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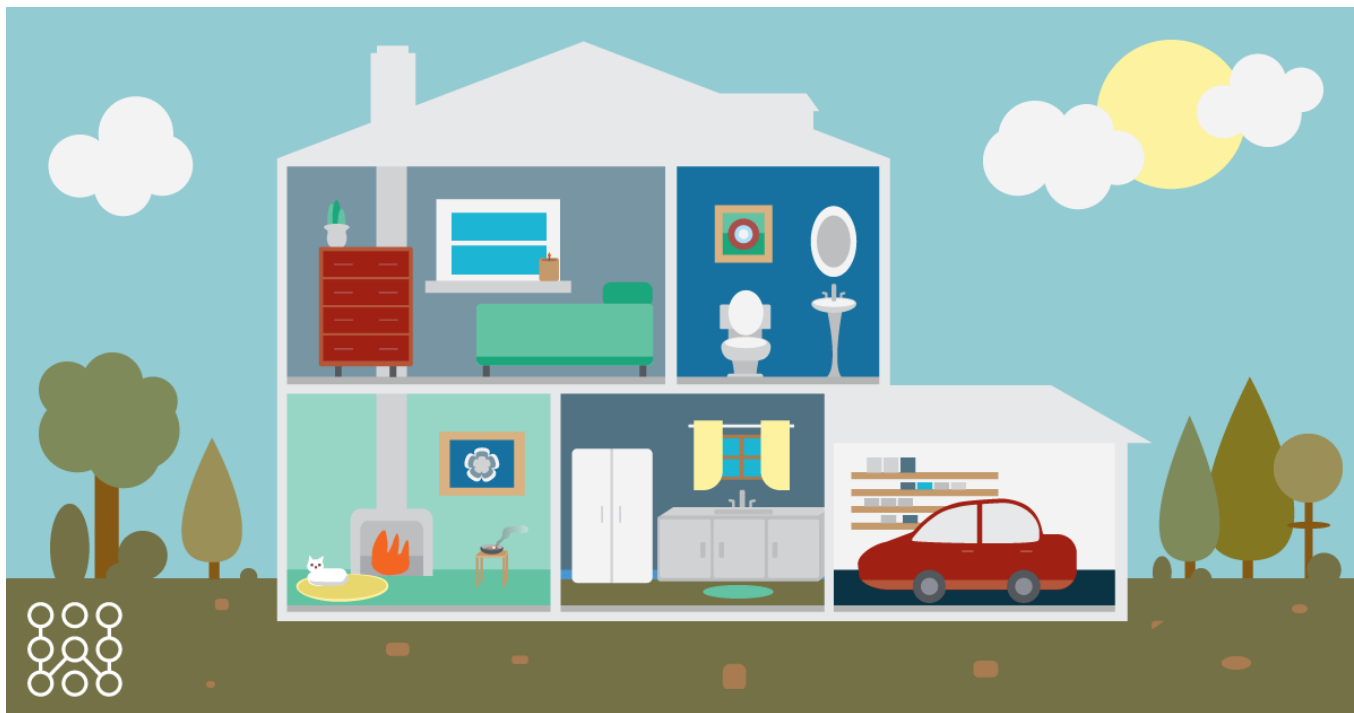
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WELL@Home: Quick tips to improve indoor air quality

Tuesday, November 21, 2017 / By: Dusan Licina

WELL Tips



Think about how much time you plan to spend outdoors today? Research shows that we spend approximately 90% of our lifetime in enclosed spaces, and as much as 69% of that time is within the home.¹ While cooking, cleaning or even comfortably resting on a sofa, we are exposed to millions of invisible air contaminants which can put us at risk for health

problems. A recent global burden of disease study, published in *The Lancet*, demonstrated that household air pollution was rated as the third cause of ill health for the world's population!²

As an air quality subject matter expert at IWBI, I am able to advocate for how the air that we breathe impacts human health. Read on to discover my top three tips for eliminating air contaminants and making your home a cleaner, safer space.

1. Prevention is better than cure.

Max von Pettenkofer (1818–1901), a pioneer of modern hygiene and preventive medicine, once said *"If there is a pile of manure in a space, do not try to remove the odor by ventilation – Remove the pile of manure."* Here I echo his point by saying that the most effective way to curb air pollution at your homes is to eliminate individual sources or to reduce their emissions.

Eliminate combustion. Combustion-related emissions, mostly from cooking and space heating, are the major and underappreciated sources of air pollution in homes.³ Cooking-related emissions can be detrimental to indoor air quality through creating harmful combustion byproducts such as carbon monoxide, nitrogen dioxide and small particles. This shouldn't compel us to abandon cooking, but should encourage us to opt for non-combustion products and avoid other combustion activities such as, candles, wood and gas fireplaces.

Choose the right materials. An estimated 95% of chemicals largely used in construction lack sufficient data on human health effects.⁴ Building materials, furnishings, fabrics, cleaning products, paints, sealants and adhesives continue to be used, despite known or suspected health hazards. Furnishings, fabrics, cleaning products, paints, sealants and many other building materials can emit volatile or semi-volatile organic compounds into the home air.⁵ Most of these dangers can be eliminated by proper material selection. Always select those that have low-emission certification labels. Consider giving up on your carpets – they are warm and cozy, but they often harbor allergens, dust, bacteria, and other pollutants that can affect indoor air quality and cause health problems.⁶ And finally, remember to trust yourself – if something has a "new smell", get rid of it or let it air out outside.

Avoid scented products. Just remember, the best smell is no smell! Air fresheners, incense, personal care products and other commercially available products emit a bouquet of volatile chemicals and usually serve only to mask rather than eliminate odors. For example, air fresheners emit chemicals such as limonene and pinene that, when mixed with other

airborne pollutants, can produce cancer-causing agents.⁷ Personal care products, including spray perfumes, deodorants, nail polish and hair sprays contain chemicals that can produce dangerous secondary pollutants.⁸ Such products should be avoided or sparingly used, and whenever used, it should be done outdoors or in well-ventilated areas.

2. To change your life, change your habits.

Human behavior is rated as one of the top three components that affect pollutants in our homes.⁹ Even if we minimize individual sources of air pollution in our homes, there are still many unavoidable ones. The good news is that we can still take several actions to further curb the indoor pollution levels.

Let the fresh air in. An open mind is like an open window – it lets the fresh air in. Whenever weather permits, make sure to crack your windows open and let fresh air in. This is especially important to do during high-polluting activities such as cooking, vacuuming or cleaning. Even when you comfortably sleep at night, your metabolism generates carbon-dioxide and other pollutants that could affect the quality of your sleep and next-day performance.¹⁰ Keeping at least a tiny bit of a window open (yes, even when weather outside is cold) should be part of your everyday practice.

Make use of exhaust fans. In addition to kitchens, bathrooms are another hot spots of indoor air pollution. Bathrooms can encourage the growth of mold and mildew, which have been associated with allergic reactions and aggravate lung diseases such as asthma.¹¹ Other than window opening, a great way to increase ventilation and help eliminate pollutants from your home is to make use of exhaust fans (they should be installed in your kitchens and bathrooms). Ensure that your oven, clothes dryer and other appliances are properly ventilated. This simple ventilation strategy should be used not only for kitchens and bathrooms, but also while you are involved in short-term activities that can generate high levels of pollution – for example, cleaning, vacuuming, painting or others. Let the fans run for another 10-15 minutes after you finish your tasks, to minimize any residual air pollution.

Clean and vacuum often. Have you ever noticed that you sneeze while cleaning or vacuuming your home? Although these activities instantaneously increase the amount of dust, allergens and other pollutants in the air, regular cleaning and vacuuming will improve air quality in your home. Consider investing in a vacuum with a HEPA filter or microfiltration bag since a standard or water-filtered vacuum cleaner usually just stirs dust up into the air. Also consider wet instead of dry dusting – this is more efficient way to eliminate dust while preventing its escape into the air and landing on already dusted surfaces. Pay special attention to frequently touched surfaces, such as doorknobs, light switches, faucets, phones... A good practice is to wear an allergy mask (e.g. N-95 respirator) during cleaning

and vacuuming to minimize inhalation of tiny dust particles. For those do-it-yourself enthusiasts, consider making your own cleaner (<http://www.organicauthority.com/sanctuary/5-homemade-cleaners-chemical-free-bathroom.html>) free of harmful chemicals.

Keep the dirt out. As we enter our homes, we inadvertently bring in dust particles, including bacteria, pesticides and other toxins on our clothing, shoes and skin from the outside world.¹² Studies have found that there is common occurrence of coliforms and *Escherichia coli* on our shoes owing to frequent contact with fecal material originating from floors in public restrooms or contact with animal fecal matter.¹³ Consider laundering your clothes (especially new ones before the first use) and shoes regularly with detergent, which eliminates most of bacteria, and next time, try to leave your shoes at the door.

Eliminate secondhand smoke. Globally, 93% of population lives in countries not protected by 100% smoke-free regulations.¹⁴ There is a strong link between exposure to secondhand smoke and adverse health outcomes, such as heart disease, respiratory infections, lung cancer and asthma.¹⁵ In addition to nicotine, cigarettes contain about 600 ingredients that form over 7,000 compounds when burned, of which at least 69 are known to be carcinogenic.¹⁵ If you think that you are protected only because your family member smokes only when you are not at home – you are wrong. The thirdhand smoke (residual chemicals left on indoor surfaces by tobacco smoke) clings to walls, furniture, clothes, bedding, carpets and other surfaces long after smoking has stopped. The only way to protect your home from secondhand and thirdhand smoke is to secure a 100% smoke-free environment.

Conduct mold inspections. Water leaks, poor plumbing, and poorly ventilated bathrooms can create standing water in which microorganisms, such as bacteria and mold, can breed. Humidity levels constantly above 60% in the home can easily cause mold growth, which can lead to odors and cause respiratory irritation and allergies in sensitive individuals.¹⁶ As many as 36% of homes across Europe, Canada, and the United States are facing mold, mildew, or water damage.¹⁷ Exposure to mold has been linked to asthma, bronchitis, hypersensitivity pneumonitis and lung tumor development.¹⁸ The key to mold control is moisture control. A good practice is to conduct regular inspections of plumbing, HVAC equipment, ceilings and roofing to identify sources of moisture and potential condensation issues. If you find moisture or mold, immediately address underlying source of moisture and dry or replace contaminated material. If facing high humidity issues, limit vapor intrusion by using a vapor barrier. Try to maintain relative humidity levels within 30-60% to prevent mold growth and to mitigate odor issues.

3. Rely on active technology.

When outside air is polluted or weather conditions are unfavorable for window opening, indoor pollutant levels can easily increase by insufficient introduction of fresh outdoor air to dilute indoor emissions or by not extracting indoor air pollutants from your home. That is the time for the active systems to kick in.

Install mechanical ventilation. If you live in area that is noisy or where outside air is polluted and weather conditions are unfavorable for most of the year, your best bet is to install mechanical supply and exhaust ventilation. In a mechanical ventilation system, which is often combined with heating and cooling into an air-conditioning system, the supply and exhaust air are transported by means of mechanical fans. Although this solution usually scales with your utility bill, it offers several advantages over window opening, such as better control of ventilation capacity, air filtration, humidity control and heat recovery. However, improperly operated or maintained system has been associated with Legionnaire's disease and symptoms such as dry eyes, skin and throat irritation, fatigue and headache.¹⁹ Make sure to change filters and clean your system regularly, following manufacturer's specifications.

Use air cleaners. Portable room air cleanings can be used to clean the air in specific areas, but they are generally not intended for whole-house air cleaning. The use of air cleaners is linked to reduced allergic rhinitis and asthma symptoms.²⁰ For optimal performance, make sure to maintain your air cleaner according to the manufacturer's instructions. The major problem of this type of products is that there is no addition of outdoor air into the space, so they should not be used as "ventilation" devices but should rather be combined with some sort of outdoor air supply.

Monitor your air. Some indoor air pollutants can be recognized by their immediate impacts on our body such as throat irritation or watery eyes. Others, which often fly under our olfactory radar are not necessarily benign. According to the EPA, some health impacts like respiratory diseases, heart disease and cancer can show up years after exposure. For example, your homes may be contaminated with colorless and odorless gases such as carbon monoxide and radon, which are some of the biggest causes of lung cancer worldwide.²¹ That is why it is important to install air quality sensors and detectors in your homes. Because air quality can fluctuate throughout the day in every household, real-time monitoring is effective way to promptly fix any deviations in indoor quality metrics to minimize exposure. Our markets are becoming flooded with relatively inexpensive and easy to use multi-sensor modules that can monitor key air quality parameters at your home,

such as carbon monoxide, carbon dioxide, volatile organic compounds, particulate matter, etc. These measures will not resolve the issue of air pollution by themselves, but they certainly raise awareness and are an important first step towards solution.

To learn more about intersections between buildings and indoor air quality, their relationship to productivity, well-being and health, and holistic design strategies to promote clean air and minimize human exposure to harmful contaminants, download our new WELL app, Build WELL. (/app) on your mobile device.



Dusan Licina has built his career in the field of energy efficient and healthy built environments. He specializes in air quality engineering, focusing on sources and transport of air pollutants in buildings, human exposure, and optimization of building ventilation systems with an aim to improve air quality. He completed his joint Doctorate degree at the National University of Singapore and Technical University of Denmark. He also holds Master and Bachelor of Science degrees in mechanical engineering

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