

GLOBAL INDOOR HEALTH NETWORK

WORKING TOGETHER FOR HEALTHY INDOOR ENVIRONMENTS
IN OUR HOMES, SCHOOLS AND BUSINESSES



September 25, 2017

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Focus on GIHN's New Paper on "Indoor Air Contaminants"

This edition of the GIHN Newsletter provides excerpts on some of the topics in GIHN's new paper on **Indoor Air Contaminants**. This new paper covers a wide range of indoor air contaminants, but it excludes molds and mycotoxins. We are currently working on another paper that will focus on Molds, Mycotoxins and Related Contaminants in Water-Damaged Buildings.

To learn more about Indoor Air Contaminants and to read our other new papers, [check out our new papers](#) posted on our website.

Indoor Air Contaminants (Overview)

Astute physicians and healers have been aware of the existence of environmental toxins for over a thousand years. The list of substances, both naturally occurring and manmade, which may cause harm to the human organism, is continually growing. Curiously, while heart disease, cancers and rare exotic illnesses frequently grab headlines, illness due to environmental sources, though incredibly common, often receive little or no media coverage.

Typically, little education is offered to allopathic physicians in their medical training on this subject. Hence, there is poor understanding of the concept that our environment is capable of slowly poisoning its inhabitants.

The published roots of toxicology extend back over a millennium. However, thorough understanding of many toxins is not nearly as prevalent as one would expect in our modern medical society. Typically, a few individuals discover the toxic potential of a substance (such as asbestos) and publish their findings. However, history has shown that it may take 3-4 decades or longer for the public and Western medicine to accept (or uncover) the truth about the danger.

Occasionally, an environmental illness becomes national news overnight. Legionnaire's disease, caused by the *Legionella* bacteria, became a media superstar in the summer of 1976 as hundreds of people became ill at the American Legion convention in Philadelphia, Pennsylvania. However, this is the exception for most environmental poisons.

If we look at tobacco as an example, it was more than 50 years before the truth was revealed and, yet, the tobacco companies are still continuing to produce and sell those products.

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See *Indoor Air Contaminants (cont'd)* page 2

Indoor Air Contaminants (Overview)-- continued

Continued from page 1...

This delay in widespread awareness of scientific findings is not new and was certainly around in the times of Copernicus (1473-1543), Galileo (1564-1642) and others whose theories and proofs were opposed by powerful controlling bodies. In time, however, the truths of their works prevailed.

Another important environmental health publication in history was a book by Bernardini Ramazzini in 1700. He published a book titled “De Morbis Artificum” (Diseases of Workers) that discussed the health hazards affecting workers including chemicals, dust, metals and other agents.

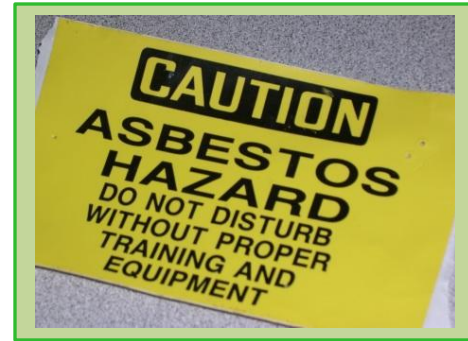
This book highlights a number of environmental toxins, most of which have already been accepted as capable of causing significant disease. Studying their individual histories of usage and poison potential discoveries confirms that we, as people and as physicians, are usually slow to accept that these substances—found in most homes, schools and workplaces—are capable of harming us and our children.

A 2013 research paper describes the situation as follows:

Escalating numbers of people throughout the world are presenting to primary care physicians, allergists, and immunologists with myriad clinical symptoms after low-level exposure to assorted everyday chemicals such as smoke, perfumes, air fresheners, paints, glues and other products.

The emerging problem of ubiquitous adverse toxicant exposures in modern society has resulted in escalating numbers of individuals developing a chemical sensitivity (CS) disorder. As usual in medical history, iconoclastic ideas and emerging evidence regarding novel disease mechanisms, such as the pathogenesis of CS, have been met with controversy, resistance and sluggish knowledge translation.

To learn more about the decades-old strategy of denying the health effects of environmental exposures, [read our paper](#) titled “Discussion of Naysayers and Deniers.”



Asbestos

Asbestos is the commercial name given to six naturally occurring fibers. These six fibers belong to two subgroups (amphibole and serpentine), each differing in chemical formula and physical properties. All types share the property of mutagenicity (i.e., being able to induce malignant transformations in the deoxyribonucleic acid (DNA) of exposed cells). It is well established that all forms of asbestos are carcinogenic.

While most exposure occurs with those who mine, fashion or use asbestos professionally, exposure from buildings can also occur. Asbestos fibers remain in the materials in which they are used, but aging can cause these materials to become friable and release respirable fibers into the air. Remodeling or renovations of buildings further disrupts these materials and allow asbestos fibers to infiltrate the air of indoor spaces. It has also been found in drinking water due to the erosion of natural deposits, leaching from asbestos in landfills and the deterioration of asbestos-containing pipes.

The most common diseases associated with chronic exposure to asbestos are asbestosis and pleural abnormalities (mesothelioma, lung cancer). Cancers associated with asbestos exposure affect the lungs, larynx, ovaries, pharynx, stomach, colorectum and other organs.

Cross contamination (secondhand exposure) can also occur from asbestos on workers' clothing, causing asbestosis in caregivers and family members.

Asbestos has been banned in 55 countries, including bans that will take place in 2018 in Canada, Oman and Sri Lanka. However, asbestos has not been fully banned in the United States or other countries including China, Russia, India, Singapore, Taiwan, Mongolia and Ukraine.

See *Impact of Indoor Air Contaminants* on page 3

Impact of Indoor Air Contaminants

It is staggering to comprehend the enormous impact on our global society as literally millions of individuals and families are harmed by contaminants inside our homes, schools and workplaces. The financial costs are equally staggering with estimates in the hundreds of billions of dollars. The statistics presented throughout this paper should catch the attention of every physician, every lawmaker and every layperson.

Changes over the years in building philosophy, construction materials, pesticides, usage patterns, etc., along with new awareness and improved testing capabilities, have brought us to the understanding that some buildings are sick and can make their occupants sick. Shoddy construction practices and environmental disasters also contribute.

People spend approximately 90% of their time indoors. As such, it is a disconcerting thought that the structures where we live, work and go to school might lead to significant and even deadly health problems.

As a society, we trust and even cherish many of these edifices. Yet some harbor hidden and harmful dangers.

Imagine how different things could be if the truth came to light and all vested parties worked together to improve our indoor air.

- Medical costs would drop significantly.
- Doctors would have accurate, reliable information and be able to provide proper medical diagnosis and treatment.
- We could reverse the huge increase in asthma rates and reduce the billions of dollars being spent on asthma-related illnesses.
- Builders and construction firms would have the information they need to create safe and healthy homes, schools and workplaces.
- Teachers and students could teach and learn in schools with healthy indoor air, increasing their productivity, improving their education and attendance, and increasing their chances for success in school and in the future.

Indoor dampness is estimated to affect 10-50% of indoor environments in Australia, Europe, India, Japan and North America.

Cost of healthcare and lost earnings due to illness caused by endocrine-disrupting chemicals is \$340 billion in the U.S. and \$217 billion in Europe.

50% of all U.S. buildings are water damaged, and the bill to correct these spaces is enormous.

A 2017 report from Europe reported the annual cost of asthma and chronic obstructive pulmonary disease at €82 billion (\$93 billion).

In Finland, the estimated the cost of health problems associated with mould and damp is 450 million euros each year. When you add the cost of repairing the problems, the total reaches 1.4 billion euros.

In Africa, the estimated cost of indoor pollution is \$232 billion.

In the European Region, the estimated cost of indoor and outdoor pollution is \$1.6 trillion (1/10 of the Gross Domestic Product of the entire European Union).

Impact of Indoor Air Contaminants (cont'd)

- Employees could work in buildings with healthy indoor air, increasing worker productivity and decreasing sick days and workers' compensation claims.
- Disability claims would drop significantly, reducing the cost and administrative burden of the rapidly increasing number of social security and private employer disability cases.
- Poor indoor air quality situations would be handled correctly, enabling business owners and landlords to properly remediate and remove contaminants, and prevent homeowners, tenants and employees from losing their homes and jobs as well as their lifetimes of achievements.

In other words, we would create a healthier, more productive society worldwide. For additional statistics, [read our paper](#) titled "Global Burden of Indoor Air Contaminants."

See *Pesticides* on page 4

Pesticides

Pesticides are chemicals used to kill or limit the growth of numerous types of pests. Included in this grouping are herbicides (kill plants), fungicides (kill fungi), insecticides (kill insects) and numerous other classes. They are designed to disrupt biological systems.

Pesticides are used extensively in farming and are also used in homes, schools and businesses. Ten of the twelve most dangerous organic chemicals are pesticides.

In addition to the widespread use of pesticides on agricultural lands, parks, schools and commercial and residential properties, pesticides are also found in household cleaners, hand soaps and swimming pools.

There are more than 17,000 pesticide products on the market. Many of those are approved through “conditional registration”—a regulatory loophole that allows products on the market quickly without thorough review.

Pesticide exposure has been linked to numerous health effects including non-Hodgkin’s lymphoma, Parkinson’s disease, autism, leukemia, fetal death, birth defects, neurodevelopmental disorders and cancer.

Pesticide poisoning is another significant health issue caused by exposure to pesticides. Symptoms include nausea, vomiting, headaches, rashes, eye irritation, fatigue, weakness, cramps, tremors, seizures and death.

As stated by the World Health Organization:

Cases of acute pesticide poisoning (APP) account for significant morbidity and mortality worldwide. Developing countries are particularly susceptible due to poorer regulation, lack of surveillance systems, less enforcement, lack of training and inadequate access to information systems.

Many individuals and workers who experience health effects from APP may never present to a health-care provider due to distance from a medical facility, lack of resources, economic factors, fear of job loss or other reasons. Some health-care providers may be unaware of the relationship between pesticide and illnesses and fail to diagnose or report the incident properly.



Pesticides (continued)

According to a 2009 report, over 1 billion pounds of pesticides are used in the United States and 5.6 billion pounds are used worldwide.

Although attempts to reduce pesticide use through organic agricultural practices and the use of other technologies to control pests continue, exposure to pesticides occupationally, through home and garden use, through termite control or indirectly through spray drifts and through residues in household dust, and in food and water are common.

The U.S. Department of Agriculture has estimated that 50 million people in the United States obtain their drinking water from groundwater that is potentially contaminated by pesticides and other agricultural chemicals. Children from 3-6 years old received most of their dermal and non-dietary oral doses from playing with toys and while playing on carpets which contributed the largest portion of their exposure.

Another type of “indoor environment” affected by organophosphates is the cabins inside airplanes. Organophosphates are added as a lubricant in aircraft engine oil and are included in the “bleed air” that is mixed inside the aircraft with recirculated cabin air. This creates a condition known as aerotoxic syndrome.

In 2017, the United Nations issued a special report discussing the harmful impact of pesticides on human health and ecosystems worldwide.

To learn more about chlorpyrifos, glyphosate (Roundup) and other specific types of pesticides, the 2017 report by the UN, and alternatives for pest control, [read our paper](#) titled “Indoor Air Contaminants.”

See *Chemical Sensitivity* on page 5

Chemical Sensitivity

Because of harm caused by chemicals in our environment and in commercial and consumer products, there are an increasing number of people developing a condition commonly known as chemical sensitivity. Some of the other names for this illness are multiple chemical sensitivity, Toxicant-induced Loss of Tolerance (TILT), environmental intolerance, sensitivity-related illness and Cumulative Organic Chemical Hyper-Toxicity.

Dr. William Rea, a pioneer in this field, wrote a paper in 2016 on the “History of Chemical Sensitivity and Diagnosis.” He discusses the connection between chemical sensitivity and other environmental exposures. Here is an excerpt from the paper:

Histories of mold, pollen, dust, food, chemicals, and electromagnetic field (EMF) sensitivities are the major categories of triggers for chemical sensitivity. They are tied together by the coherence phenomenon, where each has its own frequencies and identifiable EMF; therefore, they can be correlated.

The principles of diagnosis and treatment depend on total environmental and total body pollutant loads, masking or adaptation, bipolarity of response, and biochemical individuality, among others.

A 2013 research paper by Dr. Stephen Genuis, another leader in this field, states:

Escalating numbers of people throughout the world are presenting to primary care physicians, allergists, and immunologists with myriad clinical symptoms after low-level exposure to assorted everyday chemicals such as smoke, perfumes, air fresheners, paints, glues, and other products.

The emerging problem of ubiquitous adverse toxicant exposures in modern society has resulted in escalating numbers of individuals developing a chemical sensitivity (CS) disorder. As usual in medical history, iconoclastic ideas and emerging evidence regarding novel disease mechanisms, such as the pathogenesis of CS, have been met with controversy, resistance, and sluggish knowledge translation.

To learn more about Chemical Sensitivity, [read our paper](#) titled “Indoor Air Contaminants.”

Histories of mold, pollen, dust, food, chemicals, and electromagnetic field (EMF) sensitivities are the major categories of triggers for chemical sensitivity. They are tied together by the coherence phenomenon, where each has its own frequencies and identifiable EMF; therefore, they can be correlated.

Formaldehyde

Formaldehyde (FA) is a gas at room temperature. It chemically reacts with biological molecules, amino acids, nucleosides, nucleotides, DNA and proteins and forms DNA-protein crosslinks. Thus, it is recognized as a mutagen and a probable human carcinogen.

In June 2011, the U.S. Department of Health and Human Services added eight new substances, including formaldehyde, to its list of known human carcinogens.

It is known to irritate mucous membranes and is released from paints, adhesives, sheetrock, ceiling tiles and wood materials. Formaldehyde has also been shown to have high sympathetic activity, increase the heart rate, alter the immune system, cause headaches, affect cognitive function, cause irritation and allergic contact dermatitis, stimulate reproductive problems and possibly cause birth defects. It can aggravate existing lung disease including asthma and emphysema.

In research studies, FA showed effects on embryonic development and fetal organs (liver, lungs and kidneys). Mitochondrial damage was demonstrated in fetal tissues.

After Hurricanes Katrina and Rita, there were many news stories about people becoming ill in mobile homes that were supplied by FEMA (Federal Emergency Management Agency). Eventually, tests were done and high levels of formaldehyde were found.

From 2012 through 2014, there were numerous media reports about formaldehyde in laminate flooring sold by Lumber Liquidators. Although the CDC concluded that the “concentrations may dissipate within several years,” researchers reviewed the data again in July 2016. The study concluded that non-cancer and cancer health effects are more than 12 times higher than those reported by the CDC and will persist for long periods of time (greater than 78 years).

See *EMF and RF* on page 6

Electromagnetic Fields (EMF) and Radio Frequencies (RF)

GIHN note: Our paper on “Indoor Air Contaminants” provides an overview of this topic. We are currently working on another paper that will provide an in-depth discussion of EMF and RF.

The use of EMF and RF devices is growing exponentially. These devices transmit wirelessly using Electromagnetic Fields (EMF) and Radio Frequencies (RF). They are NOT safe and are harmful to adults, children, animals and plants.

What is the difference between EMF and RF?

Electromagnetic fields or EMFs usually refer to low frequency magnetic fields. Magnetic fields are created by electricity flowing through wires. Common EMF sources are power and transmission lines, internal building wiring system, electrical panels, transformers, motors and appliances. Elevated EMF fields are often caused from wiring problems, stray current or bad grounding.

Radio Frequency Radiation or RFs usually are high frequency electromagnetic radiation due to the use of wireless equipment, devices and data transmission. Common RF sources are radio and television transmissions, cell towers and antennas, portable phones, cell phones, wireless computer networks (WLAN) and radar equipment.

The corporations that develop and sell products and equipment using EMF/RF will tell you their products are safe because they meet the FCC guidelines. This is not acceptable and not valid because the current FCC safety limits (established in 1985—more than 30 years ago) are based on thermal exposure alone. The FCC guidelines are ten times more lenient than what the Environmental Protection Agency (EPA) would have permitted to protect the general population from the health hazards of RF/microwave radiation.

In the late 1980s, the EPA radiation division, staffed with practicing biologists and epidemiologists, decided on a safe limit for human exposure. Before the announcement was made, industry intervened, federal funding for that division of the EPA was cut, and the FCC was given the task of setting the RF/microwave guidelines for the public.

Numerous scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. The corporations that develop and sell products and equipment using EMF/RF will tell you their products are safe because they meet the FCC guidelines. This is not acceptable and not valid because the current FCC safety limits (established in 1985—more than 30 years ago) are based on thermal exposure alone.

Electromagnetic Fields (EMF) and Radio Frequencies (RF)--continued

The FCC, made up of bureaucrats and engineers, had no experience or training in setting “health related” guidelines. Therefore, from the beginning, FCC guidelines were set at a limit that was too lenient to protect the general population.

As stated in the International EMF Scientist Appeal:

Numerous scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life.

In 2013, the U.S. Government Accountability Office asked the FCC bring its public radiation exposure guidelines in line with current science. However, despite the extensive research and evidence, there has been no change in the FCC’s recommended RF exposure limits.

A 2015 report, published by the Edmond J. Safra Center for Ethics at Harvard University, explains the lack of progress by the FCC. The report is titled “Captured Agency: How the Federal Communications Commission is Dominated by the Industries it Presumably Regulates.”

The report describes how “the wireless industry has unlimited access to shape FCC policies at the expense of public interests.”

See *Lead* on page 7

Lead

Poisoning from lead has been documented in several ancient civilizations and throughout many decades in modern history.

Even now, in 2017, lead poisoning is still a significant problem. As stated in a recent article in the American Academy of Pediatrics news publication:

Despite considerable progress, our public health system is still failing to prevent children from being lead poisoned and the specter of lead poisoning continues to cast a shadow over the country: over 500,000 American children have a blood lead level of $>5 \mu\text{g/dL}$ ($>50 \text{ ppb}$); 23 million homes have 1 or more lead hazards; an unknown number of Americans drink water from lead service lines; and federal standards for lead in house dust, soil and water fail to protect children.

Lead exposures have occurred via inhalation, ingestion and even through skin contact. Inhalation is less of a concern since most countries have banned tetraethyl lead from automobile gasoline. Ingestion can come from numerous sources including hundreds of consumer products, produce grown in contaminated soils, some home remedies or from lead paint in homes built prior to 1978.

Symptoms of lead poisoning vary based on the chronicity of exposure and age of the patient. Adult acute poisoning may display muscle weakness, pain, headache, occasional encephalitis and memory loss. Children with acute lead exposure exhibit learning disabilities, weight loss, constipation, kidney failure, abdominal pain with vomiting and lethargy.

Chronic exposure in children and adults often shows very subtle symptoms which may gradually become pronounced. Typically, short-term memory loss, concentration deficits, stupor, abdominal pain, loss of coordination and numbness or tingling in the extremities, as well as fatigue, headaches, anemia and sleep disturbances, are found in chronically exposed adults.

Children often refuse play, become excessively active or develop behavior problems. Hearing loss and tooth decay are also seen. Studies have shown that greater incremental loss in intelligence quotient (IQ) points in children occurs at lower levels than for adults.

Despite considerable progress, our public health system is still failing to prevent children from being lead poisoned and the specter of lead poisoning continues to cast a shadow over the country.

Lead (continued)

No safe level of lead exposure has been determined. Prevention is the best treatment and most cases of poisoning are preventable.

Reports of lead poisoning are on the rise throughout the country. Often the stories relate to lead paint in older homes.

Effective January 13, 2017, the U.S. Department of Housing and Urban Development (HUD) changed their reference level for lead blood levels to match that of the CDC. Both agencies now use 5 micrograms per deciliter.

This is a big step for HUD and will hopefully help protect children in HUD homes. However, chronic exposure may show only subtle symptoms that build over time, so parents and physicians must be watchful.

In 2015, there was extensive news coverage about lead in the water in Flint, Michigan. After the city switched its water source to the Flint River, residents became ill and tests showed elevated levels of lead in their blood. In the families tested, the lead levels had doubled or even tripled from the levels prior to the switch.

The city has started a years-long process of replacing pipes all over the city, but people have been harmed and some have died. The tap water is not safe to drink.

In June 2017, five government officials in Michigan were charged with involuntary manslaughter and misconduct in office in relation to the Flint water crisis. Fifteen additional officials are also facing criminal charges. The investigation is ongoing.

The European Commission (EC) published a new regulation about lead in consumer products. Effective June 1, 2016, lead in consumer products cannot be equal to or greater than 0.05% by weight if those articles or accessible parts may be placed in the mouth by children.

See *Products of Combustion* on page 8

Products of Combustion

Products of combustion are the end product that remains after the process of combustion. They are harmful to living and non-living matter. Some sources include carbon dioxide (CO₂), carbon monoxide (CO), kerosene, natural gas, nitrogen dioxide, solid cooking and heating fuels, tobacco smoke and e-cigarettes.

Carbon Dioxide (CO₂)

Carbon dioxide is a colorless, odorless gas. It is a waste product in our bodies and is also produced by burning fossil fuels. CO₂ is a greenhouse gas that contributes to the problem of global warming. It was previously used as an indicator of ventilation and was considered a problem in indoor air only at high levels of 5,000 parts per million or more. However, researchers have found that CO₂ is a direct pollutant that has negative effects on cognitive function.

Carbon Monoxide (CO)

Carbon monoxide (CO) is a colorless, odorless and tasteless gas which is responsible for the most common type of fatal indoor air poisoning in many countries. Derived as a product of incomplete combustion, CO is released from auto exhausts, cigarettes, malfunctioning gas appliances (water heaters, furnaces, ranges etc.), fireplaces and indoor solid fuel burning devices such as wood stoves.

CO may cause acute and chronic poisoning syndromes. Acute toxicity starts as lightheadedness, confusion, headaches, vertigo and flu-like effects. As exposure progresses, significant cardiovascular and central nervous system (CNS) problems occur which can lead to death.

Chronic low level exposure can cause depression, confusion, memory loss and frank dementia. Chronic CO poisoning can cause Parkinsonian symptoms, Chemical Sensitivity (CS) and chronic fatigue.

Kerosene

Kerosene is a combustible hydrocarbon liquid that is often used for lighting, heating and cooking in low and middle-income countries. It is also used for heating in some developed countries such as Japan and some areas in Europe.



Products of Combustion (continued)

The World Health Organization states that kerosene use can lead to particulate matter levels that exceed WHO guidelines.

Natural Gas

Natural gas is a flammable gas used for heating and cooking. Common sources of natural gas are hot water heaters, furnaces and gas cook stoves. Natural gas can cause respiratory illness, worsen allergies and be harmful to those with environmental and chemical sensitivities.

The Canada Mortgage and Housing Corporation (CMHC) Clean Air Guide in 1993 identified gas appliances as significant contributors to chemical contamination in the home. They recommended that gas appliances be replaced with electric ones to reduce indoor air pollution.

A 2014 paper on emissions from natural gas stoves says "gas stoves emit nitrogen dioxide (NO₂), carbon monoxide (CO), and formaldehyde (HCHO), each of which can exacerbate various respiratory and other health ailments.

Solid Cooking and Heating Fuels

Many people around the world use solid fuels for cooking and heating. Solid fuels include the household combustion of coal or biomass (such as wood, charcoal, dung and crop residues). They are typically burned in poorly ventilated conditions which results in indoor air pollution that far exceeds national standards and international guidelines.

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See *Products of Combustion (cont'd)* on page 9

Products of Combustion (continued)

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Solid Cooking and Heating Fuels (continued)

A 2016 report estimates that approximately 3 billion people (or half of the world's population) use biomass for cooking or heating. In China alone, 420,000 annual deaths are due to indoor air pollution caused by solid fuels.



Tobacco Smoke and E-Cigarettes

Tobacco smoke contains a toxic mix of more than 7,000 chemicals which are subsequently inhaled into the smoker's lungs and many of which are subsequently exhaled in the form of secondhand smoke.

Every day, on average, nearly 2,500 youth under age 18 smoke their first cigarette and nearly 400 youth under age 18 become daily smokers.

Nicotine is the main ingredient in tobacco, but the tobacco plant itself contains other toxic chemicals including cadmium and lead.

Nicotine reaches your brain within 10 seconds after you inhale smoke. It has been found in every organ of the body, as well as in breast milk.

Smoking harms your whole body. It increases your risk of fractures, dental diseases, sexual problems, eye diseases, and peptic ulcers. If you smoke, your illnesses last longer and you are more likely to be absent from work.

Smoking tobacco causes cancer, cardiovascular diseases, respiratory diseases, reproductive effects, and other harmful health effects. In addition to lung cancer, smoking causes many other types of cancer including cancers of the throat, mouth, larynx, nasal cavity, esophagus, stomach, pancreas, kidney, bladder, and cervix, as well as leukemia.

There is an increased risk of vision loss or blindness from smoking.

Smoking also affects unborn babies, causing low birth weight, pre-term delivery and infant death.

Products of Combustion (continued)

Tobacco kills more than 7 million people each year. More than 6 million of those deaths are the result of direct tobacco use, while around 890,000 are the result of non-smokers being exposed to secondhand smoke.

Smoking-related illness in the United States costs more than \$300 billion each year, including:

- Nearly \$170 billion for direct medical care for adults
- More than \$156 billion in lost productivity, including \$5.6 billion in lost productivity due to secondhand smoke exposure
- More than 20 million Americans have died because of smoking since 1964
- In 2014, tobacco companies spent more than \$9 billion marketing cigarettes and smokeless tobacco in the United States
- During 2016, about 258 billion cigarettes were sold in the United States.

Secondhand smoke (SHS), also known as environmental tobacco smoke (ETS), is generated by the incineration of tobacco products. It is a complex mixture of gases and particles which contains 93 known harmful and potentially harmful chemicals, including more than 70 carcinogens.

Thirdhand smoke (THS) is the result of smoke gases and particles which linger in clothing and hair and on furniture, carpets, walls, drapes, vehicles and other surfaces. A 2014 study found that thirdhand smoke is just as deadly as firsthand smoke.

...continued on page 10

See *Products of Combustion (cont'd)* on page 10

Products of Combustion (continued)

Continued from page 9...

E-Cigarettes

E-cigarettes (electronic cigarettes) include e-pens, e-pipes, e-hookah, and e-cigars and are known collectively as ENDS – electronic nicotine delivery systems. They allow users to inhale an aerosol containing nicotine and other substances.

Unlike traditional cigarettes, e-cigarettes are generally battery-operated and use a heating element to heat e-liquid from a refillable cartridge, releasing a chemical-filled aerosol.

On May 10, 2016, the FDA finalized a rule extending its regulatory authority to cover all tobacco products, including E-Cigarettes and all other ENDS. FDA now regulates the manufacture, import, packaging, labeling, advertising, promotion, sale and distribution of ENDS. This was supposed to require the e-cigarette companies to register their products by 2018, and it also set a timetable relating to cigars, cigarillos and hookah.

However, on July 28, 2017, they put the brakes on those requirements and specifically gave the e-cigarette companies another four years to comply.

This change in position toward e-cigarettes was a big disappointment to health advocates but was not a surprise. Dr. Scott Gottlieb, who was appointed to head the FDA in May 2017, was “expected to be friendly toward the e-cigarette industry since he previously held a financial interest in a vape shop called Kure.”

The U.S. Surgeon General issued a groundbreaking report in 2016 concluding that e-cigarettes can expose users to several potentially harmful chemicals, including nicotine, carbonyl compounds and volatile organic compounds.

State and local governments are also taking action to protect their residents. Hundreds of cities, counties and states have passed laws that prohibit e-cigarettes everywhere that smoking is banned.

On April 28, 2017, the World Health Organization addressed the issue of e-cigarettes in a report.

On April 28, 2017, the World Health Organization addressed the issue of e-cigarettes in a report. They recommend that governments adopt regulations that designate indoor smoke-free areas as also vape-free areas.

Radon

Radon is a naturally occurring radioactive decay product of uranium and is found in the soil throughout the earth. It is a tasteless, colorless and odorless gas. As a dense inert gas, once released from the dirt, it tends to accumulate in basements and on the ground floor of buildings.

Radon is radioactive and accounts for the majority of background radiation humans receive. The ionizing radiation emitted is carcinogenic.

After smoking, radon exposure is the primary cause of lung cancer and is credited with the deaths of 20,000 people per year in the United States (U.S.) Radon-induced lung cancer costs the United States over \$2 billion dollars per year in both direct and indirect health care costs.

Smoking, with radon exposure, increases the likelihood of lung cancer.

The U.S. Surgeon General and EPA recommend fixing homes with radon levels at or above 4 pCi/L. EPA also recommends that people think about fixing their homes for radon levels between 2 pCi/L and 4 pCi/L.

A family whose home has radon levels of 4 pCi/L is exposed to approximately 35 times as much radiation as the Nuclear Regulatory Commission would allow if that family was standing next to the fence of a radioactive waste site.

Home testing for radon is simple and inexpensive. Short-term testing gathers radioactivity data over 90 days or less while long-term testing can last up to a year. Numerous inexpensive and effective mitigation techniques are available.

See *Volatile Organic Compounds* on page 11

Volatile Organic Compounds

Molecules of substances with high vapor pressure tend to flow from the liquid (or solid) state to a gaseous or evaporated state. Substances with a high vapor pressure at normal temperatures are said to be “volatile.” Volatile organic compounds (VOCs) are organic compounds (carbon based) which come out of their liquid (or solid) phase in significant degree to become gaseous, becoming part of the air people breathe.

Examples of toxic VOCs include butane, hexane, formaldehyde, benzene, limonene, pinene, isoprene, terpenes, xylene, styrene, toluene, chlorofluorocarbons, aliphatic hydrocarbons, carbon monoxide (CO), carbon dioxide (CO₂), freon, acetone, methane and hundreds of others.

VOCs can come from a large number of sources. A few of those include air fresheners, synthetic fragrances, soaps, hand sanitizers, nail polish, solvents, paints, protective coatings, laundry supplies, dry cleaned clothes, citrus oil or pine oil cleaners, new furniture, copying and printing devices, cleaning supplies, aerosol sprays, refrigerant, degreasers, fuel, personal care products and many other sources. Evaporation of organic compounds from these sources indoors is called off-gassing.

Other volatile chemicals, such as hydrogen sulfide (H₂S) in solution (as in sewer water), are also toxic and may come from the breakdown of organic materials.

Health effects of VOCs include eye, nose and throat irritation, chest pain, brain fog, gastrointestinal problems, anxiety, visual disturbances, headaches, dizziness, fatigue, loss of coordination, nausea, memory impairment, damage to liver, kidney and central nervous system, immunological effects and cancer.

A 2017 study discussed indoor air quality in public utility environments (i.e., museums, libraries, temples, churches, schools, offices, hospitals and elderly care centres). They discuss the need for regulations and guidelines, and the importance of developing tools, techniques and methods for measures chemical compounds in indoor environments.



Air Fresheners

Air fresheners are not “fresh.” They are created using man-made chemicals. These products come in a variety of shapes and sizes including aerosols, plug-ins, candles, oils, incense sticks and commercial, metered air fresheners and deodorizers.

As stated in the article titled “Air Fresheners: The Dangers of Indoor Chemical Pollution:”

In no way, shape or form does a chemically-scented fragrance and/or aerosol propelled by butane, propane or other toxins create an indoor environment of fresh air. Chemical “deodorizers” or chemical air “fresheners” only mask other odors. These products do absolutely nothing to improve the quality of indoor air, and in fact, can contribute to a host of ailments--from headaches, high pulse rate and nausea; to mention a few.

Air fresheners have a negative effect on indoor air quality due to the chemicals used to create these products. Acetone, propane and butane are three of the most common ingredients in air fresheners. Acetone and propane are classified as cardiovascular or blood toxicants, gastrointestinal or liver toxicants, kidney toxicants, neurotoxicants, respiratory toxicants and a skin or sense organ toxicant. Butane is classified as a neurotoxicant which means that exposure can cause adverse effects on the central nervous system.

In a 2015 study, they discussed how the chemicals in air fresheners “react with ozone to produce secondary pollutants such as formaldehyde, secondary organic aerosol (SOA), oxidative product, and ultrafine particles.”

...continued on page 12

Air Fresheners (continued)

Continued from page 11...

Of the general population surveyed in the US, 17.5% are unable or reluctant to use the restrooms in a public place, because of the presence of an air freshener, deodorizer, or scented product. Also, 20.2% of the population reported that if they enter a business, and smell air fresheners or some fragranced product, they want to leave as quickly as possible.

The biggest overuse of chemical air fresheners is in metered deodorizers that have resulted in hundreds of thousands of chemical spray dispensers being placed in hotels, department stores, retail outlets and workplaces throughout America.

You should also be aware of olfactory fatigue (also known as odor adaptation) which results from a normal but temporary inability to pick up a particular smell after being exposed to it for a long time.

The apparent strength or intensity of a fragrance is dependent on the length of time the fragrance is inhaled. This phenomenon is termed "odor adaptation" or "olfactory fatigue". Upon initial exposure to a fragrance, the perceived intensity is maximum. After several minutes of exposure, the perceived intensity is substantially reduced, due to diminished sensitivity of the fragrance-sensing olfactory receptor cells and higher brain olfactory centers. After several additional minutes, many people are not able to detect the fragrance on themselves, especially if it was applied in close proximity to the nose.

When this happens in businesses using these commercial air fresheners, they (the management or employees) "turn up" the system. It often gets turned up beyond the limit recommended by the manufacturer which causes even greater harm to employees and customers.

One easy solution is to implement fragrance-free policies. This would eliminate air fresheners, perfume, scented cleaning products and other sources of fragrances. On an interesting note, olfactory fatigue is also happening to people who use e-cigarettes.

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Fragrances

Most fragrances and fragranced products are created with synthetic ingredients (i.e., not natural; made from chemicals).

Currently, there is a major loophole in federal law that allows companies to hide potentially hazardous chemicals in their products (under the guise of "trade secrets"), so most consumers are not aware they are being exposed to dangerous chemicals.

Dr. Anne Steinemann has done a great deal of work in regard to the chemicals used in fragrances and everyday products. She has conducted research, written several papers and given many presentations. The following excerpts provide a brief summary from one of her papers:

Society is suffused with fragranced consumer products: air fresheners, cleaning products, soaps, hand sanitizers, laundry supplies, and personal care products, to name a few out of hundreds. Fragranced products emit a range of volatile organic compounds (VOCs), such as terpenes (e.g., limonene), which often dominate pollutants found indoors and generate secondary pollutants such as formaldehyde.

Despite numerous laws designed to protect human health and the environment, no law in the US requires the disclosure of all ingredients in fragranced consumer products. For all fragranced consumer products, the general term "fragrance" can be listed on the label, or a related term (such as "perfume"), rather than the specific ingredients in a fragrance. Yet an individual "fragrance" in a product is typically a complex mixture of several dozen to several hundred chemicals, primarily synthetic compounds.

Fragrance-Free Policies

As stated in the Indoor Environmental Quality Policy implemented by the U.S. Centers for Disease Control and Prevention (CDC):

Fragrance is not appropriate for a professional work environment, and the use of some products with fragrance may be detrimental to the health of workers with chemical sensitivities, allergies, asthma and chronic headaches/migraines.

Additional information about the CDC's policy is provided as follows:

Scented or fragranced products are prohibited at all times in all interior space owned, rented, or leased by CDC. This includes the use of:

- Incense, candles, or reed diffusers
- Fragrance-emitting devices of any kind
- Wall-mounted devices, similar to fragrance-emitting devices, that operate automatically or by pushing a button to dispense deodorizers or disinfectants
- Potpourri
- Plug-in or spray air fresheners
- Urinal or toilet blocks
- Other fragranced deodorizer/re-odorizer products

Personal care products (e.g., colognes, perfumes, essential oils, scented skin and hair products) should not be applied at or near actual workstations, restrooms, or anywhere in CDC owned or leased buildings.

In addition, the CDC encourages employees to be as fragrance-free as possible when they arrive in the workplace.

Many businesses, universities, organizations and government agencies have adopted fragrance-free policies.

In North America, Canada has taken the lead on fragrance-free policies. Halifax is considered the "most scent-aware region" in North America.

For more information, [read our paper](#) titled "Indoor Air Contaminants."

Fragrance is not appropriate for a professional work environment, and the use of some products with fragrance may be detrimental to the health of workers.

Household Products

People throughout the world are being exposed to chemicals in household products. One method being used to study these exposures is biomonitoring (i.e., measuring the concentrations of chemicals or their breakdown byproducts in people). Biomonitoring data also provide invaluable information to track exposure trends.

In 2009, Dr. Anne Steinemann conducted research to find the chemicals included in several household products. She found that all fragranced products tested (even those labeled as 100% organic, all natural or green) emitted toxic chemicals. They found more than 450 VOCs in 25 products.

In 2012, the Environmental Working Group presented a report titled "EWG Cleaners Database: Hall of Shame." Their findings were similar to the 2009 research conducted by Dr. Steinemann.

The following information provides excerpts from the EWG report:

Our research has turned up products loaded with extremely toxic compounds banned in some countries. Some of their ingredients are known to cause cancer, blindness, asthma and other serious conditions. Others are greenwashed, meaning that they are not, as their ad hype claims, environmentally benign. [Greenwashing refers to inaccurately labeling products as safe, non-toxic or green.] Still more hide the facts about their formulations behind vague terms like "fragrance."

What should consumers do? Recommendations typically include avoiding products with any chemicals, fragrances, perfumes or scents, and avoiding all air fresheners and deodorizers.

See *Hydrogen Sulfide* on page 14

Hydrogen Sulfide (H₂S)

Hydrogen sulfide (H₂S) is a colorless gas. At low concentrations, it has an obnoxious odor similar to rotten eggs. It is soluble in water. It is produced in nature primarily through the decomposition of organic matter by bacteria. It is a constituent of natural gas, petroleum, sulfur deposits, volcanic gases and sulfur springs.

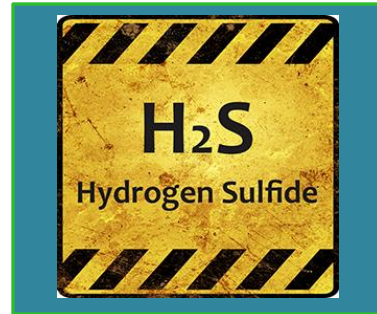
Hydrogen sulfide (H₂S), the gas with the odor of rotten eggs, was formally discovered in 1777, over 239 years ago. For many years, it was considered an environmental pollutant and a health concern only in occupational settings. Recently, however, it was discovered that H₂S is produced endogenously and plays critical physiological roles as a gasotransmitter.

Although at low physiological concentrations it is physiologically beneficial, exposure to high concentrations of H₂S is known to cause brain damage, leading to neurodegeneration and long-term neurological sequelae or death. Neurological sequelae include motor, behavioral, and cognitive deficits, which are incapacitating.

The U.S. Occupational Safety and Health Administration (OSHA) has regulations regarding the permissible concentrations of hydrogen sulfide, but they only pertain to healthy adult males in the workplace. These regulations do not apply to residential exposures and do not cover the more sensitive population, which includes the elderly, the very young and those with pre-existing illness.

Exposure can occur from various sources including ambient air near petroleum refineries, sewage treatment plants, sewers (sewer gas) and septic tanks. Sewer gas contains hydrogen sulfide and reduced sulfur compounds, such as methyl and dimethyl sulfide, ethyl and diethyl sulfide.

The health effects of hydrogen sulfide include acute system toxicity, central nervous system effects, irritation of eyes and lungs, nausea, dizziness, loss of balance, headaches, and shortness of breath. Studies have also shown that hydrogen sulfide affects the myelin sheaths in the brain.



Hydrogen Sulfide (H₂S)--continued

The most dangerous aspect of hydrogen sulfide results from olfactory accommodation or olfactory paralysis. This means that the individual can accommodate to the odor and is not able to detect the presence of the chemical after a short period of time. Death can occur.

Between 2004 and 2007, Chinese drywall was imported and used in thousands of homes in the United States. This change in the source of drywall was due a shortage of American-made drywall caused by the rebuilding efforts after numerous hurricanes during that time frame. Thousands of homeowners became ill, and tests were done. It was found that Chinese drywall emitted hydrogen sulfide and other toxic gases, and it was estimated to affect 100,000 homes in more than 20 states. Many lawsuits were filed. Large settlements were reached in some cases.

A 2010 report by the WHO states: Clean air is a basic requirement of life. The quality of air inside homes, offices, schools, day care centres, public buildings, health care facilities or other private and public buildings where people spend a large part of their life is an essential determinant of healthy life and people's well-being.

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