above all more well-functioning ventilation. Others perceived ecological construction, natural materials, and simple techniques as a solution.

At the end of the 1990s came an increased distrust of the concept of "sick building". A dissertation at the Karolinska Institutet in Stockholm 1999 questioned the methodology of previous research, and a Danish study from 2005 showed these flaws experimentally. It was suggested that sick building syndrome was not really a coherent syndrome and was not a disease to be individually diagnosed. In 2006 the Swedish National Board of Health and Welfare recommended in the medical journal Läkartidningen that "sick building syndrome" should not be used as a clinical diagnosis. Thereafter, it has become increasingly less common to use terms such as "sick buildings" and "sick building syndrome" in research. However, the concept remains alive in popular culture and is used to designate the set of symptoms related to poor home or work environment engineering. "Sick building" is therefore an expression used especially in the context of workplace health.

Sick building syndrome made a rapid journey from media to courtroom where professional engineers and architects became named defendants and were represented by their respective professional practice insurers. Proceedings invariably relied on expert witnesses, medical and technical experts along with building managers, contractors and manufacturers of finishes and furnishings, testifying as to cause and effect. Most of these actions resulted in sealed settlement agreements, none of these being dramatic. The insurers needed a defense based upon Standards of Professional Practice to meet a court decision that declared—that in a modern, essentially sealed building, the HVAC systems must produce breathing air for suitable human consumption. ASHRAE (American
Society of Heating, Refrigeration and Air Conditioning Engineers, currently with over 50,000 international members) undertook the task of codifying its IAQ (Indoor Air Quality) standard. ASHRAE empirical research determined that "acceptability" was a function of outdoor (fresh air) ventilation rate and used carbon dioxide as an accurate measurement of occupant presence and activity. Building odors and contaminants would be suitably controlled by this dilution methodology. ASHRAE codified a level of 1,000 ppm of carbon dioxide and specified the use of widely available sense-and-control equipment to assure compliance. The 1989 issue of ASHRAE 62.1-1989 published the whys and wherefores and overrode the 1981 requirements that were aimed at a ventilation level of 5,000 ppm of carbon dioxide, (the OAHA workplace limit), federally set to minimize HVAC system energy consumption. This apparently ended the SBS epidemic.

Over time, building materials changed with respect to emissions potential. Smoking vanished and dramatic improvements in ambient air quality, coupled with code compliant ventilation and maintenance, per ASHRAE standards have all contributed to the acceptability of the indoor air environment. With the publication of ASHRAE 62.1-2013 ASHRAE has reactivated 1981 with respect to ventilation rates. Only time and the courts will tell how right, or wrong ASHRAE is.

See also

- Aerotoxic syndrome
- Multiple chemical sensitivity
- NASA Clean Air Study
- Somatization disorder

References


15. Taken from another study: Whitehead II


18. The sick building syndrome as a part of the autoimmune (auto-inflammatory) syndrome induced by adjuvants. ncbi.nlm.nih.gov


By Shaoni Bhattacharya

Zapping bugs which flourish in office ventilation systems with ultraviolet radiation could cut the sickness suffered by millions of office workers, suggests a new study.

“Sick building syndrome”, recognised as a medical condition in the 1980s, results in symptoms such as a stuffy nose, itchy eyes and throat and respiratory problems like asthma. The symptoms are especially common in people who work in air-conditioned offices, where heavy growth of bacteria and fungi is common within the ventilation systems.

Dick Menzies at McGill University in Montreal, Canada, and colleagues found that by installing UV germicidal irradiation (UVGI) lamps in the air-conditioning systems of three office blocks they could cut all such symptoms by 20 per cent.

“Installation of UVGI in most North American offices could resolve work-related symptoms in about four million employees,” he says.

“A lot of people think sick-building syndrome is all in people’s heads,” Menzies told the Toronto Star newspaper. “The fact that you can install UV lights and a susceptible subgroup get biologically plausible improvements tells me that at least some of the problem is clearly not in their head.”

Survival time

The team had UVGI lamps installed in the cooling coils and drip pans of the ventilation systems of three office blocks in Montreal. Resistant bugs sitting on the surfaces were predicted to have a survival time of less than four minutes.

The lamps were switched off for the first 12 weeks of the study, while 771 office workers were quizzed on the specific symptoms they suffered. The lamps were then switched on for four weeks, and off again for 12. In total, three on/off cycles were tested over 48 weeks.

In workers reporting symptoms, switching on the UVGI lamps resulted in a 20 per cent overall reduction. It also slashed respiratory symptoms by 40 per cent, and mucosal symptoms by 30 per cent.

These effects were greatest in people with known allergies and in workers who had never smoked. Muscular complaints were halved in people who never smoked.
Microbes and endotoxins

The team says the UVGI lamps resulted in a 99 per cent cut in the concentrations of microbes and of endotoxins – poisons in the cell walls of certain bacteria. Endotoxins have been associated with flu-like symptoms.

As 70 per cent of employees in North America and Western Europe now work in offices, the researchers suggest that installing UVGI may be a cost-effective way of reducing employee absence due to sick building syndrome.

Other methods of cleaning office ventilators are being developed, including ones that use filters or ionisation to stop the microbes reaching workers.

However, Roy Anderson, an infectious diseases expert at Imperial College in London, UK, cautions that disinfecting ventilation systems alone is unlikely to stop outbreaks of all contagious respiratory diseases.

“You’ve got multiple methods of transmission and for control, you need to address all of them,” he told Associated Press.

Journal reference: The Lancet: (vol 362, p 1785)

TOWARD ELIMINATING ‘SICK-BUILDING SYNDROME’ WITH LOW-COST AIR PURIFIERS

"Indoor-Air Cleanup"

Chemical & Engineering News

If you’re inside, chances are you’re breathing in low levels of indoor air pollution, a mix of volatile organic compounds and other gaseous substances that can accumulate in buildings and potentially make you sick. An article in Chemical & Engineering News (C&EN), the weekly newsmagazine of the American Chemical Society, describes the latest in air-cleaning technology, including one approach based on a filter for the International Space Station.

Mitch Jacoby, a senior correspondent with C&EN, writes that in recent years, scientists have been gaining a better understanding of the health problems associated with indoor air
pollution collectively known as “sick-building syndrome.” In a study from 2012, one team discovered that low levels of carbon dioxide or volatile organic compounds affected people’s mental acuity and decision-making. Other symptoms, such as difficulty breathing and eye irritation, have also been associated with poor indoor air quality. Cracking open a window can help pollutants escape but is not always an option in offices — or in space. And devices to rid indoor air of unwanted gases or particles have traditionally relied on expensive metals such as platinum and palladium.

But help could soon be on the way. Scientists are working to replace these precious metals with low-cost alternatives. One company is building on its novel metal mesh design for purifying the International Space Station cabin air for more earthly applications. Recent studies that tested out new air-cleaning devices have so far yielded promising results.

It’s best to reduce chemical exposure in any way possible, but in today’s chemical laden world, it is practically impossible to completely avoid harmful toxins. For the remaining chemicals in indoor air, there are some natural ways to help reduce your family’s exposure.

I’ve mentioned houseplants before and they are a great option for improving indoor air (read my full list of recommended plants here). We have about eight indoor plants and I’m hoping to add more soon. For those who don’t want the upkeep of indoor plants or can’t have them due to pets/kids/etc, there are some other natural options.

Besides indoor plants, these are my top three natural air cleaners (and I use all three):

**BEESWAX CANDLES**

Regular paraffin candles are petroleum derived and can release chemicals like benzene, toluene, soot and other chemicals into the air. These types of candles do more harm than good for indoor air quality and should be avoided.

Pure Beeswax Candles on the other hand burn with almost no smoke or scent and clean the air by releasing negative ions into the air. These negative ions can bind with toxins and help remove them from the air.
Beeswax candles are often especially helpful for those with asthma or allergies and they are effective at removing common allergens like dust and dander from the air. Beeswax candles also burn more slowly than paraffin candles so they last much longer.

I personally only use beeswax candles in our house. We buy them by the case and our favorites are:

- **Tea-light beeswax candles**
- **Votive size beeswax candles**

**SALT LAMPS**

Salt lamps are another natural way to clean indoor air. They are made from himalayan salt crystals and just like the beeswax candles, they release negative ions in to the air to help clean it. They are also a beautiful light source. The only downside…. my kids like to lick them!

The Himalayan Natural Crystal Salt Lamp also works as an air purifier. When lit, the lamp emits negative ions that fight against positively charged particles that cause you to feel stuffy and sluggish. The lit salt crystal clears the air naturally of allergens like smoke, pet dander, pollens, and other air pollutants. It dilutes odors so that you can breathe easier. People with asthma often find it helpful in reducing their symptoms. You can keep the lamp lit for as long as you like to maintain this purifying effect. ([source](#))

We don’t do night lights in our kids rooms, but if we did or if we need a light source at night for reading, we use salt lamps. The natural orange glow doesn’t disrupt sleep hormones like fluorescent or blue lights do and I find it very relaxing.

We have an 8-inch salt lamp that we use regularly (it is also the most cost effective for its size, as the bigger lamps can get very pricey).
Another natural air cleaning option I recently discovered is bamboo charcoal. I’ve talked about one of my unusual uses for charcoal before and we use a charcoal block water filter to remove toxins from our water.

Charcoal can have the same toxin-removing effect on the air. We use bamboo charcoal in burlap bags in our house. They work wonders for odor removal and removing toxins from the air:

Moso air purifying bags, made of linen and filled with bamboo charcoal, absorb unpleasant odors and dehumidify the air. The porous structure of the high density bamboo charcoal helps remove bacteria, harmful pollutants and allergens from the air and absorbs moisture, preventing mold and mildew by trapping the impurities inside each pore. The Moso air purifying bag has been scientifically proven to reduce the amount of formaldehyde, ammonia, benzene, and chloroform gases emitted from everyday items such as paint, carpeting, furniture, air fresheners, chemical cleaners, rubber, and plastics. Toxin free, the bags are safe to use around pets and children. The bamboo charcoal rejuvenates when the bags are placed in sunlight once a month. You can reuse the bags for two years, after which the charcoal can be poured into the soil around plants to fertilize and help retain moisture. (source)

I’ve found that these are also great for removing odors from cars or from the bathroom (especially if you have recently potty-trained boys who don’t always have perfect aim!).

We use these Moso bags in every room of our house.

How do you keep your indoor air clean? Share your best tips below!

http://www.medicalexpose.com/
3 NATURAL WAYS TO CLEAN INDOOR AIR