The Health Protection Act, National Guidelines for Indoor Air Quality and Development of the National Indoor Air Programs in Finland

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This article presents the current handling of disease related to moldy buildings in Finland as an example of an integrated health strategy. It describes the role of the Finnish Health Protection Act for indoor environments and how cases of indoor air problems are dealt with by local, regional, and national authorities. Key words: guidelines, Health Protection Act, indoor air, mold, public health — Environ Health Perspect 107(suppl 3):515–517 (1999).

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Background

In Finland, the quality of indoor air in apartment buildings, daycare centers, schools, and other public buildings such as office buildings and hospitals became a subject of public concern in the early 1990s. This concern resulted from studies showing that microbial problems are common even in cold climate conditions. Before the early 1990s, health risks associated with microbial exposure had been studied mainly in the farming and sawmill industries and other types of industrial settings (1–3), although the sick building syndrome had been studied in large office buildings at the Technical University of Helsinki (4,5). However, in the 1980s moisture damage and mold exposure were not yet the focus of research on apartment or office buildings. The first major complaints of moisture damage and mold growth were from rented apartments in community-owned blocks of flats and detached houses in larger cities. In these rental apartments, a number of inhabitants experienced respiratory symptoms associated with living in apartments with visible mold growth.

In the 1980s, there were already studies in the National Public Health Institute (KTL), University of Kuopio, Kuopio Regional Institute of Occupational Health, and Helsinki University of Technology concerning the air quality of Finnish workplaces (farmhouses, sawmills, offices) and apartment buildings (3,6–10). Airborne concentrations of bacteria and mold were measured in various types of buildings during different seasons of the year (11–18). In 1990, the first pilot studies on health effects associated with microbial exposure were started in apartment buildings and daycare centers as a part of the research program of KTL (19,20). KTL is a state research institute under the Ministry of Social Affairs and Health.

In extreme situations, it is possible to prohibit the use of the building because of a health hazard. The definition of a health hazard in the Health Protection Act and the health requirements for dwellings and other premises used by people are described below (25).

Section 1—Aim of the Act. The aim of the act is to maintain and promote the health of the population and the individual and to prevent, reduce, and eliminate factors in the living environment that may constitute a health hazard (health protection). For the purpose of this act, health hazard means a sickness or other disturbance to health in a person or the occurrence of a factor or condition that may reduce the healthiness of the living environment of an individual or population.

Section 2—General Principles. Activities affecting the living environment shall be planned and arranged in a way that maintains and promotes the health of the population and the individual. Activities affecting the living environment shall be carried out in such a way that health hazards can be avoided, if possible.

Section 26—Health Requirements for Dwellings and Other Premises Used by People. The purity of the indoor air of a dwelling and other indoor premises, their temperature, humidity, noise, ventilation, light, radiation, and other corresponding conditions shall be such that they do not constitute a health hazard to those staying in the dwelling or the indoor premises. A dwelling or other premises used by people shall not contain animals or microbes to an extent that they would constitute a health hazard.

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Section 27—Health Hazard Occurring in a Dwelling or Other Premises Used by People. If noise, vibration, smell, light, microbes, dust, smoke, excessive heat or coldness or humidity, radiation, or other factors comparable to these occur in a dwelling or other premises used by people in a way that may constitute a health hazard to those staying in the dwelling or the premises, the municipal health protection authority may obligate the party whose action or measure has resulted in such a fault to take measures in order to eliminate or restrict the health hazard.

If the fault is due to shortcomings of the dwelling or other premises and it is not possible to eliminate the fault, or the owner or holder of the dwelling or the premises, in case he is responsible for remedying the shortcoming or fault, has not taken measures ordered by the health protection authority, the municipal health protection authority may prohibit or restrict the use of the dwelling or the premises for the purpose intended.

Indoor Air Programs in Finland
In the early 1990s, two indoor air programs were started. One was the Moldy House Programme of the KTL, Department of Environmental Microbiology in Kuopio. This KTL moldy house program is nationwide and has close collaboration with the Kuopio Regional Institute of Occupational Health, Kuopio University, and Kuopio University Hospital. The multidisciplinary working group consists of engineers, microbiologists, hygienists, epidemiologists, toxicologists, pulmonologists, pediatricians, and otolorhinolaryngologists. The collaborators in construction engineering science have been Helsinki Technical University, Tampere Technical University, and the State Technical Research Centers in Helsinki and in Oulu. The other national indoor air program was conducted by the Finnish Institute of Occupational Health (FIOH), which is responsible for the research and education of experts in occupational health field.

The KTL research program included a study in which a random sample of single-family houses and terraced houses in various parts of the country was studied to identify the prevalence of moisture damage and the types of moisture damages in buildings from different decades. A similar study was carried out in a random sample of apartment buildings. The results were similar in independent studies, as approximately three-quarters of the buildings had some type of moisture damage during the years. The cumulative incidence was similar in apartment buildings, daycare centers, and school buildings (26–28). All research projects were conducted in close cooperation with local authorities of environmental health surveillance in the local communities. Simultaneously, local health inspectors were trained in courses given at Kuopio University in sampling, cultivating, and identifying microorganisms that typically grow in moisture-damaged buildings. Soon several laboratories in larger cities were able to identify microbial samples in cooperation with the microbiological laboratories of the National Public Health Institute and the Regional Institute of Occupational Health. Construction engineers were also trained in building inspection at Kuopio University and the technical universities and institutes.

Diagnostics of Symptoms and Diseases Associated with Mold Exposure
At the Finnish Institute of Occupational Health, occupational health physicians and nurses were trained to identify symptoms and signs of indoor air problems at the workplace. Physicians working in outpatient care and hospitals were trained in courses given at the University of Kuopio and in a number of lectures and courses given at the central hospitals by experts from KTL and FIOH.

The five regional Institutes of Occupational Health assist local experts of occupational health in each part of the country. The Kuopio Regional Institute of Occupational Health serves the whole country in cultivating and identifying the microbial samples from the buildings and analyzing microbe-specific IgG antibodies in serum samples. The analysis of microbe-specific immunoglobulin G (IgG) antibodies as a measure of exposure is available for a total of 42 microbes. Over 14,000 serum samples were analyzed between 1980 and 1997 (29).

The clinical diagnosis of occupational diseases of mold-exposed patients takes place mainly at the FIOH in Helsinki. According to national statistics, approximately 500 new cases of occupational disease caused by mold have been diagnosed in recent years (30). These diseases include mainly allergic rhinitis, asthma, alveolitis (hypersensitivity pneumonitis), and organic dust toxic syndrome associated with microbial exposure in moisture-damaged buildings.

For patients exposed in nonoccupational settings, there are two clinics in the country that specialized in diseases associated with indoor air exposures; one is the Skin and Allergy Hospital of Helsinki University Hospital, and the other is the Dermatology Clinic of Kuopio University Hospital.

Practical Problems
Although the Health Promotion Act clearly determines the health risk associated with a building to be the owner’s responsibility, problems arise in practical situations when the building is owned by the same municipality as is responsible for surveillance and risk assessment or when the building is owned by stock owners of a cooperative organization, which is often the case in blocks of flats. When the responsibility is shared among a number of partners, the situation is more difficult, and shared responsibility often also means shared risk assessment, shared and prolonged decision making, and unclear information pathways. In difficult situations with unclear responsibilities between municipal authorities, the use of external experts has proved useful. At workplaces such as large office buildings, the FIOH and the respective regional institutes can send their experts to the site. When other types of buildings are involved, the expert group of the National Public Health Institute serves the whole country. In schools and daycare centers, which are both workplaces for adults and living surroundings for groups of children, the two institutions cooperate (24).

In difficult field situations, prerequisites for cooperation between different parties are mutual trust between multidisciplinary experts and fluent exchange of information. When external experts are used, local authorities must be involved in the process as equal partners in decision making. In most cases, a representative of the users of the building and a member of the labor protection organization are also included in the working group. In a number of larger cities, a permanent working group on indoor air problems has been a very useful tool in solving the increasing number of problematic cases (31).

Indoor Air Regulations in Other Countries
Regulations and recommendations concerning indoor air quality exist in many Nordic and central European countries as well as in the United States and Canada. In countries other than Finland the problem caused by moisture and microbial exposure is considered a health risk but is not mentioned in legislation. As such, the
Finnish legislation and other official recommendations given by the Ministry of Social Affairs and Health are unique.

In the United States, recommended values are given for ventilation rates, particulates, and several chemicals in indoor air but not for microbes (32,33). The U.S. Bioaerosol Committee decided not to give numerical threshold limit values (TLV) for bioaerosols. The rationale for this decision has been discussed in scientific meetings, e.g., in Saratoga Springs, New York, in 1998 (34).

In other European countries, e.g., the United Kingdom, microbial growth and moisture in buildings are considered potentially harmful to health, and recommended values for relative humidity, particulates, and ventilation rates are given as well as the means for control of moisture in buildings (35). In Germany, house dust, microorganisms, and other allergens are considered health hazards, and measures are given for avoiding these risks (36).

In Sweden, molds and other moisture-related microbes are considered health risks, but no recommended values are given. In the Swedish National Action Plan it is stated that "no-one should need to risk sickness or symptoms caused by defective indoor environments" (37).

Conclusion
Currently, there is considerable agreement on the health risk caused by moisture and microbial growth in residential buildings. How these risks are mitigated and taken into consideration in legislation depends on existing national and state legislation and administrative traditions, as well as on climatic conditions and other local factors. On a national level, risk assessment and determination of TLV or recommended limit values should be based on scientific research on exposure assessment and health effects in respective conditions. The Finnish model is presented as a proposal for other countries planning similar regulatory procedures.

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