FOCUS ON COLLEGES, UNIVERSITIES, AND SCHOOLS
VOLUME 4, NUMBER 1, 2010

Environmental Hazards in America's Schools

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ABSTRACT

School administrators need to be sensitive to environmental hazards that can threaten the health and safety of students and staff in America's schools. In this article, I discuss the following environmental hazards: asbestos, radon gas, school lead, indoor air quality, and electromagnetic fields. These hazards can threaten schools and the workplace.

A number of environmental hazards, including asbestos, toxic waste, landfill and chemical dump sites, ground water contamination, lake and river pollution, air pollution, and ozone depletion, threaten America's health and economy and dominate the headlines (Lippmann, 2010). Moreover, in the 1990s these hazards moved indoors and now threaten the schools and workplace. Indoor hazards, such as asbestos, radon gas, school lead in paint and pipes, poor indoor air quality, and electromagnetic fields, pose threats to the health and safety of students and staff in many of America's schools.

Asbestos

The U.S. Environmental Protection Agency (EPA) has ordered government and commercial property owners to clean up *asbestos-laden buildings* that have been housing people at work and in school for the last 25 to 50 years. Estimated costs to clean up these buildings are hard to come by, although one estimate was $100 billion for government and commercial buildings and 3.5 billion for some 45,000 schools in 31,000 school districts (Subcommittee of the Committee on Government Operations, United States Congress, 2011). Another nationwide study puts the estimate at $1.2 billion, or $22,858 per school and $31 per student. The cost exceeded $150 per student in 10 percent of the schools, and the Oklahoma City School District had the greatest expenditures—or the dubious distinction of having a $65 million bill and $1688 cost per student. These costs are based on an estimate of $15 to $20 a linear square foot to remove asbestos, depending on whether this once-acclaimed "wonder fiber" is located in the ceilings, walls, floors, or basements (U.S. Environmental Protection Agency, 2010). In 2009, some 8 to 10 million

children and 1.1 million school employees were subject to asbestos exposure, which is a marked improvement from ten years ago, when some 15-20 million children and 1.5 million employees were subject (Soto, 2010).

The estimates of people on the job who will die from direct exposure to asbestos-contained buildings are extremely low (25 a year) compared to those who die due to workplace accidents (10,000 a year) (Florio, 1988). The ultimate question is, do we need to spend all this money on asbestos removal? At what level of exposure is asbestos unsafe? If asbestos is intact, not flaking, and out of reach of students and employees, should it be removed? Although airborne asbestos can be deadly (more than 1 percent in the air), the dangers of inert asbestos are minimal in most buildings. Nonetheless, children are considered to be especially vulnerable because their longer life expectancy means that a latent asbestos-related disease has more time to develop (Roggli, 2011).

During the 1980s and 1990s, the federal government imposed many environmental requirements and regulations on the schools but did not provide funds for compliance. Many school districts delayed in removing the asbestos, while others used funds from their school maintenance budget to comply with federal regulations. However, one EPA study reports that as much as 75 percent of all school cleanup work was done improperly up to 1985 (U.S. Environmental Protection Agency, 2010). Rather than mitigating the problem, it is likely that the problem was exacerbated in many cases; indeed, the "cure" may be worse that the "disease," especially with a lot of "rip and skip" companies.

It should be pointed out that removal is not the only form of abatement, although the great majority of school districts have chosen this option. Encapsulation, if done properly, can last for several years (ten or more years, depending on what and how the materials are applied) at an average cost of 10 percent of the removal bill (Probst, 1990). The savings are obvious, but in cases where asbestos is loose or crumbling, removal is the best solution. In still other cases, encapsulation is only a stopgap measure until a school district can raise sufficient money for removal.

Radon Gas

Radon gas may pose as much of a threat to the health and safety of students and staff as asbestos. *Radon gas* is considered to be the second leading cause of lung cancer among adults (World Health Organization, 2011). EPA tests show dangerously high levels of this invisible, odorless gas in 54 percent of the 130 schools randomly checked (National Research Council, 2000); homes are also affected (Susoeff, 2010). In short, many of our children are exposed to a risk equivalent to smoking 1/2 to 1 1/2 packs of cigarettes a day (Upfal, 2001).

The gas seeps into buildings through the foundation from soil and rock as radium-266 decays. In some cases, well water may be a source of radon. No EPA, federal, or state guidelines exist for containment or abatement of the gas; however, the situation is considered dangerous, and levels are too high in schools to wait for the EPA. Basically, procedures for ascertaining radon levels include: (1) testing all school rooms on and below ground level, (2) testing in the cold months of the year, and (3) testing for two

days to four weeks depending on the type of test. Screening test results over 4pCi/L (picoCuries/liter, or one-trillionth of a unit of radon) are considered enough to warrant a lengthy retest (nine to twelve months); levels over 100pCi/L are considered sufficiently dangerous to relocate children (Taylor, 2001).

Average corrective costs per school run from as low as $1000 if ventilation adjustment works to $10,000 if subventilation is needed. On the other hand, some observers contend that the cost for decontaminating the nation's schools runs into billions of dollars, and since the connection between radon and illness has not been firmly proven, it may not be worth the cost to ventilate schools.

School Lead

"Water, water everywhere, and not a good drop to drink" is the play on words reflecting reality (Hlavinek, 2010). The water our children are drinking at home and school may be tainted with lead that accumulates in their blood and bones and eventually dulls the mind and causes severe behavior problems.

According to one U.S. government survey, 15 to 16% of the nation's children under fourteen years have blood levels high enough to cause academic and neurobehavioral problems in school, which eventually leads to school failure. The incidence of elevated lead levels are three times higher among poor white than middle-class white children, and seven times higher among inner city blacks than suburban whites, largely because of the differences in air quality and the age of their housing (Toxic Substances Control Act and the Chemical Management Program at EPA: Hearing before the Committee on Environment and Public Works, United States Senate, One Hundred Ninth Congress, Second Session, 2010; U.S. Agency on Toxic Substances 1988).

The federal Centers for Disease Control and Prevention (CDC) maintains that lead poisoning is the nation's number-one preventable child health problem and that proper lead abatement would eventually reduce the cost of child medical care and special education as much as $45 billion annually (Centers for Disease Control, 2005). The CDC has revised its definition of lead poisoning, lowering the level at which lead is now considered dangerous, from 25 micrograms per deciliter in 1974 to 10 micrograms in 1991. The last revision resulted in a tenfold increase in the number of children now considered poisoned—about 1.5% (now affecting 15% of all U.S. preschoolers) (Black, 2001). Moreover, there are at least twenty recent U.S. and international studies from industrialized nations showing that levels of lead in children are associated with measures of low IQ, language and reading incompetency, limited attention span, inability to follow instructions, behavioral impairment, and forty additional cognitive, social, psychological, and health problems (Bellinger, 1987; Needleman, 1992).

In a recent study one researcher found that first and second graders who had moderate quantities of lead (5.0 micrograms or less) in their systems were six times as likely to exhibit reading problems and seven times more likely to drop out of high school compared to children who were lead free (Lanphear, 2001). Although the lead variable

possibly interacts with a social-class variable, the fact remains that lead infects multiple organs of the body.

In short, childhood poisoning may be one of the most important and least acknowledged causes of school failure and learning disorders. Given all the rhetoric and funding for school reform, which focuses on curriculum, instruction, teaching, and testing, we may have been myopic and even foolhardy not to realize that part of school failure may be related to the adverse effects of lead.

The major source of lead poisoning is that old lead-based paint and the dust produced from it when windows are opened and closed or renovations take place. The problems exist in nearly all schools built before 1978, the year lead-based paint was banned by Congress (and that's more than 65 percent of the nation's schools) (Oakes, 2011). Several layers down, because of cracking and flaking, the paint is not always sealed as we might believe, and it can be found in the air teachers and students breathe. Renovations cause bigger problems because these building areas are not properly sealed and monitored with sample air readings, as in the prescribed manner for asbestos removal.

And there is some more bad news. Dangerous traces of lead are sometimes found in the municipal water we drink (Puritano, 2011). Even worse, lead gets into water from lead lines in our older water coolers, faucets (unless made from plastic, which most people feel is inferior in quality), copper pipes (because of the lead solder on the joints), and the old plumbing in cities and villages that connects the water main to our schools and homes (Maczulak, 2010). Allowing water to run for a couple of minutes before drinking it or using if for cleaning foods can flush out the lead that has collected—but that idea does not always sit well with budget-mined people who pay utility bills.

It costs about $50 to $75 for a laboratory to test each water faucet and cooler in our schools; however, this is not going to happen on a large scale unless schools are forced to budget this item. The National Education Association estimates that $30 million per year is needed for paint and water testing in our schools, a tiny sum for such an important safety measure (National Conference of State Legislatures, 2000). Since the problem is odorless and invisible, and since most parents are not aware the problem even exists, school officials are not under pressure to take appropriate measures.

No testing and reporting procedures are required for lead, and school authorities have been remiss in dealing with the problem. Furthermore, many school officials who are in the position to do something about it take the position that there is no problem (they believe it went away when lead was outlawed in paints and gasoline) or see the solutions as too expensive because eventually abatement and not testing is what has to be done in may schools (and other government buildings). The cost of lead abatement is estimated between $5000 and $15,000 per 1000 square feet of lead paint coverage. Most school boards (and owners of property) find the cost too expensive and just leave the problem as is, gambling that if a party files a lead-injury claim their insurance will pay for it. Verdicts run as high as $10 million, though most are settled in the range of $500,000 (Banham, 1994).

EPA or health requirements are needed to ensure adequate compliance. Like the tobacco industry, fighting facts about cigarette smoking and cancer, the lead industry has its spokespeople and lobbyists who obscure the health hazards of lead. As with smoking,

the federal government, medical profession, and socially concerned groups need to come together to force cleanups of lead contamination.

Indoor Air Quality

Some schools suffer from what is known as *sick building syndrome* (SBS) and other indoor air-quality shortcomings due to the trend to increase insulation and tighten schools (and office buildings) to save energy. The outcome, in extreme cases, is virtually no outside air infiltration (Goyal, 2011).

Everything in a building has some form of toxic emission (Ballantyne, 2010; Lazaridis, 2011). The human body exhales carbon dioxide, and it emits body odors, gases, and other *bio-effluents.* Carbon monoxide, also colorless and highly poisonous, results from incomplete combustion of fuel. It can be a problem when auto engines are left running, say in school parking lots near open windows when parents pick up or drop off their children. Diesel exhaust from parked buses is also common, as drivers wait for students or warm the bus in winter before students board. Carpets, plastics (most furniture and bathroom fixtures contain plastics), and pressed wood emit formaldehyde and other gases. Room dividers and window blinds emit a host of carbon chemicals. Copy machines give off ozone, spirit duplicators give off methyl alcohol, and fluorescent lights give off ultraviolet rays.

Then there is the dilemma of doing battle with pests—fleas, cockroaches, termites, wasps, and rodents. Although chemical pesticides are a critical component of successful pest control, there is the other side of the coin—our concern to limit or even rid schools of pesticides (Krieger, 2000). It's one thing to permit weeds to run amok on school playgrounds because of our concern to reduce pesticide exposure, but it's quite another to allow the aforementioned pests to run wild with the likelihood of increasing. Nonetheless, educators and parents are concerned that students are unknowingly breathing in various poisonous chemicals used to kill vermin. As of 2000, 31 out of 50 states had school pesticide management policies that were considered "inadequate" or "unsatisfactory" for protecting children from pesticides that are harmful to children's central nervous system and have "very profound consequences for human beings" (Bushweller, 2000).

Even drywall, paints, and cleaning fluids have various fumes that are dangerous if sufficient quantities exist. Long-term exposure to chemicals and volatile compounds from art supplies, science labs, shop facilities, and indoor pools is potentially dangerous, and it affects all students because the vapors and dusts enter the heating and cooling systems. Excessive humidity—found in locker rooms, pool areas, and school basements—can lead to mold and fungus growths that multiply to potentially harmful levels—which they often do without school authorities recognizing it (World Health Organization, 2010).

As schools become more insulated, the toxins from cigarette smoke, chalk dusts, science labs, art rooms, and shop facilities cannot escape and thus get circulated through the ventilation system. In addition, the entire duct system usually has dust or mold that spreads germs throughout the building. If vents are not cleaned on a regularly scheduled

basis, the potential for Legionnaires' disease or other respiratory infections caused by bacteria and/or germs exists. OSHA requires that outside air be circulated into buildings to avoid the constant recirculating of viruses and bacteria (Gelfond, 2011; Raymer, 2010).

Roughly one-third of the nation's schools (and offices) are considered to be afflicted with sick building syndrome. We need to follow the amended recommendations of the American Society for Heating, Refrigeration and Air Conditioning Engineers; they raised air circulation standards from 5 cubic feet per minute to 15 (Athanasiadis, 2010; Bluyssen, 2010). Two problems arise: more energy is consumed, and in some big cities, such as Los Angeles, Houston, and New York, it is even more damaging to bring in outside air at certain times of the year.

The human symptoms of poor indoor air quality are eye, nose, throat, or lung irritations. Students (and teachers) are drowsy, exhibit shorter attention spans, or become out of breath when walking up the stairs or plying in the gym. In searching for problems, one important consideration is whether people's symptoms disappear in a few hours after school (Kneeppel, 2011). Parents whose children suffer from respiratory problems often feel their children are being infected by classmates, not considering the strong possibility that the school air may be the culprit.

Unless symptoms are apparent, educators usually believe the indoor air quality of the school is fine. But many air pollutants, including radon gas, carbon monoxide, asbestos particles, and lead dust, are not easily detectable by sight or smell. Other pollutants are obvious only in high concentrations (Curley, 2011). Formaldehyde, paint, and cleaning fluid vapors, and mold and fungus, for example, have an odor only at harmful levels.

Obviously, schools need to test air quality regularly and not assume the best-case scenario (Salthammer, 2010). But when was the last time your neighborhood school, or the school your brother, sister, or children attend, tested the air to see whether it was "healthy"? Given the budget constraints of most school districts, the answer is probably, "Not since anyone can remember." So long as parental and public pressure is on improving the curriculum and teaching process, and minimal attention is directed at the air we breathe (being merely taken for granted), and so long as there is no legislation requiring the testing and improvement of our air, the problem will be ignored. With lack of funds as a common school problem, ventilation maintenance is not a top priority; in fact, the maintenance budget is often robbed to pay for curriculum and teaching reform—an unfortunate circumstance that threatens student health and learning conditions.

When the public becomes more aware of the hazards related to indoor pollutants, air quality within school buildings will become the focal point for student rights and litigation. Lack of responsiveness today by school officials can make a seemingly innocuous problem and noncontroversial issue into a serious issue in the future.

Electromagnetic Fields

Electromagnetic fields (EMF) are part of our complicated and growing technology: radio, television, computers, microwaves, fluorescent lights, and so on. The

most controversial and visible electromagnetic fields are produced by the existence of transmission lines running through our communities—often near our schools, playgrounds, and homes. Only six states set limits on the strength of EMF around transmission lines. New York State, for example, requires a 350-yard corridor around their lines. The fear seems to coincide with growing research data: children exposed to these power lines suffer from childhood cancer two to three times more (depending on years of exposure) than children who are not exposed (Adams, 2011).

What about our home appliances and school machines? The higher the strength of the magnetic field (as in devices such as microwaves, ovens, stoves, and heaters), as well as the closer the object and the longer the exposure (as with electric blankets, computers, copy machines, televisions, and fluorescent lights), the greater the risk. Actually, objects with electric motors (such as air conditioners, electric clocks, hair blowers, and even telephones) present a possible risk to humans (Stavroulakis, 2011). In theory, these household and school objects may be more dangerous than transmission lines because our bodies are often only inches away (Jin, 2011).

To get an idea of the emission effects of these household and school objects, copy machines give off 4.0 milligauss units, computers 10.0, and microwave ovens 15.0. The problem is, some of us sit by a computer for hours. In general, the research on EMF is highly complex and tentative (Weiner, 2011).

Some scientists claim we are unsure what to measure to determine exposure. Right now the best precaution is to have children keep their distance from all EMF emitters at home and in school, especially televisions and computers. Schools need to enforce this notion of distance and purchase computers and electronic equipment with screens or filters (Jin, 2011). Since there is little public pressure to spend money on screens or filters, and no legislation requiring schools to take corrective steps, few schools are considering these precautionary steps.

Conclusion

School administrators need to be sensitive to environmental hazards that can threaten the health and safety of students and staff. These environmental hazards include asbestos, radon gas, school lead, indoor air quality, and electromagnetic fields. These hazards can threaten schools and the workplace.

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