



**Statement for the Record
Before the Subcommittees on Oversight and
Investigations and Housing and Community
Opportunity
Committee on Financial Services
United States House of Representatives**

**State of the Science on Molds and
Human Health**

Statement of

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Good afternoon. I am Dr. Stephen Redd, the lead CDC scientist on air pollution and respiratory health at the Centers for Disease Control and Prevention (CDC). Accompanying me today is Dr. Thomas Sinks, Associate Director for Science of environmental issues at CDC.

We are pleased to appear before you today on behalf of the CDC, an agency whose mission is to protect the health and safety of the American people. I want to thank you for taking the time to hear about the mold exposures in poorly maintained housing and other indoor environments and their effect on people's health. While there remain many unresolved scientific questions, we do know that exposure to high levels of molds causes some illnesses in susceptible people. Because molds can be harmful, it is important to maintain buildings, prevent water damage and mold growth, and clean up moldy materials.

Today I will briefly summarize for the committee

- CDC's perspective on the state of the science relating to mold and health effects in people;
- CDC's efforts to evaluate health problems associated with molds,
- CDC's collaborations with other Federal agencies related to mold and people's health;
- CDC's collaboration with the Institute of Medicine on mold and health; and
- CDC's next steps regarding mold and health.

The State of the Science

Fungi are a kingdom of organisms that include mushrooms, mildews, molds, and yeasts. It is

estimated that there are between 50,000 and 250,000 species of fungi, and fewer than 200 have been described as human pathogens that can cause infections. Molds are ubiquitous in nature and grow almost anywhere indoors and outdoors. More than 1,000 different kinds of indoor molds have been found in U.S. homes. Molds spread and reproduce by making spores, which are very small and lightweight, able to travel through air, capable of resisting dry, adverse environmental conditions, and hence capable of surviving a long time. Molds need moisture and food to grow, and their growth is stimulated by warm, damp, and humid conditions.

Molds can cause illnesses in situations other than humid indoor environments. We have documented that molds can cause infections in susceptible people, particularly in hospital settings where 9% of hospital-acquired (nosocomial) infections are caused by fungi. Respiratory infections due to inhalation of the fungus *Aspergillus* have been documented mostly in immunocompromised individuals. Molds also have been associated with some cancers. Two mold-produced toxins (aflatoxins and ochratoxin A) have been classified by the National Toxicology Program as human carcinogens (<http://ntp-server.niehs.nih.gov/>). Chronic ingestion of these toxins from eating contaminated foods has been associated with liver and kidney tumors in animals and people.

We also know that respiratory illnesses among workers may be attributed to mold exposures. In industrial and agricultural settings, various forms of hypersensitivity pneumonitis (e.g., farmer's lung, woodworker's lung, malt worker's lung), and other allergic responses and infectious respiratory diseases (e.g., aspergillosis) have been reported. Farmer's lung is caused by

Thermoactinomyces species or fungi found in moldy hay, straw, or grain dust. Farmer's lung has been extensively reported in many countries including the United States, Canada, The Scandinavian countries, France, and other European countries. Reported prevalence of farmer's lung ranges from 0.5% to 9.6% in farming populations.

Outbreaks of hypersensitivity pneumonitis also have been reported in office buildings in relation to exposures to mold-contaminated humidifiers and ventilation systems (Arnou et al. 1987. *Early detection of hypersensitivity pneumonitis in office workers, American Journal of Medicine* 64:236-242 and Hodgson et al. 1987. *An outbreak of recurrent acute and chronic hypersensitivity pneumonitis in office workers. American Journal of Epidemiology* 125:631-638)).

We also know that molds can cause illness when people are exposed to extensive mold growth indoors. In its 1993 report "Indoor Allergens," the Institute of Medicine (IOM) concluded that airborne fungal allergens were most often associated with allergic diseases, such as allergic rhinitis/conjunctivitis, allergic asthma, and hypersensitivity pneumonitis. In its 2000 report "Clearing the Air: Asthma and Indoor Air Exposures," IOM concluded that there is sufficient evidence of an association between exposure to mold and exacerbations of asthma. The IOM also stated that there was inadequate evidence that molds caused people to become asthmatic.

We do not know whether molds cause other adverse health effects, such as pulmonary hemorrhage, memory loss, or lethargy. We also do not know if the occurrence of mold-related

illnesses is increasing. Other than surveillance for hospital-acquired infections, there is no system to track the public's exposure to and the possible health effects of mold.

Exposure to mold does not always result in a health problem. However, routine measures should be taken to prevent mold growth indoors because some people are, or may become, allergic to it.

For people who are allergic to mold, common effects include hay-fever-like allergic symptoms. Certain individuals with chronic respiratory disease (chronic obstructive pulmonary disease or asthma) may experience difficulty breathing when exposed to mold. Also, people with immune suppression or underlying lung disease are more susceptible to fungal infections.

CDC efforts to evaluate the health problems associated with molds

CDC has conducted several activities related to mold in wet indoor environments and its effect on people's health.

In 1994, CDC conducted two epidemiologic investigations of reported clusters of the acute onset of bleeding from the lungs of very young children (pulmonary hemorrhage or idiopathic pulmonary hemosiderosis). In one investigation a possible association was reported between exposure to the mold *Stachybotrys atra* (*S. atra*) and disease. This association was not reported in the second investigation. In a further review of our first investigation, CDC reviewers and an external panel of experts determined that there was insufficient evidence of any association between exposure to *S. atra* or other toxic fungi and idiopathic pulmonary hemosiderosis in infants. CDC has plans to further evaluate the relationship between pulmonary hemorrhage and

S. atra through state-based surveillance, further investigations of identified disease clusters, and focused research studies.

· In July 2001, following flooding in North Dakota, CDC investigated Turtle Mountain Reservation residents' concerns that mold contaminating their homes might be contributing to an increase in illness among tribal members. CDC assessed both the physical and environmental condition of the homes to identify any environmental hazards, including the presence of mold, and collected information on health conditions of the individuals living in the homes. An interim report identified several existing hazards unrelated to mold and made recommendations to address these hazards. The final report is expected in October 2002. In addition to working with the Indian Health Service and the Federal Emergency Management Agency (FEMA) on this project, CDC also worked with the U.S. Department of Housing and Urban Development (HUD) to identify procedures that might be implemented to assess conditions of HUD homes that would help to prevent mold.

· CDC responded to a request from the State of Texas and the City of Houston in the summer of 2001, after the city experienced significant flooding, to assess the conditions of the buildings and provide advice on cleanup and repair of affected buildings. The emphasis of this technical assistance was cleanup and prevention of further mold growth and prevention of unnecessary exposure.

· In 1999, CDC's occupational health experts began a 5-year initiative on work-related asthma in

offices and schools, with an emphasis on moisture and mold exposures. We have a targeted research program regarding work-related asthma that includes evaluations of workplaces, intervention studies, and recommendations for reducing the risk of respiratory disease, and provision of information to management, employees and environmental health and safety professionals. The research aims are to be achieved utilizing problem buildings identified through the CDC's occupational Health Hazard Evaluation program. Specific objectives include methods development and testing, specifically with regard to state-of-the-art techniques for assessing indoor air quality-related exposures; quantification of objective medical indices related to asthma and other lung diseases; and planned case-control, cross-sectional, and intervention studies directed towards risk factor identification and assessment.

So far, the results include the following:

- there were significant relationships between reports of work-related respiratory disease and visual assessment of water and mold-damage in two studies;
 - there were significant relationships between endotoxin and ultra-fine particles in air and work-related respiratory symptoms; and
 - there were significant relationships between indicators of mold in chair and floor dust and work-related respiratory symptoms.
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- CDC is planning an occupational and environmental research project regarding bioaerosols in schools to address children's and teacher's health issues.

· CDC is working to address indoor air quality issues, including mold, in partnership with stakeholders through the National Occupational Research Agenda (NORA). NORA efforts have resulted in development of the research priorities paper, “Improving the Health of Workers in Indoor Environments: Priority Research Needs for a National Occupational Research Agenda,” which identifies important areas for future research. The paper has been accepted for publication in the American Journal of Public Health (AJPH).

CDC’s collaborations with other Federal agencies

CDC is working with federal, state, local, and tribal governments to investigate and respond to mold-related problems. I have already mentioned that we work with HUD, FEMA, and the Indian Health Service on mold issues. We have also assisted the U.S. Environmental Protection Agency (EPA) Indoor Environments Division in the development of a guide for mold remediation in schools and large buildings and in the development of a brief guide to mold for homeowners. CDC is participating in the development of a World Health Organization guidance document on exposures to biological agents in the indoor environment; this document should be finalized in the year 2003. CDC also has worked with the Council of State and Territorial Epidemiologists in the development of case definitions and classifications for pulmonary hemorrhage in infants.

CDC’s collaboration with the Institute of Medicine

CDC is funding the IOM to evaluate the relationship between damp or moldy indoor environments and the manifestation of adverse health effects. Under this project, the IOM will

conduct a comprehensive review of the scientific literature. The review will focus on respiratory and allergic symptoms and other non-allergic health effects. The IOM will include recommendations or suggest guidelines for public health interventions and future research. The IOM began the study in January 2002 and is expected to complete it in the late summer or early fall of 2003. To date, the IOM committee conducting the study has held two meetings, the first on March 26, 2002 and the second on June 17, 2002. A third meeting is planned for Fall 2002. The report will be disseminated to audiences such as relevant federal agencies, state public health and indoor air quality officials, academic institutions and researchers, environmental firms, and the building industry.

CDC's Next Steps

In response to concerns about mold and the gaps in scientific knowledge, CDC is currently developing an agenda for research, service, and education related to molds. The results of this effort will ultimately enable CDC to (1) make recommendations for reducing mold contamination, (2) identify environmental conditions that contribute to the occurrence of disease following mold exposure, and (3) assist state and local health departments in improving their capacity to investigate mold exposures. CDC is working to help strengthen state and local capacity to respond to requests regarding molds. Because there are no quantitative standards, guidelines or uniform recommendations for responding to mold in indoor environments, each state or local health department responds to public inquiries based solely on its own experience. CDC is working with the Council of State and Territorial Epidemiologists to:

- develop an inventory of state Indoor Air Quality programs;

- determine the extent to which these programs are coordinated to respond to issues related to indoor mold exposures;
- identify resources that states need in order to develop and implement appropriate responses; and
- develop a coordinated public health response strategy to mold exposure.

CDC will continue to investigate and evaluate the health effects of and quantify the risks associated with, exposure to mold and poor indoor air. The expectation is that such studies will help to identify the environmental factors and antecedents associated with mold contamination and factors that determine poor health outcomes. For example, CDC is developing a protocol for investigating the possible health effects of exposure to mold in indoor school environments. CDC will use the knowledge, experience and skill gained from these investigations and evaluations to translate science-based findings into appropriate public health interventions to reduce any health risk found to be associated with mold exposure.

There are a number of barriers that need to be overcome in investigating the possible effects of molds on health. There are no accepted standards for mold sampling in indoor environments or for analyzing and interpreting the data in terms of human health. Molds are ubiquitous in the environment, and can be found almost anywhere samples are taken. It is not known, however, what quantity of mold is acceptable in indoor environments with respect to health. Because of difficulties related to sampling for mold, most studies have tended to be based primarily on baseline environmental data rather than human dose-response data. For these reasons, and because individuals have different sensitivities to molds, setting standards and guidelines for

indoor mold exposure levels is difficult and may not be practical. Despite the lack of standards, CDC concurs with EPA's recommendation to remedy mold contamination in indoor environments to prevent negative health effects.

Summary

We do know that people who are exposed to molds may experience a variety of illnesses. Fungi account for 9% of nosocomial infections, that is, infections originating or taking place in a hospital. Ingestion of foods contaminated with certain toxins produced by molds is associated with development of human cancer. Many respiratory illnesses among workers may be attributed to mold exposures. Uncommon illnesses that collectively can be called hypersensitivity pneumonitis are caused by chronic exposures to high concentrations of mold and are almost exclusively limited to certain agricultural workers in particularly moldy environments. Common illnesses caused by molds include allergic conditions such as hay fever and asthma.

Because molds can be harmful, CDC concurs with the general recommendations of agencies such as EPA and FEMA, which offer information on preventing and cleaning up mold growth in indoor environments. Linkages between indoor airborne exposures to molds and other health effects, such as bleeding from the lung, or memory loss, have not yet been scientifically substantiated. CDC and other organizations are taking steps to fill the gaps in our knowledge about linkages between exposure to mold and human health.

Thank you again for the opportunity to testify. I would be happy to answer any questions that you have.

