Clearing the Air: Indoor Air Quality and Employee Health

by *Betty Waynick*

Look around you, and listen. Is your work area stacked with papers, books, serials, old and new? Are the people around you coughing, rubbing their eyes, forever telling you how tired they are, or constantly plagued with sinus infections, bronchitis, and colds or flu? There may be a correlation between these two situations. Even minor alterations in the work environment could make a difference in the health of employees in the workplace. This article is not designed to give technical jargon on either the medical aspects or building mechanics of indoor air health problems, or provide engineering solutions. Rather I intend to start with the most basic and inexpensive changes possible in the workplace and progress to a few more complex and costly efforts that can be made to protect the health of employees in libraries.

According to the Asthma and Allergy Foundation of America one in five Americans suffers from allergies, or approximately 54 million people.[1] The facts presented in this article suggest that the figure may be even higher among librarians. In 1993 the EPA estimated that pollution indoors is consistently two to five times greater than outdoors. Since the average American spends at least 90% of the workday inside, it is increasingly important to have the best quality air possible in our buildings. Documentation has shown that the indoor environment is having a marked effect on worker's health. Approximately half of the health problems plaguing American workers are in fact cold, flu, and allergy related illnesses.[2] This is an enormous health problem and a drain to both the pocketbooks and the productivity of library and other workers. Many of these problems may be caused by factors in the work environment. Most of the following environmental problems are at very elevated levels in the library setting. Don't panic as you read through this article; the first three aspects mentioned below can be controlled mainly through an awareness of the situation and a joint effort of the staff and management to improve it.

Scents and other controllable irritants that can be avoided.

In the average person, the sense of smell is remarkably acute. Odors travel directly from receptors in the nasal passages, called nasal epithelium, to the brain. These receptors are the only nerve cells in the body exposed to the open air. As few as 12 molecules can excite a receptor and as few as 40 cells can induce the sensation of smell.[3] People's sensitivity to chemicals is higher at night than during the day. Since your building accumulates pollution all day, the night staff should receive special consideration.[4]

The two seconds that it takes you to put on perfume or highly scented aftershave in the morning can spoil a coworker's day, or perhaps several days. Though most people don't think of it as such, perfume is a soup of chemicals that can contain formaldehyde and other potentially irritating substances causing eye, nose and upper respiratory irritation, asthmatic reactions, headaches and dizziness. The high dust levels in libraries can further aggravate these reactions. Just as smoke-free buildings are becoming commonplace for the health of employees, groups of sufferers now advocate the establishment of fragrance odor-free zones in buildings.[5]

Clutter: dust mites, molds and other inhaled substances, and ways to improve the situation.

Most libraries are very concerned about the preservation of their book collection. Endless workshops and articles are devoted to this subject. Yet many of the problems that attack books and other materials are also harmful to the people who process, catalog, and otherwise deal with these materials. Clutter and dust seem to be a ubiquitous part of library office and shelving areas. Libraries are virtual dust reservoirs, and this coating provides a haven for mites and a variety of bacteria. The dust alone that accumulates in a library can cause asthma or allergic rhinitis, a serious inflammation of the mucous membrane. Because susceptibility to dust mites and other organisms that live in dust increases with exposure, a person who is not sensitive now could become so over years of working in the same environment.[6] The bacteria that live in dust should also be of definite concern to workers. Samples of this bacteria have been shown to contain "a class of biological molecules with

certain characteristic toxic effects" called endotoxin.[7] While endotoxin is prevalent in both indoor and outdoor air, it can sometimes reach dangerous levels in an enclosed space. The healthy immune system fights off harmful bacteria all the time, but with prolonged exposure this system can accumulate an overload and finally start to break down. The bacteria that causes Legionnaires' disease is well documented; recently endotoxins have also been implicated in other types of pneumonia such as hypersensitivity pneumonitis and organic dust toxic syndrome.[8]

One of the least expensive, if not easiest, solutions to the dust problem is a regular cleaning schedule. This includes routine vacuuming and dusting with a damp cloth, which should be done several times a week in heavy traffic areas. (There will be more about dusting later.) Finding a consistent and regularly scheduled way of dealing with the mountains of paper, books, committee minutes, and other materials that accumulate is a good way of dealing with clutter. This accumulation includes all of the things which were originally going to be temporarily stored on a desk, but ten years later are still lying on the farthest reaches of a bookcase or table.

Molds and mildew are also associated with older books and papers that have likely been stored in a backlog area or closet. Most libraries receive a steady flow of gift books, many of which contain mold spores. The spores found on these objects present a threat not only to the infected material but also to the existing collections and, of course, to the unsuspecting workers who process them. Preservation departments are fully aware of this problem and provide adequate protection to their materials and staff. Unfortunately, protection is not always available in the central technical services areas of many libraries where the question of humidity levels and the possibility for isolating offending materials becomes paramount to protecting staff.

A steady, controlled temperature and humidity setting can help tremendously with the control of molds. If the humidity gets above 65% or the temperature above 70 degrees, there is a good chance that ever-present mold spores will begin to grow.[9] These spores can quickly enter the air conditioning system and spread throughout the library. In addition to increasing the breakdown of older books through the creation of sulfuric acid, high humidity also makes other indoor pollution more intense. It speeds up the out-gassing of chemicals from furnishings by releasing formaldehyde and other volatile organic compounds from materials such as particle board, polyurethane foam and other products commonly used in modern office, as well.

Inhaled chemicals also pose a growing problem for the library community. A casual browse through a large bookstore, to those who are sensitive to smells, can be a trying experience. Just walking in the front door can immediately irritate the eyes and nose of those people who are most susceptible. The papers and covering materials for books, and especially serials, have much more chemical processing than ever before. In libraries, add to this publications from other countries that may contain insecticides, and books just entering the building from an outside bindery. Newly bound materials contain adhesives, and many are covered with extensively processed coating and finishes. The number of chemicals that the library worker must deal with is staggering.

Reducing chemical and all indoor air pollution requires both a sufficient intake of outdoor air and good air flow within the workspace. While a well maintained HVAC (heating, ventilation and air conditioning) system is essential, other more easily obtainable measures also are important. The room partitions and shelving that are currently standard in most offices and libraries can block air flow. One way of dealing with partitions is to buy ones that stand on legs, with a foot or more of air space at the bottom. They also should be made no higher than is absolutely necessary for privacy. Shelving, too, should contain as much air flow space below, above, and between units as it is possible to provide.

Cleaning agents: what does clean really mean?

What do you think of when cleaning is mentioned? If cleaning to you means pulling out the ammonia filled aerosols for windows or other widely advertised sprays for dusting, and the wax that smells like shoe polish for furniture, then you could be endangering your health in a very big way. All of the cleaners promoted by the major magazines and by television add to the air a significant number of unhealthy chemicals, some of which cause cancer. If several people decide to polish their desks on the same day in a closed workspace, the petroleum distillates alone could reach dangerous levels. When this happens it is likely that the next day some people will be so ill that they will be unable to come to work; others will show signs of respiratory distress. Headaches, fatigue or asthma attacks may be evident that same afternoon in workers who are at all sensitive to chemicals.

There are much safer ways to accomplish the goal of cleaning your workspace while keeping the air clean. The truly safe products are "old-fashioned" formulas such as borax, vinegar, and baking soda. A number of popular books give detailed recipes for making your own cleaners, and commercial cleaners which use nontoxic agents are available to your janitorial staff. Possibly the most important cleaning task in the library is removing the layer of dust which accumulates overnight. This is best accomplished by using no cleaner at all, but only a damp cloth. Hepa (high efficiency particulate air) vacuum cleaners are also a necessity in the library environment. These vacuums remove even very fine particles from the air and do not redistribute the dust as most regular vacuums do. In an article on healthy cleaning in the online periodical ENVIROS, Frank A. Lewis mentions seven cleaning fundamentals for environmentally safe cleaning.[10] Among these are safety and cleaning for health first and appearance second: removing the maximum number of pollutants from the workspace while adding as few chemicals, particles, and as little moisture as possible.

It is most important for the library manager to know what products both the cleaning staff and employees are using in the building and request that specific non-toxic items be used. This is especially important with such routine tasks as vacuuming and washing windows, and with major jobs like the regular cleaning of carpets or stack areas.

More complex issues: HVAC systems, filters, and fresh air.

Although HVAC (heating, ventilation and air conditioning) systems are the key to healthy, safe indoor environments, they can be extremely expensive to replace or even upgrade. Before this option is considered, try a few simple measures that can make a noticeable difference in your system. Air conditioning equipment is designed to be most efficient with a clean filtering system. Even the best system cannot function properly with clogged airways or dust encrusted filters. The next time you are under an air or intake vent, notice the visible grids. If you touched or unscrewed the vent, would the floor be inches deep

in dust and grime? The air that employees breath passes through these vent systems. A regular maintenance schedule is needed to keep the filtering system as free of contaminants as possible. Most libraries need extra heavy duty filters because of the enormous amount of dust that they must handle. If your library is part of a larger organization, housekeeping and physical plant may have to coordinate their efforts, the physical plant first turning off the system for a brief time so that the housekeepers can properly clean the vents. Thorough protection also must be provided to the housekeeping or other cleaning staff who vacuum the vents. Any type of vent cleaning should be done at a time when other staff are out of the building so that the system will have enough time to clear the dust that has been introduced into the air from the cleaning.

Managers should know how the HVAC system is being maintained and that appropriate filters and cleaning schedules are in place. It also is important to determine if older procedures implemented in the early 1970s are still being used. In response to the oil embargo of the 70s, conservation measures were introduced that affected the operation of HVAC systems. Closing down the system at night, reduction of airflow during peak usage hours, and the reduction of outdoor air to a minimum are practices that may still be in effect in your library. ASHRAE (American Society for Heating, Refrigeration and Air Conditioning Engineers) has set standards for air movement based on the number of occupants in a building. The library or building manager should be acquainted with this and other air quality standards and their frequent revisions.[11]

Planning for renovation.

Renovation seems constant in some libraries, while in others it happens much less frequently, but most employees have experienced at least one major renovation of their work space. This poses not only the risks of lung damaging dust and chemical contamination, but also the challenge of choosing new furniture, office partitions, and carpeting. It is important that planners not only have layout, aesthetic, and functional concerns on their agenda, but also consider the comfort and safety of staff. The following concerns should be considered.

The actual construction process poses problems that must be discussed in detail with the contractor. Workers near the construction must be isolated from the work area as much as possible, either by moving them to a safer area or by sealing off the work site. Temporary exhaust ventilation systems should be installed so that air contaminants can be exhausted directly to the outdoors, protecting workers from paint fumes, construction dust, adhesives, and other harmful substances.[12] For major projects like asbestos or lead paint removal, strict federal guidelines have been set; however, for the more routine projects such as installing new carpet, reconfiguring and painting walls, there is no set standard. Contractors often provide only the most rudimentary controls for protecting the staff, who are often expected to work in the very heart of the affected area.

All furniture, partitions, carpet, and carpet glues should have the lowest levels of toxic emissions possible. All of these products can contain noticeable amounts of formaldehyde. Copiers and laser printers, both of which emit ozone, should be as far from the workspace as possible. Ideally copiers would have their own separate room ventilated directly to the outside. New carpets should be aired out if possible before installation for a week or so. Large fans running constantly for several weeks will allow any chemicals in the carpet to dissipate much more quickly.

Planning for a new building.

All of the above suggestions also apply to a new building project. In addition, the physical location of a new building must be considered. Often the library manager has no control over the site that is chosen, but several factors can be dealt with before construction begins. A soil analysis can determine if the ground is contaminated with radon, oil from improperly stored fuel from an earlier inhabitant of the space, or other chemical peculiarities that might later affect people working in the building. Noting what industries, utilities, or major roads are located nearby will give the contractors a better idea of where air intake vents should go, so that the outside air being drawn into the building will be as clean as possible. The workers in the building should be shielded from major generators or other high power sources. Loading docks or other parking areas where diesel fuel or other gases might accumulate should be as far as possible from both air intakes and doors that will be constantly in use. For an excellent explanation and list of considerations for both renovations and designing a new building, see the Bush and Enssie article cited in note 11.

You are probably beginning to realize that keeping the library environment safe is a very delicate balancing act. Improving the working environment requires both concerned and knowledgeable management and channels of communication for employees to express concerns related to their health and the building in which they work. By working together, all staff members can identify, monitor, and eventually eliminate dangerous situations. These efforts should lead to better health, more job satisfaction, and higher productivity for all workers in the library.

References

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[12] David W. Bearg, *Indoor Air Quality and HVAC Systems* (Boca Raton, FL.: Lewis Pub., 1993), 37.

Selected Indoor Air Quality Resources on the Internet

Allergy, Asthma & Immunology Online <http://allergy.mcg.edu>

American Industrial Hygiene Assoc. <http://www.aiha.org>

American Lung Association <http://www.lungusa.org>

American Society of Heating, Refrigeration and Air-Conditioning Engineers <http://www.ashrae.org>

Asthma and Allergy Foundation of America <http://www.aafa.org/>

EnviroCenter <http://www.envirocenter.com>

Environmental Health Center <http://www.ehcd.com>

Environmental Health Clearinghouse <http://infoventures.com> (NIEHS)

Enviromental Protection Agency <http://www.epa.gov/iaq/>

National Institute of Environmental Health Sciences <http://www.niehs.nih.gov>

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