

# Air Pollution in Libraries

By **Edith** Arbach

Pollution in libraries has always been an issue for library patrons and staff alike. Research on major library pollutants goes back to 1916, when an analysis of dust collected in a vacuum cleaner from the bookshelves of Rensselaer Polytechnic Institute Library in Troy, NY, was conducted. The analysis under the microscope showed human hair, wool, cotton, fly wings, leather, iron, aluminum, calcium, silicon, and a very high content of carbon and nitrogen. But the most striking finding in that study was the presence of a bacterium which came probably from the sneezing and coughing of library patrons. This organism survived under the same conditions as those causing diphtheria, cholera, typhoid fever, and tuberculosis – all deadly diseases at that time.

### **Origin of Pollutants in Libraries**

In the past, major pollutants in libraries were of external origin, resulting from the combustion of oil derivatives, such as gases released by vehicle exhausts and boilers, or emissions linked to industrial activities. These pollutants were aggressive gases such as ozone (O<sub>3</sub>).

In modern libraries the pollution issue is more complex. At the end of the 20th century, efforts to improve building insulation led to the incorporation of synthetic insulating material and to the reduction of ventilation. Insulating materials, along with furniture, release volatile organic compounds (VOCs) – a whole range of toxic chemicals

including formaldehyde, one of the most toxic indoor pollutants and an irritant gas known as a carcinogen. A correlation between formaldehyde concentration and different cancers and allergies, including severe asthma, has been established clinically.

Another of the principal identified risks in our present libraries is that of ozone released by laser printers and photocopying machines. This equipment often contains filters capable of neutralizing fumes, but, once the filters are saturated, ozone is released and is frequently detectable in the areas located around the equipment.

Library heritage is also a major source of indoor pollution. Many of us are familiar with the odour of old books and paper. This odour is a sign of the presence of volatile organic acids derived from the degradation of lignin and cellulose, major constituents of paper. Films stocked in libraries, magnetic tapes, and other audiovisual collections release toxic lubricants and VOCs, due to alteration while in storage. This alteration appears to be accelerated by humidity.

### **Results of Recent Studies**

A 2005 study of indoor air quality in 20 university libraries in Strasbourg, France, and its suburbs has shown a significant concentration of formaldehydes in many of them, especially those located in proximity to laboratories.

The concentration values obtained in this study were comparable to those obtained from the study of the 16 libraries of the University of Modena (Italy) in 1996.

Another dangerous pollutant in libraries is dust. Since libraries hold large print collections in confined spaces, dust accumulated on books tends to catch and hold high numbers of bacteria and mites. A survey of dust samples from hospitals, libraries, and institutes in Upper Silesia (Poland) in 1998 showed that the highest mite densities per gram of dust were found on library bookshelves. In 2006, another survey of 219 employees from libraries, archives, and public services in Germany found more complaints of allergies of the respiratory system and the skin among employees of libraries and archives, with dermatitis (inflammation of the skin) diagnosed significantly more often in employees of archives.

### **Strategies to Improve Air Quality**

The main strategy consists of avoiding or eliminating indoor pollution sources by performing regular quality tests to evaluate the concentration of VOCs and other toxic gases in different areas of the library, and by controlling this concentration.

There is no doubt that frequent cleaning of bookshelves and increased ventilation can reduce indoor air pollution. But confined spaces in libraries, shelving areas, and photocopying/ printing areas require additional measures to reduce the concentration of air contaminants, such as the installation of air purification devices. A new generation of highly effective air filtration systems has recently been commercialized. These systems use treated charcoal, chemical gels, and a group of minerals called zeolites. They are all materials with high binding power, capable of trapping, modifying, and removing undesirable toxic gases such as formaldehyde and ozone from enclosed environments.

Cost effectiveness analyses done by the World Health Organization have shown that interventions to reduce indoor air pollution are cost effective, considering the costly treatments of allergies, respiratory diseases, and other ailments caused or aggravated by indoor air contaminants. From a public health point of view, continuous promotion of improved air quality in libraries is necessary, and an ounce of prevention is worth a pound of cure.

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