

## Just Breathing in Katrina-Flooded Homes Poses Health Risks

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This New Orleans resident searches for salvageable items in her home following Hurricane Katrina. Many of the homes were like this one with mold damage to the ceiling. (Photo by Andrea Booher)

Homes flooded by Hurricane Katrina in 2005 may contain harmful levels of airborne contaminants in addition to polluted sediment deposits, finds new research from scientists at Louisiana State University in Baton Rouge. Indoor gases, mold films, and aerosols may have exposed residents, first responders, and demolition crews to dangerous contaminant levels without the need for direct skin contact, according to the modeling study published in the April 2009 issue of "Environmental Engineering Science," a peer-reviewed journal published by Mary Ann Liebert, Inc.

The model published by Nicholas Ashley, Kalliat Valsaraj, and Louis Thibodeaux, from Louisiana State, details the possible types and levels of volatile and semi-volatile organic pollutants that might be present inside the flooded homes.

When made landfall on the Louisiana and Mississippi Gulf Coasts on August 29, 2005, failure of protective levees around the city of New Orleans resulted in floodwaters inundating numerous residential areas to a depth of six to nine feet for nearly two weeks.

The floodwaters carried with them suspended sediments from Lake Pontchartrain, along with other contaminants accumulated in the submerged neighborhoods, the authors say.

When floodwaters were later pumped from residential areas back into Lake Pontchartrain, sediment remained behind.

"Because the houses sat unoccupied for weeks and months after the storm, volatile and semivolatile sediment pollutants partition into the vapor space inside the home, where they present a gas-phase exposure to persons entering the home," the study states.

The warm, damp conditions inside the flooded homes led to the growth of mold on walls, furniture, and other interior surfaces, which may have absorbed contaminant gases. These mold films in turn emit contaminated spores into the air inside the home.

The authors conclude that these mold spores may represent a significant sink for polycyclic aromatic hydrocarbons, or PAHs; pesticides and esters such as phthalates, which are plasticizers.

They also mention aldehydes and organic acids as contribu-

tors to the airborne contaminants inside the flooded houses.

"An exposure assessment that only considers exposure to gas-phase materials of these classes may under predict the total mass of pollutant which a person may be inhaling," the authors write.

These newly identified inhalation exposure routes could present a significant health risk to people who walk inside and breathe the air in contaminated homes, even if there is no skin contact with the sediment covering the floors or the mold growing on the walls and other surfaces, concludes the paper, entitled, "Multiphase Contaminant Distributions Inside Flooded Homes in New Orleans, Louisiana, after Hurricane Katrina: A Modeling Study."

Finally, the authors warn, the PAHs detected in the sediment and mold films may be cause for concern when contaminated housing materials are disposed of.

"This may represent a special problem for waste incinerators where products of incomplete combustion may release partially oxidized PAH or other species to the air," they advise. "In landfills or other disposal facilities, regular monitoring of run-off effluents or waste streams may be needed."

"This is an excellent and important study by one of the top research teams in the nation," said Domenico Grasso, PhD, editor-in-chief and dean and professor in the College of Engineering and Mathematical Sciences at the University of Vermont-Burlington, who was not involved in the study. "It will help us better prepare first responders for the additional risks that may be posed by such events."

"Results indicate that prolonged contact with contaminated sediment, vapor-phase organics, and pollutant-laden aerosolized mold spores, may result in a significant exposure of New Orleans area residents and recovery workers to toxic materials," the authors write. "Future research efforts should further probe the effects of mold as a transport and partitioning medium for volatile and semivolatile materials, because experimental data in this area are severely lacking."

The Federal Emergency Management Agency warns that exposure to mold can cause respiratory tract infections, especially for infants, children, immune-compromised patients, pregnant women, the elderly and individuals with existing respiratory conditions, allergies, multiple chemical sensitivity, and asthma.