

Effective Cleaning

Most home cleaning fixates on how good your home looks afterwards and ignores how clean your home actually is. Small particles such as residual mold spores and fungal fragments persist even after normal cleaning methods. For example, typical sweeping or mopping spreads the spores from one place to another but doesn't remove them from the home. Vacuums can also spread particulate matter around. While they are good at sucking up filth, including mold, the majority of vacuums then spit the really small particles, like mold spores, back into the air. Over time the particles dispersed in the air will settle throughout the surfaces of your home.

This chapter will provide you with some simple changes to your cleaning practices that will help you eliminate these particles from your home. There are 10 simple changes you can make, and I will explain each one in greater detail:

1. Ban the broom
2. Always use a properly functioning true HEPA vacuum cleaner
3. Vacuum from all directions
4. Remove and empty the vacuum collection bag or canister outside
5. Check to see how much dirt you miss when you vacuum
6. HEPA vacuum before performing wet or damp cleaning
7. Clean hard surfaces with microfiber cleaning cloths
8. Monitor how effectively you have cleaned hard surfaces
9. Use common, safe household products for cleaning effectively
10. Avoid dangerous ineffective products

Cleaning practices are beneficial in all homes and critical in damaged homes. Mold is present almost everywhere in the outdoor environment. Inevitably spores work their way into and settle inside your home. There is no home currently being built that can prevent the migration of mold spores. Spores can float on tiny air currents through cracks and crevices or by way of other pathways such as electrical switches, outlets and other

penetrations found in walls, ceilings and floors. A crack the size of a human hair is like a freeway for mold spores.

All homes can benefit from effective cleaning, although some homes are worse than others. A home has *normal background levels* when it is in balance with the outdoor environment. Except for seasonal allergies, most mold sensitive people don't react to the typical outdoor environment. The fresh air and natural competition that occurs between different types of organisms keep mold in balance so that reactions are minimal. These levels are termed *normal background levels*. Most of the spores migrating in from the outside will also be typical outdoor types. Small amounts of the spores and fungal fragments that come in from the outside will be the type that are able to grow in damp areas within a building. When the building is dry these spores settle on various surfaces, but they don't start growing until they are given water. When a well maintained home is kept dry and cleaned effectively the fungal ecology inside the home achieves a healthy equilibrium.

When water damage results in mold growth in homes the volume of mold spores and fungal fragments increases dramatically as they reproduce. Immediate action can help prevent the condition from getting out of control. Unfortunately, many times the growth is hidden out of sight and easy to miss. The mold will mature and produce spores in elevated moisture. Stopping the water leak is not enough. The area must also dry rapidly enough so that no hidden mold growth occurs. Cleaning up mold without addressing the source of the water that caused the growth will result in additional mold developing.

Over time the levels of spores and fungal fragments that migrate into the living space will build up. Think of it this way. Your home is like a boat with a hole in its bottom. If the hole is small, the amount of bailing necessary to keep the boat afloat is minimal. As the hole gets bigger it is necessary to bail faster. At some point the water may be coming into the boat so fast that no amount of bailing can keep it afloat. The boat sinks!

When water or moisture damage results in indoor mold growth, the conditions determine whether routine maintenance and cleaning alone are sufficient to resolve the issue or if a full scale remediation involving demolition is needed.

Some examples of mold growth that may only require routine maintenance and cleaning include mold caused by:

- Winter condensation on windows
- Wet tile or grout that does not adequately dry each day after bathing or showering
- Condensation on metal air conditioner registers

These mold conditions can be controlled by routine cleaning; however, the cause of the excess moisture should be resolved. If these conditions repeatedly soak beyond the surface and into wall cavities, insulation, attics, ductwork, behind baseboard or into other inaccessible places in the building then it may be necessary to perform mold remediation by physically removing the damaged materials.

The techniques I will share with you for effective cleaning are the same whether you are attempting to deep clean a building for remediation, restoration, or routine housekeeping. The major differences are the intensity and the duration of the cleaning.

Continuing our boat analogy, if the boat is in good condition, some bailing will remove water that splashes into the boat so that the water isn't left standing where it will cause eventual damage. This would be akin to routine effective cleaning to reduce the amount of dirt and spores that normally migrate into a building.

If something punctures a hole in the boat, you must bail the boat proportionately. Until the leaky boat can be repaired the amount of bailing needs to match the increased intake of water. This describes situations that involve minor amounts of mold growth. In these cases effective cleaning may be used to temporarily prevent the situation from getting worse although instituting moisture control strategies is necessary for the best control.

As the size of the leak in the boat increases, you must bail faster and longer. In an emergency, a boat with a large hole may still float with continuous vigorous bailing, but it is not practical to expend that amount of energy forever. Sooner or later the hole needs to be fixed. Since a square inch of mold growth can contain over a million spores, it doesn't take a lot of indoor mold growth to upset the balance of the indoor environment and make it difficult to provide enough cleaning for control. The mold needs to be properly remediated to return conditions to normal so that a normal routine intensity of cleaning will be sufficient.

You are about to learn ten tricks that will make cleaning your home more effective for mold spores, fragments and routine house cleaning for health. Instead of spreading these settled particles from one part of your home to another, you're going to learn how to make some simple changes that will remove them from your home!

Simple Change 1.) Ban the Broom

As you sweep dust, spores and fragments of mold growth become airborne and then begin to settle again. Visible dust and dirt only takes a few minutes to settle, but tiny

particles require much longer. The typical human hair is approximately 75 microns in cross sectional diameter. Mold spores on the other hand typically range from two to twenty microns and are too small to see with the unaided eye. A twenty micron size mold spore will settle in still air from the ceiling to the floor in about 20 seconds whereas a 2 micron size spore takes all night. By avoiding sweeping more of these particles can be cleaned directly from surfaces instead of having them distributed into the air. Using a broom or sweeper redistributes the fine particles throughout the area and increases the quantities of fine particles being inhaled as the spore laden dust deposits on furnishings and other surfaces. Once these ineffective methods are used it becomes necessary to wait over night for the fine particles to settle. Avoiding unhealthy cleaning methods and follow the simple effective tips described below will dramatically improve your indoor environment.

Simple Change 2.) Always Use a Properly Functioning True HEPA Vacuum Cleaner

The most important single tool for cleaning mold spores or small dust fragments from soft or porous materials such as wall-to-wall carpet, area rugs, upholstered furnishings, and pillows is a quality "High Efficiency Particulate Arrestance" (HEPA) vacuum cleaner. Regular vacuums permit mold spores and many other irritating particles to pass right through regular vacuum cleaner filters and spews them back into the indoor environment. Some unfiltered vacuum cleaners are so bad they pump out more small particles than they collect. This is because the particles are bounced around inside the vacuum cleaner which can fracture them into smaller fragments that exhaust back into the room air. A HEPA filtered vacuum cleaner has a specially designed filter which helps remove dirt, mold spores, and even smaller fragments.

Simple Change 3.) Vacuum From All Directions.

When vacuuming carpets or area rugs it is important to vacuum from all possible directions. Most people by habit vacuum back and forth in the most convenient direction. Even when using a power head with a beater bar, this misses a lot of debris that has collected in the carpet. Every bit of the carpet should be vacuumed back and forth, side to side and in the direction of both diagonals. Cleaning from all possible directions will also increase the amount of soils that are removed from other soft porous materials such as upholstered furnishings. The upholstery brush that comes with your vacuum cleaner is smaller than the carpet cleaning head. This means it will provide more suction which is important for providing deeper cleaning for thicker padding materials found in pillows, upholstered sofas, chairs and stuffed toys. Even so, it can take an extensive amount of vacuuming multiple times to return heavily contaminated soft porous items to an acceptable condition.

Simple Change 4.) Remove and Empty the vacuum collection bag or canister outside.

Every time the vacuum cleaner bag or collection canister is emptied inside your home some dust will become airborne and resettle back into your home. Performing this task outside is a simple way to maximize the removal of unwanted dirt and mold spores from your home. If you're going to clean or service the interior of your vacuum cleaner this

should also be done outside. Also run your vacuum cleaner outside for a minute after servicing the vacuum or changing the HEPA filter to allow any residual dirt or debris that settled after the filter to be exhausted to the outside instead of allowing it to deposit inside your home.

Simple Change 5.) Check to see how much dirt is being missed when you vacuum.

This check will help you learn how much vacuuming you need to do to be sufficient. Start by HEPA vacuuming your home in the usual fashion. Once you are finished take the vacuum cleaner outside for emptying then replace the collection bag. If you are using a bag-less canister, wipe the interior clean before reassembling the unit. Repeat the vacuuming of the area you just vacuumed so you can see how much additional dirt you missed. Don't be surprised if you pull out as much dirt and dust with the second round of cleaning as the first. Over the months or years that the carpet has been installed it is likely that it accumulated a lot of dust and debris. Don't be surprised if it takes several minutes or more per square yard of vacuuming to deep clean the amount of built up dirt to an acceptable level. Initially a 450 square foot living room might need an hour and a half of non-stop vacuuming to pull out the accessible dirt that has accumulated. Start by vacuuming it for 15 minutes then check how much dirt has been collected as you empty the bag or collection canister. Now continue vacuuming the same area you have been working on for another 15 minutes and recheck how much has been collected. With some carpets you will find they shed lots of fibers which fill up the vacuum. Ignore these fibers and instead look for the fine dust and dirt that has been collected. Chances are you will still be collecting a lot. Empty and repeat as many times as is necessary to get to a point where very little dirt and dust is being collected in the vacuum cleaner. The carpet or area rug is now about as clean as it can get without professional help. You can now return to whatever your regular cleaning schedule had been.

After about two weeks on the regular schedule you may want to check to see if the regular cleaning is sufficient. Vacuum according to your regular schedule, empty the collected dirt and then do the 15 minute cleaning described above. If the amount of fine dust and dirt you collect is significant you will know that your current cleaning schedule is insufficient to keep your carpets or area rugs clean.

You can double check how good a job your professional cleaners are doing by using this same method immediately after your carpet or area rug has been professionally cleaned. Most professional cleaning is for appearance, but just because it looks good doesn't mean it is really clean. Cleaning to remove residual mold spores requires a lot more work and attention to detail. Cleaning that is only performed from the top may not be effective in removing the deeper soils and contaminants.

To give you an example of the importance of effective cleaning: In May 2012 my colleagues at RestCon and I published a study in the *Journal of Environmental Health* titled *Bacteria Amplification and In-Place Carpet Drying*. In order to conduct the study we collected the residual dirt from a recently cleaned ten year old wall-to-wall carpet

that had never been water damaged. We began by vacuuming the carpet in the typical way from the top resulting in a collection of approximately 3 ounces of dirt from fifty square yards of carpet. We then removed the carpet and pad to vacuum the floor in the same areas. We collected three pounds of dirt that had accumulated under the carpet and pad over the decade the carpet had been in place. One industry expert assured us that the dust under the carpet was just pad that had broken down and that it would be "practically sterile". So we tested to determine the mold and bacteria counts for the dirt we had collected from both the top and beneath carpet. We found the dirt from the floor under the carpet and pad had as many mold and bacteria organisms as the sample we vacuumed from the top. It was apparent that bacteria and mold sifted through the carpet and pad along with the fine dust that accumulates on the floor beneath the carpet and pad. The types and quantities of organisms collected from this normal carpet demonstrated that in order to avoid soil accumulation, routine carpet vacuuming and cleaning must be thorough and frequent enough to avoid the dirt migrating throughout the home and to the floor below.

Simple Change 6.) HEPA Vacuum Before Performing Wet or Damp Cleaning.

Any time visible dirt is present on a surface it should be thoroughly cleaned by HEPA vacuuming first. Wet cleaning surfaces with loose dirt or dust makes mud which will load the cleaning cloth faster and will be more work to clean the surfaces. A quick HEPA vacuuming first will make any damp cleaning you perform more effective by removing the excess loose debris first. This is especially important when cleaning up residual mold spores.

The hydrophobic or water repellent and buoyant nature of mold spores is another reason for HEPA vacuuming surfaces first. Wet cleaning when loose spores are present can repel them making the cleaning less effective. If the loose spores and dust are collected by HEPA vacuuming first, what remains on the surface is stuck by static forces, grease and grime. HEPA vacuuming removes the largest amount of contamination, but afterwards damp wiping with a mild soap, detergent or surfactant is able to cut through the surface film and remove remaining spores and other dirt and debris leaving a very clean surface.

Simple Change 7.) Clean Hard Surfaces with Microfiber Cleaning Cloths.

Cleaning with typical rags or towels quickly begin to smear the dirt around on a surface rather than clean it well. Microfiber cleaning cloths do an amazing job of picking up and holding tiny particles. This is because the microfibers are extremely tiny - 10 to 50 times smaller than a human hair. The smaller the fiber the more surface area it has and the more particles it can hold before it becomes loaded and starts to push the dirt around instead of picking it up.

I am a proponent of not using harmful chemicals and harsh cleaners in our homes. This is especially important for families with chemical sensitivities. Microfiber cleaning cloths even do a good job removing and trapping particles when they are used dry. They can be used dry for cleaning surfaces that may be sensitive to the presence of moisture

such as books, papers, photos or other documents. When used to clean surfaces that won't be damaged by the presence of water, the cleaning cloth can be dampened with a small amount of water that has had a few drops of dish detergent added to the bucket of water. This will help cut through oils or grease on the surface -that hold dirt and spores. Our skin cells and pet dander contain fats, oils or grease. Cooking by frying can add more grease to surfaces and many oil based polishes and waxes will leave fats and oils that can cause mold particles to stick. Mycotoxins dissolve in oils and may remain behind when cleaning doesn't remove the oil film. A very small amount of soap or detergent is all that is necessary to cut through the grease and make the microfiber cleaning cloth even more effective in cleaning. I like dish detergent because the product is safe and effective at cleaning oily food residues from kitchen wares. It is important for only a limited amount of soap or detergent to be used, otherwise it can replace the surface grease film with a soap film. If excess soap is left behind you can re-wipe with a microfiber cloth dampened the same way with clean water. If you are concerned that the soap will remove an oiled finish or polish from furniture - it will. But that is a good thing when cleaning for mold. The furniture oils and polishes should be cleaned away and a new coat of furniture oil or polish added to renew the surface with a clean finish.

When used wet, the microfiber cleaning cloth should have as much soapy water squeezed out of it as is possible. Studies performed for the "Clean Room Industry", where dust free environments are critical have shown that little or no residual moisture should be left behind on surfaces when they are cleaned. Swabbing a wet mop over a surface leaves a lot of dirt and particulate behind in the residual liquid. Anytime a puddle of water is left behind it will contain more spores and debris.

The Swiffer[®] (insist on unscented!) dry wipe, Bona[®] microfiber cleaning cloth and Rubbermaid[®] Hygen[®] disposable microfiber cleaning system are brands of disposable wipes that should be readily available at your local supermarket, hardware or box store or via the internet. For cleaning residual mold spores from a contaminated home I prefer to use single use disposable wipes. If you do choose to use a reusable microfiber cloths it is important they are washed very thoroughly in a very hot water wash cycle in order to remove the mold contaminants they have picked up. The hot water causes the microfibers to loosen their grip on the dirt so they can be cleaned. Don't try rinsing contaminated wipes in your bucket of soapy water. It will cross contaminate the water in the bucket and will also not be effective in cleaning the wipe.

I usually will fold the wipe into quarters or a size, which I find is manageable. Dip the wipe in the soapy water solution, then wring it as dry as you can. You may find it helpful to fold and dip a bunch of wipes at the same time, then squeeze the bunch of them to get as much water out as you can. Wipe across the surface keeping track of what has and hasn't been wiped. As the wipe becomes loaded with the grime keep adjusting to a clean part of the wipe so as not to smear. Once the entire surface of the wipe, front and back, has been used - stop and get a new wipe. Once you have worked your way across all the surfaces in the area to be cleaned, start over with a clean wipe. The first time you do this there may be years of accumulated dirt, so it may be necessary to repeatedly clean the surface to cut through all the layers.

Simple Change 8.) Monitor How Effectively You have Cleaned Hard Surfaces.

When surfaces are really clean you should be able to use a new microfiber cleaning cloth dampened with soapy water to wipe 40 square feet of hard surfaced items such as wood floors, ceramic floors, resilient flooring, table tops, wood, glass and metal furnishings and counter tops and have the wipe look a little dingy - but not dirty. The test wipe is prepared the same as the cleaning wipes described in Simple Change 7. You can use this as a check throughout the process of deep cleaning to monitor the cleaning progress. This same monitoring method can be used to see how clean the work site has been left after remediation is complete, but it is also valuable for monitoring routine cleaning that takes place.

The first time a home is deep cleaned it may require multiple passes to remove the accumulated grease, oils, dirt and crud that have collected for years. After a successful initial deep cleaning, the amount of routine cleaning necessary to keep your home clean should reduce to normal. By checking and keeping track of the way the wipe looks each time you clean you can evaluate the effectiveness of the cleaning. You can also get an idea of how frequently cleaning should be performed to keep dirt from accumulating to an unacceptable level.

If you find that your home gets dirty faster than makes sense, there may be unintended pathways allowing soils to enter the home. This monitoring technique can alert you when something is not right. I once had a client that kept an immaculate home. She noticed one day that the house had begun to smell bad and her home was accumulating a lot more dirt than before. It got to the point that constant cleaning wasn't enough to keep the home clean. She also noted that the heating system was running a lot more to keep the home warm. These should have been red flags. When her heating bill went up by almost \$200 for the month and the family started suffering from respiratory problems, she called for help. It turned out that the duct tape used to adhere the cold air return duct to the intake plenum had failed. The duct had fallen onto the soil in the crawlspace under the home. Dirt was being sucked directly from the crawlspace and blown throughout the home. Once the problem was corrected and the system and ducts cleaned she was able to use the wipe method to monitor the cleanliness of the home. It quickly returned to a normal condition and she was able to successfully resume the regular cleaning schedule. The family's health also returned to normal.

Simple Change 9.) Use Common, Safe Household Products for Cleaning Effectively.

A small amount of soap or detergent in warm water is safe and effective for cleaning fats, greases and oils from surfaces. Over time most surfaces in our home end up with a built up layer of these lipids. Deep fat frying and other cooking techniques can result in spattering but one of the greatest sources is people and pets. Every day we shed half a million skin cells which contain significant amount of fats or lipids. These result in an oily film on surfaces in our homes. A variety of particles and other unwanted residues will accumulate and stick to surfaces as an oil film. Water alone can't clean up oily films.

This is because oil and water don't mix. Adding a small amount of soap in the form of dish detergent to water will make the oil soluble in water. I like using dish detergent because you already have it in your home and if you are sensitive to various products it is likely you have already chosen a dish detergent that works for you. If it works for cleaning greasy plates and silverware, it will also work on other hard non-porous surfaces throughout your home.

Simple Change 10.) Avoid Dangerous Ineffective Products.

I am amazed at how often recommendations for using cleaners (both safe and dangerous) don't adequately discuss how the product is used. The cynic in me believes this is because we have been brain washed by advertising. The more you use (or misuse) a product whether it is effective or not the more money the manufacture makes. There are tricks that are often times used to make you think something is cleaner than it is.

Optical Brighteners glow under UV light and make whites look whiter. Sunlight has UV light - so in effect optical brighteners are a dye that tricks the eye into thinking that clothing is cleaner. Bleach doesn't clean very well, but it can hide the discoloration or staining. When bleach is sprayed on mold growth and stains they appear to disappear, but they are not really gone. If a stain is added the growth will again become visible under a microscope.

Many other commonly available household products are being misused in an attempt to clean mold and for cleaning in general. This results in a lot more unnecessary work or the false perception that surfaces have been effectively cleaned.

Trying to kill mold with dangerous biocides is folly. The EPA states "The purpose of mold remediation is to remove the mold to prevent human exposure and damage to building materials and furnishings. It is necessary to clean up mold contamination, not just to kill the mold. Dead mold is still allergenic, and some dead molds are potentially toxic."

People consider the use of soap too simple and inexpensive to be able to work - but remember oil and water don't mix! Adding a small amount of soap or dish washing detergent allows the water to dissolve the oil film and you will increase your cleaning effectiveness tremendously.

It is also important to never mix different cleaning products together. Mixing some products like bleach and ammonia produces dangerous fumes that result in a chemical pneumonia. After inhaling the fumes, the lungs begin to fill with body fluids to try to dilute the toxic gas.

Mixing acidic and basic cleaners together makes them useless because the chemical reaction forms salt and water eliminating the cleaning effectiveness. The same thing can happen when mixing anionic and cationic cleaners.

By following these ten tips for effective cleaning you may find that the methods you've been using have allowed a lot of dirt, grime and fungal contaminants to accumulate. But don't worry, as you use these methods you will learn what your home needs in order to return it to a clean status and keep it that way.

Buildings with mold problems need more help than can be provided by effective cleaning alone. The moisture that caused the mold growth must be eliminated and remediation performed if the growth has impacted building components. But whether a building has a mold problem or not, effective cleaning methods will help reduce the amount of work needed to keep your home healthy for you and your family.

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John is working on a new book that focuses on mold problems in the home. This article on Effective Cleaning is a chapter from that book. If you would like to be added to the mailing list for book progress updates, please send an email to the address at the bottom of the page.

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