What You Don't Know CAN Hurt You: A Primer on Heat and Humidity, Noise Pollution, Indoor Lighting, Radon, and Electromagnetic fields

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I expect you've heard the saying, "What you don't know can't hurt you." What about what you can't feel? or smell? Or about what can't be seen even with a microscope?

It seems that most of the improvements we work so hard for in school environments tend to be "molecular" in nature - materials with physical properties - like asbestos, fibreglass, silica, or chemicals in the air, lead, viruses, bacteria, dust and moulds, etc. **But there are less tangible things like heat and humidity, noise pollution, indoor lighting, radiation, and electromagnetic fields that also have the potential to affect comfort and even the health of those in schools.** Each of these topics deserves at least a full article, but for now, here is some essential information plus suggestions for further study.

Testing for levels of these "intangibles" is relatively inexpensive, but there are as yet, no clear safety standards or acceptable levels set for most of them. Knowledge of health risks is ever evolving. As is so with testing for moulds, chemicals, and other indoor air pollutants, the tester and the interpreter of data must be well trained, and the equipment must be of good quality. Even then, the sensitivity of the human body can foil testing efforts.

RADON

Radon is a naturally occurring tasteless, odourless, and colourless gas. Radon gas travels through soil or cracks in underground rock and leaks into some buildings through their foundations. It comes from uranium in the earth. As it decays it breaks down into other more harmful radioactive particles which become trapped in the lungs, damaging lung tissue by releasing small bursts of radiation. All schools should be well tested **throughout** for radon because it can emerge in one area of a building but not in an adjacent area, depending on variations in rock and soil characteristics and on ventilation and building design. Exposure can eventually lead to lung cancer.

For those who are exposed to both tobacco smoke and radon, the risk of developing cancer is much higher than the risk from each contaminant alone, estimated at 100 times the risk of dying in as airplane crash, or 29 people out of 1000. It is also thought that risks to children may be much greater than for adults. *Note that in 2006 Health Canada lowered the acceptable indoor radon levels 200 Bq/m3. All schools in Nova Scotia were then tested for radon and remedial action taken in problem areas.*

HEAT and COLD

Thermal comfort is often overlooked in schools. It is common for sunny classrooms and those with poor ventilation, or with poorly balanced or malfunctioning heating systems, to overheat to the point of discomfort, causing symptoms such as fatigue, difficulty concentrating, and headaches.

Poorly functioning heating systems can also cause low temperatures and result in shivering, difficulty concentrating, tense muscles and joints and lower resistance to infection.

It is also of note that heat and humidity speed the off-gassing of materials. If there are sources of chemicals in the classroom (vinyl tiles, glues, cardboard, paper finishes, and much more) and if the ventilation system is not adequate, this can raise the levels of Volatile Organic Compounds in the classroom's air.

HUMIDITY

The optimum relative humidity level is between 40 and 50%, although some sources

state as high as 60% to be acceptable. Germs, moulds and dust mites tend to like higher humidity, while below 40% relative humidity the drying of the mucous membranes of the nose and throat can cause increases in irritation and infections. It is difficult to separate temperature from humidity in terms of health and comfort, and air movement is also a factor. The Thermal Comfort chapter in Your Home, Your Health & Well-Being (listed in reference section) provides much understandable information that may help you.

NOISE POLLUTION

To quote directly from page 27 of Your Home, Your Health & Well-Being: "Sound is physical energy causing rapid vibration of the air around us. ... Noise is any unwanted sound. ... Noise, according to many psychologists and doctors is one of the most significant pollutants of modern life. Noise contributes to tension, and to psychological and physical deterioration, increasing the incidence of heart disease, ulcers, and high blood pressure. Noise affects children in the womb, and affects their development at home and at school. Studies of schools in noisy locations show significant deficiencies in attention span and learning skills among children compared to those in quieter locations."

LIGHTING

Full-spectrum and incandescent lighting have been shown to cause fewer difficulties than the fluorescent lighting currently in use in most schools. These lights can emit x-rays, radiation, and radio waves, and can cause many symptoms including fatigue, eyestrain, irritability, confusion, depression, and hyperactivity in some. In her new book Is This Your Child's World, Dr. Doris Rapp tells of a study where hyperactivity in a classroom decreased by 33% when full-spectrum lighting replaced fluorescent. Also that Germany banned fluorescent lighting years ago in schools and hospitals. I suggest you also read the chapter on light and colour in Your Home, Your Health & Well-Being.

ELECTROMAGNETIC FIELDS (EMFs)

Can the magnetic and electrical fields that emanate from electrical equipment cause health problems? Since the late 1970's this question has been discussed and studied, and much is still unknown. Scientists disagree about the potential risks of exposures, and on what, if any, measures should be taken to avoid risks from exposure. Some say that avoidance just for the sake of possible, but so far unproven, harm is unnecessary. Based on what we do know, others advise erring on the side of caution until more is known, especially when children are involved. Certainly the EMF "canaries", those who are hypersensitive to EMFs, are pointing the way toward the conclusion that just because you can't see them doesn't mean they can't hurt you.

Dr. Andrew A. Marino, in Chapter 11 of The Healthy School Handbook, gives us seven basic facts to help us understand the health risks from EMFs:

1) EMFs come in various kinds, but they can be measured.

2) They are real, but are not composed of atoms. They are forms of energy.

3) Because they are forms of energy, not matter, they have their own properties. One plus one can equal two, or three, or even zero, depending on various factors.

4) EMFs are created by every electrical device from battery operated toys to power lines. It is not possible or desirable, Dr. Marino points out, to eliminate all EMFs in classrooms because there are so many benefits from the electrification of society that were not there to help us in previous centuries. Instead he suggests focusing on removing unusual or excessive sources in the classroom.

5) EMFs radiate outward through surrounding space and become weaker as the distance increases. He points out that it is this property of spreading that enables TV and communication waves to work. However, the radiating waves from a computer are more like by-products, and not of inherent value to the operation. He suggests possible vanishing points where EMFs can no longer be detected, (they would have to be measured to be sure) as being: One mile from

a TV antenna, 1,000 ft. from a radar source, 500 ft. from a high voltage power line, 100 ft. from a telephone communications tower, 50 ft. from a building transformer, 10 ft. from an electric motor, 5 ft. from a computer screen, 1 ft. from a light bulb, 3 inches from an electric clock.

7) Estimates of risk are just that - estimates. They are influenced by many subjective factors, and can vary from risk assessor to risk assessor. For example, if Dr. X believes it is important to protect the unlimited use of EMFs by society, the amount of evidence needed to convince Dr. X of risk would be much greater than that needed to convince Dr. Y, who himself suffers from EMF hypersensitivity.

Researchers have found strong links between EMFs from high-voltage electrical lines and increased rates of childhood leukaemia. Other diseases can also result because EMFs combine with other factors to affect the body's resistance to disease in general. It should be noted, however, that although illness (usually cancer) has been clearly connected to some EMF exposures, not all who are exposed develop cancer or other illness. High level exposures from such sources as high tension power lines, have well documented effects including cataracts and neurological damage. Less well known are the effects of lower level exposures. While many individuals display no apparent affects from EMF exposure, some individuals experience profound symptoms even to low levels. This can not be overlooked when trying to determine the cause of, for example, a child's difficult behaviour or other unexplained symptoms.

Dr. Doris Rapp, in her book, Is This Your Child's World? provides practical information for us for recognizing an existing sensitivity to EMFs:

If your child "experiences any of the following symptoms at school or at home, EMFs might be the cause.

1) Chest pain, headaches, blurry vision, or any unexplained discomfort while sitting directly in front of a standard upright

6) The absence of research showing possible harm should not give us a sense of security. Dr. Marino concludes that "the existing state of scientific evidence warrants the inference that EMFs can be a health risk and, for this reason, that steps ought to be taken to avoid exposure."
computer. (By contrast, laptops cause fewer health difficulties.) 2) Looking, feeling, or behaving in ways other than normal after exposure to a computer, television, set, or microwave oven 3) Feeling ill or different just before or during a thunderstorm or certain other weather changes 4) Not feeling right near high-power electric wires 5) Tics or seizures"

Dr. Rapp also tells of evidence that EMFs can increase the toxicity of chemicals by allowing them access to nerve cells. She also reports research which shows that low-level magnetic fields can affect the blood-brain barrier and allow particles to enter the brain and disrupt normal function.

Common EMF Sources:

Common sources of EMFs are High-tension wires, electrical transformers, radio and television transmitters, power plants, telephone lines, computers, TVs, kitchen appliances, lighting fixtures, and more. Electric fields are found even in a building's wiring, and are often present when the electrical equipment is not turned on. For example, hair dryers, power tools, clocks, and other electric appliances have localized EMFs, some of which are there even while the object is switched off. The amount of electricity used by an appliance does not reflect its EMF levels.

Unlike electric fields, magnetic fields are present only when electricity is flowing.

The closer one is to an electric or magnetic source, the stronger the field, and the field strength drops quite quickly with distance. For example, computer EMFs are reported to be negligible at arms length, or at about 30 inches. Students should be kept at least 40 inches from the back and sides of computers. Place the keyboard as far as possible from

the computer and screen, and add a grounded screen. There are protective boxes available and even protective barrier clothing if maximum protection is necessary to prevent symptoms.

According to the Report to the New York State Board of Regents on the Environmental Quality of Schools, p.32, "Most U.S. homes have background magnetic field readings ranging from 0.5 to 4 milligauss" (mG).

Dr. Rapp suggests renting or buying a gaussmeter to measure the EMFs. "In general, a level of about one milligauss measured about two feet from the item being checked, is considered safe, while levels over 10 mG are cause for concern. Although the acceptable level in Sweden is 2.5 mG, scientists there have warned that as little as one or two mG can produce adverse health affects in very sensitive individuals." This leaves the area between 2.5 and 10 mGs as an unknown risk range.

Although some workplaces have standards for exposure to video display terminals, few standards exist for acceptable levels of EMFs in industry - let alone for dwellings or schools. There are no laws requiring testing of schools for EMFs.

New York State looked closely at the issue of EMFs and schools. They found 32 of their schools were located near high power lines. They negotiated a voluntary agreement with power suppliers to prevent future location of high EMF sites near schools, and for assistance with correcting existing problems. The NY State Dept. of Health does EMF tests for schools upon request and provides information on "prudent avoidance measures" as needed.

The following are recommendations from the Report to the New York State Board of Regents on the Environmental Quality of Schools, p56:

At the School Level:

1) Plan new construction away from fixed EMF fields. 2) Use existing space already exposed to fixed EMF fields only

Example EMF measurements from page 33 of the New York State Board Report:

centre of a living room 0.2-3 milligauss (mG) under an electric blanket 5-25 mG hair dryer at 4 inches 3-400 mG operating toaster (at 4 inches) 10-60 mG connection at home (electric meter) 5-20 mG directly under high voltage line 50-500 mG edge of right-of-way high voltage line 10-200 mG

intermittently, if at all. Keep adequate distance between people and the EMFs generated by electrical equipment; of particular concern is the design of work spaces in which students and staff use computers. 3) Reduce exposure to EMFs when this can be accomplished at no great expense or inconvenience by practicing "prudent avoidance". 4) Remove EMF exposure from the school vicinity. 5) Require students to maintain a distance of, at least 40 inches from the back and sides of video display terminals.

At State Level:

1) Recognize the current limitations of scientific knowledge about electromagnetic fields and their health effects. 2) Use restraint in establishing any policy on EMF exposure in light of the lack of concrete evidence to support a policy direction. 3) Establish safe EMF exposure levels for children. (Do 2 and 3 seem to contradict each other, or is it just me?)

Dr. Marino advises in the Healthy School Handbook:

Radio and television towers radiate intense levels of EMFs and schools should not be located closer than 1,000 to 2,000 ft. (Dr. Rapp quotes experts as recommending that schools be no closer than one mile from high EMF sources.) In schools, the feed from the power grid should be underground, and the circuitry should be away from inhabited rooms.

The lay out of school wiring should take EMFs into account. The wiring, if done in sequence, can cause a classroom located near the power source to have EMFs about four times higher than a room four rooms

away, simply because the power for the fourth classroom (and the second, and third) must pass through the first classroom on its way to the others.

EMF audits should be done in all classrooms. Broadcast EMFs, electrical power EMFs, and cellular telephone EMFs all need to be detected. Dr. Marino suggests as well that for externally generated EMFs the ones responsible for generating the EMFs should be involved in the decisions for correcting the exposure.

Dr. Marino also advises that cellular phones not be used around children because of the very high EMF levels.

Glass windows or glazed panels that allow light to pass but stop EMFs can lower EMF levels in some classrooms.

Overall, the wise choice seems to be to keep children's exposure to EMFs to a minimum. There are some experts knowledgeable in matters of environmental health impacts from EMFs and who can help advise school officials. It would be wise to be sure those consulted are well informed and trained in the concerns and issues voiced in the reference materials quoted in this article.

I hope that those involved in school safety will come to recognize the importance of looking further into those less obvious, but still important, issues of radon, thermal comfort, relative humidity, lighting, and electromagnetic fields, because these too can affect our school children's health and learning abilities. In the meantime, perhaps a few of you will find this information useful in clarifying an issue that may be harming yourself or your child - maybe it is something you didn't know about and didn't know was hurting.

K Robinson Healthy Schools Editor, AEHA National UPdate, Winter, 1997

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