

Occupational Airways

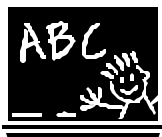
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Indoor Air Quality and Respiratory Disease, An Increasing Threat to Teachers

by Benjamin M. DeLisa, University of Connecticut, School of Medicine; Paula Schenck, MPH, Robert DeBernardo, MD and Eileen Storey, MD, MPH, University of Connecticut Health Center, Division of Occupational & Environmental Medicine

Introduction:



A recent government study notes that one in five schools have indoor air quality problems.¹ While it is commonly known that outdoor air pollution can cause damage to people's health, indoor air pollution can do the same. Respiratory diseases are of particular concern. This article discusses some of the aspects in recognizing and treating respiratory disease in teachers and other staff affected by the indoor environment within a school.

Sick Building Syndrome and Building-Related Illness:

Illnesses caused by indoor air pollutants may be categorized as *sick building syndrome* or as *building-related illnesses*. In sick-building syndrome, a cluster of individuals describe a complex of non-specific symptoms that may include mucous membrane irritation, headaches, fatigue, chest tightness, and skin complaints. Symptoms resolve, sometimes immediately, without long-term consequences, after the worker leaves the environment.

On the other hand, building related illnesses, which may include rhinitis, sinusitis, asthma, and hypersensitivity pneumonitis, are diagnosable illnesses with symptoms that can be

clinically defined and can be attributed to the indoor air environment. Symptoms may not resolve after the worker leaves the environment, and there may be serious long term health effects.

Teachers and Building-Related Respiratory Disease:

Teachers are among the most frequently affected groups of workers reported to develop asthma and rhinosinusitis, two common building-related illnesses. Hypersensitivity pneumonitis is another disease occasionally seen in this population. With asthma on the rise among



teachers in the United States, correct diagnosis and treatment is a priority. Effective asthma management requires the identification and elimination of asthma triggers. The school environment may be suspect when a number of teachers are seen with the same illness from the same school, symptoms clear on vacations or weekends, or worsen as the week progresses.

This issue:

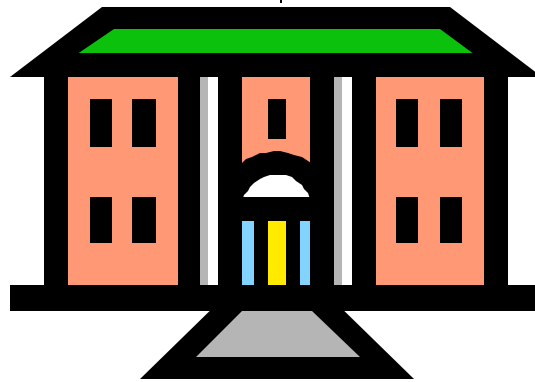
- ⇒ Indoor Air Quality and Respiratory Disease, An Increasing Threat to Teachers
- ⇒ Schools and Indoor Air Quality: Do's, Don'ts & Resources
- ⇒ IAQ Tips from Connecticut OSHA's Consultation Program
- ⇒ The Indoor Environment & Respiratory Disease in CT

Currently, the University of Connecticut Health Center's Division of Occupational and Environmental Medicine is assessing and treating several teachers with suspected building-related asthma. Since removal from the exposure (the workplace) is sometimes the only effective treatment, early diagnosis and intervention is key.

The Problem with School Buildings:

School buildings are designed for dense occupancy and pose a challenge for maintenance of healthy air quality. School committees and boards of education are often faced with insufficient resources to fix aging buildings and deteriorating ventilation systems. As ventilation systems deteriorate due to lack of maintenance, they lose their ability to keep air moving effectively. The reduction of adequate ventilation leads to an increase in airborne particulate matter and the accumulation of pollutants generated in the environment, which may provoke respiratory illness in the occupants of the building.

Moisture is another factor that affects indoor air. One way, moisture is introduced into the indoor environment is through roof, window and basement leaks. Another way is through poor humidity control. This can provide opportune conditions for mold and bacteria to grow. Specific allergens found in bioaerosols can then initiate or exacerbate immunologic respiratory disease. The levels of indoor bioaerosols in some schools have been recorded at more than three times the outdoor levels. These conditions have been among those implicated in the rise of asthma among school children. Teachers and other staff who spend more time in the environment than the children may be at additional health risk.



Diagnosis of Building-Related Asthma:

Asthma is characterized by airway inflammation, variable airflow limitation, and reversible airway responsiveness to various stimuli. An occupational or environmental cause should be explored in all new onset cases of asthma in adults. Diagnosis of building-related asthma in teachers and other staff should include both the diagnosis of asthma and the establishment of a relation between the illness and the school building.

Linking asthma to the workplace can often prove difficult. First, an occupational and environmental history should be taken to assess past and current workplace and other exposures. This is important, since there can be a latency period of a few weeks to several years between the initial exposure and the onset of symptoms.

Second, a history of improvement of symptoms during weekends, holidays, and summers, and a subsequent worsening of symptoms upon return to work is suggestive of building-related illness. Finally, objective pulmonary measurements, including peak flows and spirometry, may be performed. Measurements before and after work are helpful. Serial measurements taken at home and at work may further link the asthma to the workplace environment. This may require referral to specialists in the area of occupational health.

Indoor Air Evaluation and Remediation:

Recognition of a teacher or another staff member with building-related respiratory disease should prompt an evaluation of his/her school environment for the presence of factors that can lead to asthma. The environment of concern includes the class-room(s), hallways, and common areas such as teachers' lounge, libraries. Since dirt and moisture are associated

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RESOURCE ARTICLE

Schools and Indoor Air Quality: Do's, Don'ts & Resources

by Judy Sparer, CIH, Yale Occupational & Environmental
Medicine Program, Yale University School of Medicine

In recent years we have all been bombarded with reports of "unhealthy" schools. Headlines proclaim that the increase of asthma may be due to the poor air quality in many of our schools. Physicians are seeing teachers and children complaining of symptoms, which they associate with the school building. At the same time, our schools are aging and the budgets for their care and repair have been cut. There is a great deal of literature (much of it conflicting) about indoor air quality (IAQ), how to evaluate it and how to evaluate its potential health impact. We know that improving the environment will be accomplished by a combination of reducing many sources of contamination and improving the ventilation. There is rarely a single quick fix.

WHAT TO DO

When people report symptoms associated with their presence in the school, it is important to take this seriously. Individuals should make the school and the local health department aware of their concerns and encourage the school to identify and resolve environmental problems. IAQ investigators should maintain open communication with all persons who contribute to and are concerned about the school environment. They should enlist help from those who have experience and can deal with both health and environmental issues in a comprehensive way. The investigators should obtain a methodical inspection of the school, focus on reducing the sources of contaminants, and improving the ventilation, cleaning and maintenance of the school. They should make sure that problems are corrected.

WHAT NOT TO DO

Do not focus on measurement of contaminants in the environment. Measurement can be expensive and is unlikely to be very helpful in either

confirming the link to symptoms or in pointing toward the solution. It should never be the first step. Measured levels of contaminants in non-manufacturing settings are always low compared to any standards that were designed for an industrial environment. Most often, taking measurements do not add very much information to what can be gained by a methodical inspection of the premises.

RESOURCES

The Environmental Protection Agency (EPA) has taken the lead in addressing IAQ issues in schools.



EPA has developed an innovative program which is based around an action-oriented kit, the *Indoor Air Quality Tools for Schools* Kit. The Kit includes

all the materials necessary to develop a committee of administrators, teachers, maintenance staff, parents and school nurses. The trained committee investigates and prioritizes indoor air hazards and develops short and long term strategies to strategies to solve IAQ problems. The kit also includes educational materials, sample letters, specific instructions about how to disseminate this material, checklists of what to look for in the schools, and solutions.

A consortium of state agencies, teachers' unions, the Connecticut Council for Occupational Safety & Health (CTCOSH) and the Yale and UConn Occupational Medicine Programs has come together to form an IAQ "Resource Team" to promote Tools for Schools and to offer training and technical assistance to Connecticut schools. For information about the EPA Tools for Schools Program and the Resource Team, call Kenny Foscue at the Connecticut Department of Public Health (860-509-7742) or Deb Hovey at CTCOSH (860-549-1877).

The occupational health programs at Yale (203/785-4197) and at UConn (860/679-2893) are staffed by occupational physicians who are experienced in dealing with IAQ health problems. Both programs have industrial hygienists who can help the schools identify and address environmental issues.



IAQ Tips From Connecticut OSHA's Consultation Program

by Richard Crans, Industrial Hygienist,
Connecticut Occupational Safety & Health Administration

Connecticut OSHA provides free safety and health consulting services for employers. A large portion of CT's public sector employees work in schools and offices, presenting significant concerns about the indoor environment. In 1998, 34 of the 55 (62%) health-related consulting requests completed in public sector workplaces were related to indoor air quality. Of the 34 indoor air quality requests, 17 (50%) were in schools.

Three concerns appeared to dominate employers' requests for assistance last year. Most commonly, employers and their employees expressed feelings of inadequate ventilation or no "fresh air". Additional issues involved reported temperature extremes, and mold within work areas.

The following are some questions related to these issues which may help with an investigation if poor indoor air quality is suspected.

Heating, ventilation, and air-conditioning (HVAC) systems are frequently found no longer operating within design specifications. Determine when the last preventive maintenance (PM) was performed. Is PM conducted routinely? What is the opinion of the person responsible for PM? Additionally, have there been any renovations to the facility? Did the renovation consider the capabilities of the existing system? Was the system reconfigured, upgraded, and/or balanced as determined necessary by a qualified individual?

Temperature can be difficult to regulate in a building with poor HVAC control. Sketch the

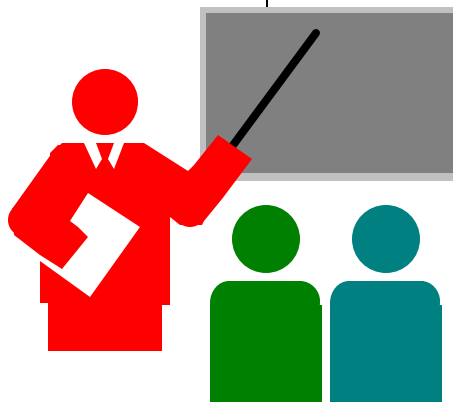
locations of thermostats, dampers, and other system components that affect temperature. Record the current settings. Also record other factors that may affect temperature, such as a strong solar load on a particular side of the building, high energy demands from equipment in certain areas, obstructed air registers, and increased occupant density. Compare this sketch with locations where occupants are voicing concerns over temperature control. Finally, compare with HVAC design specifications, which can be obtained from mechanical blue prints of the building. Check to see if design specifications will allow for resetting controls to meet the demand. If so, make setting adjustments in problem areas.

Buildings without HVAC systems have fewer mechanical complications as well as fewer options to control air distribution. Check building windows for function and drafts. Are screens in place for the windows? If area fans can be used safely, will they help to circulate air beneficially? Does the building have a functioning air exhaust system?

Concerns about mold contamination are easier to assess than most realize. Are there any moisture problems? Roof leaks, recurrent water or steam leaks, or dripping condensation? Do people occupy areas that feel or smell damp? Having a moisture problem may be the first link to mold problems. Always dry the wet areas and clean as soon as possible. Correct the problem, and monitor for reoccurrence. If water was present for a period of time, it's recommended to remove water damaged porous building materials and objects.

Consider employees' symptoms and concerns, map locations and any mechanical systems, and start with the obvious first. For more information, call Connecticut OSHA at 860/566-4550 or visit their web site at www.ctdol.state.ct.us/osh/osh.htm.

The Indoor Environment & Respiratory Disease in CT



Respiratory disease reports have comprised nearly 5% of the 2000 physician reports of occupational disease received each year by the Departments of Labor and Public Health. Of these respiratory disease reports, occupational asthma, RADS, sinusitis, rhinitis, hypersensitivity pneumonitis (HP) and bronchitis have been reported to be attributed to the indoor environment. From 12/01/89-12/31/98, there were 324 cases of these six respiratory diseases reported to the Occupational Disease Surveillance System (ODSS) (see Table 1). For 74 (23%) of the 324 cases, agents related to the indoor environment were reported to be the suspected cause of the disease. Table 2 shows the reported suspected agents used to define a case of respiratory disease attributed to the indoor environment.

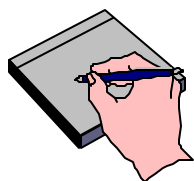


Table 1 Cases of Occupational Respiratory Disease in CT attributed to the Indoor Environment (IE), 12/1/1989- 12/31/1998 CT DPH Occupational Disease Surveillance Data			
Disease	# of cases reported	# of cases attributed to IE	% of cases attributed to IE
Asthma	172	30	17%
Bronchitis	58	13	22%
HP*	26	9	34%
RADS	26	4	15%
Rhinitis	24	11	46%
Sinusitis	18	7	39%
Total	324	74	23%

* Hypersensitivity Pneumonitis

Of the 74 workers with respiratory disease attributed to the indoor environment, the most frequently reported *occupations* were Educators, 18 (24%), and Office Workers, 16 (22%). Educators included teachers, principals, and guidance counselors. Office Workers included

administrative assistants, secretaries, data entry operators, clerks, accountants, accounting clerks, and bookkeepers. The most frequently reported

industry was educational services, noted on 24 (32%) of the 74 cases attributed to the indoor environment.

Table 2 Suspected Agents for Cases of Respiratory Diseases Attributed to the Indoor Environment, 12/1/1989-12/31/1998 CT DPH Occupational Disease Surveillance Data	
Bioaerosols	Indoor air
Cigar/cigarette smoke	Microbial agents
Construction/renovation	Mold/fungus
Dust/dust mites	Poor ventilation/HVAC

Indoor air complaints are sometimes difficult to handle because there are currently no state or federal standards for indoor air in occupational and non-occupational settings. However, the information outlined in the preceding articles by DeLisa et. al., Sparer, and Crans provide guidance on approaches that can be used to address indoor air problems in schools. For additional information, call DPH at 860/509-7744.

Please Report Occupational Diseases Now! Thank You.

For a reporting form, call (860) 509-7744.

Summary of Number of Reported Cases of Selected Respiratory Diseases in CT CT DPH Occupational Disease Surveillance Data					
	1996	1997	1998	1999*	ODSS Total**
Asthma	39	27	19	11	182
RADS***	7	4	6	4	30
Silicosis	0	1	3	0	12
Asbestosis	10	3	7	6	109
Asbestos-related pleural diseases	8	2	10	8	118
Total	64	37	45	29	451

*As of October 31, 1999. Data subject to change.

** Occupational Disease Surveillance System (ODSS) total since 12/89

*** Reactive Airways Dysfunction Syndrome



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TO:

(DeLisa, et. al., Continued from page 2)

with allergens (*i.e.*, dust mites, cockroaches and mold) that can lead to respiratory problems, the environmental evaluation should note items such as window and roof leaks, sources of moldy odors, stained ceiling tiles, soiled and/or moist carpeting, upholstery, and partitions. Materials and equipment such as art materials, shop supplies, cleaners and photocopiers should be reviewed for irritant properties and the likelihood of exposure for the affected teacher. The adequacy of air movement and ventilation should also be examined, especially in areas where irritants and/or allergens could be generated.

Addressing the problems may be as straightforward as removing old carpeting, increasing general housekeeping, or changing air filters. Or it may be more involved and costly, such as eliminating water intrusion from a roof or basement. Remediation of the factors that contribute to the asthma may allow a teacher to

successfully continue to work in his/her school. In other circumstances, a teacher may require a transfer to another area or a different school building. While medical treatment may be helpful, it should not be used in place of careful assessment of environmental factors and an appropriate response to them.

For more information, contact the Occupational & Environmental Health Center, UConn Health Center, at 860/679-2893.

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