

**Summary of 2009 WHO Report: *WHO Guidelines for Indoor Air Quality: Dampness and Mould***

In 2009 the World Health Organization issued a report, entitled *WHO Guidelines for Indoor Air Quality: Dampness and Mould*, of its study of the latest investigations regarding dampness, mold, and indoor quality. CDC played no role in the development or writing of this report. In the report WHO) provides the following summary of its conclusions, excerpted here without comment:

- Sufficient epidemiological evidence is available from studies conducted in different countries and under different climatic conditions to show that the occupants of damp or mouldy buildings, both houses and public buildings, are at increased risk of respiratory symptoms, respiratory infections and exacerbation of asthma. Some evidence suggests increased risks of allergic rhinitis and asthma. Although few intervention studies were available, their results show that remediation of dampness can reduce adverse health outcomes.
- There is clinical evidence that exposure to mould and other dampness-related microbial agents increases the risks of rare conditions, such as hypersensitivity pneumonitis, allergic alveolitis, chronic rhinosinusitis and allergic fungal sinusitis.
- Toxicological evidence obtained in vivo and in vitro supports these findings, showing the occurrence of diverse inflammatory and toxic responses after exposure to



microorganisms isolated from damp buildings, including their spores, metabolites and components.

- While groups such as atopic and allergic people are particularly susceptible to biological and chemical agents in damp indoor environments, adverse health effects have also been found in nonatopic populations.
- The increasing prevalences of asthma and allergies in many countries increase the number of people susceptible to the effects of dampness and mould in buildings.

The conditions that contribute to the health risk are summarized by WHO in the Executive Summary as follows:

- The prevalence of indoor dampness varies widely within and among countries, continents and climate zones. It is estimated to affect 10–50% of indoor environments in Europe, North America, Australia, India and Japan. In certain settings, such as river valleys and coastal areas, the conditions of dampness are substantially more severe than the national averages for such conditions.
- The amount of water on or in materials is the most important trigger of the growth of microorganisms, including fungi, actinomycetes and other bacteria.
- Microorganisms are ubiquitous. Microbes propagate rapidly wherever water is available. The dust and dirt normally present in most indoor spaces provide sufficient nutrients to support extensive microbial growth. While mould can grow on all materials,



selection of appropriate materials can prevent dirt accumulation, moisture penetration and mould growth.

- Microbial growth may result in greater numbers of spores, cell fragments, allergens, mycotoxins, endotoxins,  $\beta$ -glucans and volatile organic compounds in indoor air. The causative agents of adverse health effects have not been identified conclusively, but an excess level of any of these agents in the indoor environment is a potential health hazard.
- Microbial interactions and moisture-related physical and chemical emissions from building materials may also play a role in dampness-related health effects.
- Building standards and regulations with regard to comfort and health do not sufficiently emphasize requirements for preventing and controlling excess moisture and dampness.
- Apart from its entry during occasional events (such as water leaks, heavy rain and flooding), most moisture enters a building in incoming air, including that infiltrating through the building envelope or that resulting from the occupants' activities.
- Allowing surfaces to become cooler than the surrounding air may result in unwanted condensation. Thermal bridges (such as metal window frames), inadequate insulation and unplanned air pathways, or cold water plumbing and cool parts of air-conditioning units can result in surface temperatures below the dew point of the air and in dampness.



WHO formulated the following guidelines and presented them in the report Executive Summary:

- Persistent dampness and microbial growth on interior surfaces and in building structures should be avoided or minimized, as they may lead to adverse health effects.
- Indicators of dampness and microbial growth include the presence of condensation on surfaces or in structures, visible mould, perceived mouldy odour and a history of water damage, leakage or penetration. Thorough inspection and, if necessary, appropriate measurements can be used to confirm indoor moisture and microbial growth.
- As the relations between dampness, microbial exposure and health effects cannot be quantified precisely, no quantitative health-based guideline values or thresholds can be recommended for acceptable levels of contamination with microorganisms. Instead, it is recommended that dampness and mould-related problems be prevented. When they occur, they should be remediated because they increase the risk of hazardous exposure to microbes and chemicals.
- Well-designed, well-constructed, well-maintained building envelopes are critical to the prevention and control of excess moisture and microbial growth, as they prevent thermal bridges and the entry of liquid or vapour-phase water. Management of moisture requires proper control of temperatures and ventilation to avoid excess humidity, condensation on surfaces and excess moisture in materials. Ventilation should be distributed effectively throughout spaces, and stagnant air zones should be avoided.



- Building owners are responsible for providing a healthy workplace or living environment free of excess moisture and mould, by ensuring proper building construction and maintenance. The occupants are responsible for managing the use of water, heating, ventilation and appliances in a manner that does not lead to dampness and mould growth. Local recommendations for different climatic regions should be updated to control dampness-mediated microbial growth in buildings and to ensure desirable indoor air quality.

- Dampness and mould may be particularly prevalent in poorly maintained housing for low-income people. Remediation of the conditions that lead to adverse exposure should be given priority to prevent an additional contribution to poor health in populations who are already living with an increased burden of disease.

The guidelines are intended for worldwide use, to protect public health under various environmental, social and economic conditions, and to support the achievement of optimal indoor air quality. They focus on building characteristics that prevent the occurrence of adverse health effects associated with dampness or mould. The guidelines pertain to various levels of economic development and different climates, cover all relevant population groups and propose feasible approaches for reducing health risks due to dampness and microbial contamination. Both private and public buildings (e.g. offices and nursing homes) are covered, as dampness and mould are risks everywhere.



Source: Heseltine E & Rosen J, eds. *WHO Guidelines for Indoor Air Quality: Dampness and Mould* (2009). Executive Summary, pp. xii-xvi. Accessed at [www.euro.who.int/document/E92645.pdf](http://www.euro.who.int/document/E92645.pdf)

