

Thermal Telegraphing: When Black Mold Testing Isn't Necessary

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We have received many telephone calls from very upset homeowners who feared that their houses were being devastated by a black mold that caused black streaks on walls and ceilings, especially above baseboard heaters and at the outside corners of walls. This devious mold even had a way of darkening white plastic objects hidden in drawers. One client had been told that she had the worst case of toxic *Aspergillus* mold that the consultant had ever seen. The family was preparing to move when they called me. I stained and observed samples from the home with a light microscope and found that they contained mostly pollen particles coated with soot from a kerosene lantern they burned.

How can soot masquerade as mold? We are accustomed to seeing mold in patterns on exterior walls, usually on outside corners and behind furniture near the floor, growing in discrete colonies on cooler areas of the wall where the relative humidity is highest. Temperature differences on walls cannot be seen but are responsible for the appearance of both mold and soot patterns. At the exterior walls of homes with wall insulation, the interior drywall surface is cooler at the studs because heat is lost through the wood to the exterior faster than through the insulation; heat loss to the exterior is even faster with metal studs because metal conducts heat faster than wood. The outside corners of house rooms are cooler because there is only wood framing at the corners, and no insulation. Similarly, in ceilings, drywall close to the building perimeter may be colder than interior surfaces. The heads of fasteners may appear as black circular "ghosts" in the paint at drywall seams because the metal fasteners are colder than the drywall.

Where there are lower wall temperatures, in addition to increased relative humidity, there are also increased amounts of air movements due to convection. Cold air sinks and warm air rises. Where the exterior wall is colder, air is cooled and sinks. Air is full of particles, and in areas where there are increased air flows due to wall convection or heated air flows, there are increased rates of collisions of particles with walls. Some particles stick to the walls, and the greater the collision rate, the greater the deposition rate. In homes where there are soot particles in the air, soot builds up on all surfaces, but surfaces where there are increased rates of deposition darken faster and therefore become more apparent visually. Wall areas where there are reduced collisions have less deposition and remain lighter in color; this is why the outline of pictures can be seen on walls after inhabitants move out.

Due to the lack of air exchange, burning a single candle a week in a tight, well-insulated home can cause very worrisome wall-darkening. Wax-filled jar-candles are worse offenders than free-standing candles, because the flame in the jar-candle flickers constantly, producing increased amounts of soot. Spillage from any combustion equipment can also produce wall-darkening soot; if no candles or lanterns are burned in a home, it should be assumed that patterned black stains on the upper portions of walls or above heat units may be the result of soot from improperly burning or igniting heating systems, whether fired by gas or oil. Poor draft at fireplaces where gas or artificial (wax-containing) "logs" are used can also be sources of soot. In apartment buildings near traffic or with below-grade (below ground level) garages, light-colored carpeting may acquire patterned soot stains from automobile exhaust, especially along outside walls and near door thresholds to common halls.

Because deposited soot particles are about the size of paint pigment particles, they adhere very tenaciously to surfaces and can barely be removed by any means. Soot also deposits on windows where it adheres to the glass. Rubbing a window very hard with a white paper towel will reveal the presence of soot (mold does not grow on window glass). For testing, dark stains can also be wiped with bleach. Soot cannot be lightened at all by bleach, the way mold can.

I have found in all cases of patterned black wall-staining that have come to my attention, where the darkness is devoid of texture and on upper walls or above heating units, that the culprit was soot and not mold. In homes where it is possible to eliminate the sources of soot, repainting solves the cosmetic problem. Unfortunately, in well-insulated, tight homes where outside or inside sources of soot cannot be controlled, staining will reappear. Many painters and insurance companies have paid the price for thermal telegraphing; homeowners who cannot stop infiltration of exterior soot must await the invention of a cure.