Mold Clean-up Guidance for New Orleans Area Residents Affected by Hurricane Katrina

This document was written by Bill Sothern, MS, CIH of Microecologies®, Inc. and Ray Lopez of Little Sisters of the Assumption Family Health Service, Inc. (LSAFHS) following their inspections of twenty flood damaged homes throughout the New Orleans area during October 2005. The purpose of this document is to provide very specific advice to residents and to clean-up workers on how to deal with hurricane and flood related mold issues, and to answer many commonly asked questions. This document is the basis for the script of an instructional video produced by LSAFHS and Microecologies, Inc. Funding for this project was provided by the HUD Office of Healthy Homes and Lead Hazard Control.

When can I safely re-occupy my home?

- Homes that sustained any flood damage can be expected to be contaminated with visible mold growth, and should not be re-occupied until the necessary mold remediation work is performed.
- However, if you are in a situation where you have a two-story home and no where else to stay, you can prevent mold from traveling up to your living space on the second floor by using plastic sheeting and duct tape to construct a barrier at the top of the staircase. Then, place an exhaust fan into a 1st floor window to keep the air flowing from the second floor into the first floor.

What are the health effects associated with exposure to mold?

- People are exposed to mold primarily by inhaling the invisible sized mold spores that are suspended in the air they are breathing.
- We know, based on testing that we conducted in New Orleans' houses with severe mold problems, that mold spore levels are over 1,000,000 mold spores per cubic meter of air, or more than 100 times the levels in the outdoor air.
- When people with mold allergies breathe air that contains these high mold levels, they are likely to suffer from allergy symptoms such as stuffy nose, sinus problems, and shortness of breath, or worse, they may suffer an asthma attack.
- We also know that one of the molds growing in many of these homes is *Aspergillus niger*, which may cause lung infections in people with weakened immune systems.
- Our testing also determined that the mold growth in these homes is predominated by species that produce toxins, such as the notorious *Stachybotrys*. Toxic health effects occur from high-dose exposures, such as the exposures that may occur when workers or residents perform mold clean-up work without wearing proper respiratory protection, and symptoms include sore throat, flu-like aches and pains, and severe fatigue. Infants are also very susceptible to the toxins produced by molds, and infants should not be allowed to enter a moldy home.

Who should perform mold clean-up work?

- If mold growth covers more than 100 square feet, or a 10 foot by 10 foot area, then the EPA and CDC recommend that the work be performed by trained mold remediation personnel.
- Under normal circumstances, more than 25 to 30 square feet of mold should also be handled by trained personnel.
- However, under these emergency circumstances, we observed that many residents and volunteers are performing mold clean-up work that would normally be handled by trained mold remediation personnel.
- Regardless of who is performing the mold clean-up work, it is critical that workers wear the necessary personal protective equipment, and follow the work practices and procedures (as described below) that will assure a safe and effective job.

Personal Protective Equipment

- Inspection and retrieving salvageable possessions: use N-95 dust mask + gloves, and limit time spent in severely molded homes to 15 minute excursions. Try to minimize dust release.
- Removing moldy furnishings and performing mold remediation of small to mid-size areas (< 100 sq ft or 10 ft x 10 ft): use half-face air purifying respirator (in-stock at Home Depot for $30) + goggles + gloves.
- Removing large areas (> 100 sq ft) of moldy sheetrock or scraping large areas of moldy plaster: use full-face air purifying respirator + gloves + disposable coveralls. This work should be performed by trained mold remediation personnel.
- Persons wearing half face and full face air purifying respirators should be free of respiratory and heart problems, and should have permission from their physician.

Removing Salvageable Possessions

- Before entering a moldy home for the first time, open the front and back doors and allow the house to air out for at least 30 minutes before entering. This will allow odors and volatile organic compounds (VOC's) produced by molds to be diluted and thereby reduce exposure to occupants.
- Non-porous items (china, glass, jewelry, porcelain, metal) can be damp wiped with a mild (dishwashing) detergent solution or washed (dishwasher) to remove dust and superficial mold.
- Wood furnishings displaying mold growth, but in otherwise good condition, may be salvageable by cleaning (SoftScrub/abrasive sponge) then refinishing (may require professional restoration).
- Appliances and electronics that were not water damaged may be salvageable, and can be cleaned with regular cleaning products.
- Window air conditioning units that are housed in moldy rooms should be carefully inspected, and should be disposed of if they display visible mold growth.
- TV's, stereo equipment, and other electronics that do not contain fans may be salvageable, and can be cleaned with regular cleaning products.
- Photographs and critical documents displaying minor levels of mold growth may be salvageable by wiping with damp paper towels and a mild detergent solution. Freezing these items will retard further growth until professional restoration can be performed.
- Valuable artwork can be HEPA vacuumed to remove surface mold. Frames and backings can be wet wiped with a mild detergent solution. Items can then be set aside for professional restoration.

Non-salvageable Possessions

- Porous items (upholstery, textiles, clothing, carpeting/padding, rugs, papers, books) and other items that were submerged or display significant visible mold growth should be disposed of.
- The removal of these items will unavoidably result in the release of extraordinarily high levels of airborne mold, and consequential potential for exposure to residents and workers by inhalation. Therefore, persons performing this work should be wearing (at a minimum) a half face air purifying respirator and gloves, and should shower promptly after completing this work.
- To the extent practical, items being disposed of should be placed in heavy duty trash bags to limit the potential for exposure to sanitation workers who will be handling your trash.

Mold Remediation Procedures

Gutting

- In most of the homes that we inspected, the flood waters had risen to a height ranging from 1 to 7 feet on the 1st floor. Many homes display such extensive mold growth that complete "gutting" is necessary. Gutting

should generally include the removal of all sheetrock, all underlying insulation, and plaster walls and ceilings, all wood lath (behind plaster) displaying visible mold growth, all non-structural wood studs and joists displaying visible mold growth, all wood flooring laid on sub-flooring, all sub-flooring, cabinetry and trims, all vinyl flooring, all submerged windows, all water damaged ductwork and air handlers.

- **Gutting (interior demolition) is the ultimate mold remediation project**, and should be performed **only** by trained and licensed mold remediation personnel.
  Chapter 24-A of Title 37 of the Louisiana Revised Statutes states that "mold remediation means the removal, cleaning, sanitizing, **demolition**, or other treatment, including preventive activities, of mold or mold-contaminated matter that was not purposely grown at that location . . . no person shall engage in or conduct . . . mold remediation unless such person holds a mold remediation license as provided for in this chapter."

Sheetrock Constructions

- Sheetrock acts like a wick for water, and in homes where flood waters rose to a height of 2 feet on the first floor, severe mold growth covered the lower 4 to 6 feet of these walls. It is the paper covering of sheetrock that toxic mold likes to eat, and remember that both the front and back sides of sheetrock are covered with paper.
- Sheetrock displaying visible mold growth on the front or back side must be removed. Before removing sheetrock, spray visibly moldy surfaces with water to reduce dust release, or cover visibly moldy surfaces with poly-sheeting secured by duct tape. Remove with minimum possible disturbance (use a crowbar instead of a hammer). Remove minimum 1-2 ft beyond visible mold growth on front and back sides. Bag for disposal.
- Remove all insulation material in the wall and ceiling cavities where sheetrock is removed. Bag for disposal.
- Remove and dispose of non-structural wood studs/joists displaying rot or severe levels of mold growth.
- HEPA vacuum, then scrub (abrasive sponge) or bristle brush discolored wood studs/joists with detergent solution. Borax is a good choice of detergents.

Plaster Constructions

- Remember, wet dust does not fly, so wet scrape (spray with water) with one hand to remove paint and weakened plaster/brown coat while spraying with the other hand.
- Remove wood lath boards that were submerged and display visible mold growth.
- HEPA vacuum, then scrub (abrasive sponge) or bristle brush discolored wood studs/joists with detergent solution. Borax is a good choice of detergents.

Structural Wood

- Structural wood (studs, sill plates, floor and ceiling joists) displaying mold growth should be HEPA vacuumed, and then bristle brushed with a detergent solution. Treating the wood with a borate product such as Termite-Proof or BoraCare may also provide protection against termites and other insects. Certified pest control operators may also treat the wood with a product such as BoraCare with Mold Care to provide protection against both insects and mold. Mold remediation contractors may treat the wood with a disinfectant such as Foster 40-80 (ammonium chloride disinfectant). When the wood is completely dry, mold remediation contractors may also paint the wood with an encapsulant such as Foster 40-50 (low toxicity fungicidal protective coating).

Wood Trims

- Remove and dispose of swollen doors.
- Remove base moldings and inspect back side. If visibly moldy, then dispose of or scrub with detergent solution.

- Wood door frames and window components displaying visible mold may be salvageable by cleaning with a detergent solution, then setting aside for professional restoration. Difficult to access areas that were submerged, such as window counterweight cavities and the underneath side of staircases, should be inspected and cleaned/disinfected/encapsulated as described above.
- Antique and other valuable wood trims should be removed, cleaned/disinfected then set aside for professional restoration.

Wood Cabinetry (kitchen/bathrooms/built-ins)
- Remove and dispose of all cabinetry (fiberboard/plywood) that had been partially or fully submerged or displays severe visible mold. Architectural quality wood cabinetry may be salvageable by removing, cleaning, then setting aside for professional restoration.
- Remove any cabinetry that impairs access to affected walls.

Wood Floors
- For constructions on piling/piers, buckling will subside. Flooded wood plank floors with two layers of boards or laid over plywood should be removed and disposed of. Single-layer wood plank floors nailed directly to joists may be salvageable. After all other remediation work, HEPA vacuum, then scrub floors with detergent solution to prepare for sanding/re-finishing. Final polyurethane coating will substantially prevent air infiltration from crawl space below.
- For constructions on slabs, remove and dispose of flooring and sub-flooring that were submerged.

Ceramic and Vinyl Flooring
- Ceramic flooring laid directly onto cement/concrete slabs may require only HEPA vacuuming, then washing with a detergent/disinfect solution.
- Vinyl flooring should be removed and disposed of.
- Vinyl or ceramic flooring laid onto plywood should be removed and disposed of, including the plywood. The underlying cement/concrete should be brushed with a detergent/disinfectant solution.

Asbestos Floor Tiles
- Pre-1970 rigid floor tiles measuring 8" X 8" or 9" X 9" should be presumed to be asbestos containing tiles. Under normal conditions, these tiles should be removed as an asbestos project in accordance with regulations. While it is a violation to remove these tiles other than as an asbestos project, remediators should understand that saturating these tiles with water will substantially reduce the levels of asbestos released if the incidental disturbance of these tiles is unavoidable.

Painted Brick/Cement
- HEPA vacuum to remove precipitate deposits (efflorescence), then wet wire brush (detergent solution) to remove discoloration.

Heating and Air Conditioning Systems
- Remove and dispose of all ductwork and air handling equipment that was submerged. Inspect non-submerged air handlers and ducts for visible mold. Fiberglass insulation on the interior surfaces of air handlers and air supply ducts is highly susceptible to mold growth and should be inspected. Visible mold growth can be encapsulated with Fosters 40-20. The interior surfaces of flexible duct are also highly susceptible to mold growth, and any flexible duct displaying visible mold growth should be replaced.

Building Envelope
- In homes that were partially submerged in flood waters, the materials on the exterior side of the structural wall studs must be inspected.

- In older homes, we found that the interior face of the exterior clapboard is frequently supporting mold growth. These surfaces should be HEPA vacuumed, then bristle brushed with a detergent solution. These surfaces may then be treated as described above in the *Structural Wood* section.
- In brick homes, we found that the sheathing on the exterior side of the structural wall studs is frequently supporting substantial mold growth. In such cases, the sheathing should be HEPA vacuumed and bristle brushed with a detergent solution. These surfaces may then be treated as described above in the *Structural Wood* section.

Occupant, Worker and Premise Protection

- Establish critical barriers (using poly sheeting and duct tape) to isolate the work area and prevent dust infiltration to surrounding areas. In two story houses, thoroughly seal-off second floor with poly sheeting (blue tape on ceiling, duct tape poly to blue tape).
- Protect any HVAC components from dust infiltration.
- Run high power exhaust fan in work area to provide dilution ventilation and to prevent infiltration of airborne mold/bacteria into adjoining spaces. Exercise good judgment: don't place your exhaust fan in a window that is too close to your neighbor's window.
- Bag all bagable debris, and remove all debris to the curbside.
- Require workers to wear HEPA filtered full face respirators, and disposable gloves/hooded coveralls.
- Clean up all dust with a HEPA filtered vacuum cleaner.
- Houses that are being "gutted" must still be considered mold remediation projects. While occupant exposure is not an issue, worker exposure is a huge issue.
- **Warning** to contractors and homeowners: personal injury lawyers are already soliciting workers to file personal injury lawsuits for adverse health effects related to remediation work exposures.

Dealing with Mold Remediation Contractors

- State of Louisiana requires licensing of mold remediation contractors. Hire only a licensed contractor. Get two to three price quotes.
- Require contractor to provide insurance certificate, naming property owner as insured, with proof of commercial general liability, contractual liability, and pollution (mold) liability.
- Ask contractor to provide 5 references on similar jobs, and call re job satisfaction.
- Require contractor to submit written proposal that includes:
    - Detailed scope of work.
    - Detailed plan for occupant, worker and premise protection.
    - Provision for final payment being conditional on results of satisfactory third party final inspection (no visible mold and no mold odors), and satisfactory post-remediation air testing.
- The final inspection and testing should be performed by a highly qualified person, and under Louisiana State law, that person must be completely independent of the mold remediation contractor, and must issue a written report of his/her findings. This report not only assures you that it is safe to rebuild, but may also be an important document to show prospective buyers when selling your home.
- **Beware** of contractors who recommend fogging/spraying. Moldy materials must be removed.

Rebuild

- Do **not** use sheetrock (paper-faced gypsum board) when rebuilding. It is the refined cellulose content of paper that provides ideal nutrient to support toxic fungal growth in the presence of water damage. Good substitutes for sheetrock include Georgia Pacific's DensArmor Plus (fiberglass mat finished gypsum board) and Wonder Board (cement board). DensArmor Plus is available at Home Depot at a price of $11.50 per 4' by 8' board (1/2 inch thick) compared to $8.41 per board for sheetrock. At 10¢ per square foot, this is the cheapest mold insurance you can buy.
- For seam taping, use fiberglass tape in place of paper tape.
- Insulate wall cavities with Styrofoam board in place of fiberglass batting insulation.
- Where wood studs/joists are removed, replace with galvanized metal.
- Paint walls and ceilings with a mold resistant paint such as Caliwel (www.alistagen.com; active ingredient: calcium hydroxide).

Where to Find It

- HEPA (high efficiency particulate arresting) filtered vacuum cleaners (canister type) are available at Sears in Metarie, LA (504-889-8200) and Home Depot in Gretna, LA (504-362-3460).
- Full face air purifying respirators are available at Bayou Safety in Belle Chase, LA (504-433-2400).
- Foster 40-80, 40-50 and 40-20 are also available at Bayou Safety.
- Moisture meters are available at Bayou Safety and major hardware stores.
- Certified laboratory testing for mold is available at Aerotech-P&K Laboratory (856-489-4455). Certified laboratory testing for asbestos and lead is available at EMSL Analytical laboratory in Baton Rouge, LA (225-755-1920).

Health and Safety Advisories

- Black mold growing on sheetrock may be *Stachybotrys chartarum*, which may produce a toxin associated with severe adverse health effects in humans, and especially in infants.
- The whitish/yellowish cotton candy-like mold growth observed in many homes has been identified in limited testing as *Fusarium*, which may produce a toxin associated with severe adverse health effects.
- Mold clean-up activities may result in the release of lead paint dust. For households with children under the age of 7, lead dust wipe post remediation clearance testing is strongly recommended.
- Plaster may contain asbestos. More extensive testing is required to understand the scope of this potential problem. Plaster can be inexpensively tested for asbestos content. Remediation of asbestos-containing plaster surfaces poses a severe health risk to workers and occupants.
- If you smell a gas leak, there may be a risk of fire or explosion. Call your utility company.
- Stay away from downed power lines and damaged electrical wires.
- Carbon monoxide exhaust kills. Use gas powered generators outdoors only.

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