

CLEANING UP

After Indoor Pesticide Misuse

How do I clean up pesticides in the home?

If you know which pesticides were used, start by contacting the [manufacturer](#) of the product(s). The name of the manufacturer is on the product label. They know whether the product is watery or oily. They know all of the product ingredients, and how to break them up. However, they may not know how to clean up the kind of messes that result from pesticide misuse in homes. For example, it's possible that no one has ever evaluated how agricultural pesticides interact with carpet, linoleum, or wood.

If you don't know which pesticides were used, don't try any cleanup method, even household cleaners, without getting some advice from a professional. Some pesticides may react badly with acids or bases, and a few pesticides even react with water.¹ Consider contacting an [industrial hygienist](#) or a remediation expert in your area. Your [local health department](#) may be able to provide technical advice and site-specific evaluations. To learn about a specific pesticide, including its toxicity and persistence, call the National Pesticide Information Center at 1-800-858-7378.

There are no standard cleaning rules for removing unwanted pesticide residue from building materials, and there are many potential [dangers to avoid](#). Consider hiring a professional, especially if pesticides were misused or over-applied in your home.

If a professional applicator over-applied pesticides in your home, call the [authorities](#).
There should never be puddles or piles of dust after a proper pesticide application.

How do I know whether or not cleanup is necessary?

There is no simple set of rules that can determine whether cleanup is necessary, or how much. A professional could help you identify your main concerns, and evaluate the level of contamination in your home.

Pesticides are often found in homes [at low levels](#), even without a history of misapplication.

How do I know which items and surfaces are contaminated?

Gather as much information as possible about where the pesticide was applied. For example, if it was applied to cracks and crevices, ask the applicator how high up the wall and how much of the floor they treated.

Potential questions for the applicator

- Which product was used? What is the EPA registration number?
- How exactly was the product diluted?
- Which rooms were treated?
- Were any wall voids treated?
- How much material did you use in total?

Should I try to get some laboratory testing done myself?

It is very difficult to tell how much pesticide residue is too much in order to protect the health of residents. It depends on the toxicity of the chemical(s) involved, the frequency of contact with contaminated surfaces, how likely the chemical is to volatilize into breathable air, the sensitivity and habits of the residents, among other factors. You might consider consulting with an industrial hygienist who could help you make an informed decision about whether clean up is necessary.

Before you pursue laboratory analysis of any kind, ask about whether the results can be interpreted to meet your needs. Some laboratories offer analytic services without interpretation, leaving people to guess about the meaning of test results.

For drinking water, there are published [Maximum Contaminant Levels](#) (MCLs) for many pesticides. That makes it easy to interpret pesticide detections in drinking water. Was the detected level above or below the MCL? For air samples, some risk-based values are available as well.² For surface swipe samples, there are no such numbers available for easy comparison. For that reason, it may not be useful for the layperson to rely on laboratory testing to determine whether cleaning procedures are needed to protect human health.³

Which materials should be discarded, and which ones can be cleaned?

Porous materials can absorb liquids and potentially dust, taking them deep inside. Non-porous materials don't allow liquids or dust to penetrate their surfaces, making them much easier to clean. Table 1 includes common items, identifying them as porous, semi-porous, or non-porous. It makes a big difference in determining how to clean, or whether to discard the item(s).

Porous	Semi-porous	Non-porous
Carpeting	Wood	Some tiles
Clothing	Drywall	Some sealed countertops
Bedding	Tile grout	Glass
Pillows	Hardwood floor	Metal
Mattresses	Linoleum	
Upholstered furniture	Concrete	
Fabrics		
Leather		
Wall Insulation		
Ceiling tile		

It may not be possible to remove enough of the pesticide residue from porous and semi-porous items.^{4,6,8} For example, one study found that double mopping with detergent, followed by a rinse on a linoleum floor had no effect on the level of pesticide residue in a cotton swab test.⁸ Sometimes, porous and semi-porous items are discarded in the process of remediation.

To protect yourself and others, consider these tips:

- Do not dry clean contaminated items.
- If clothing was soaked with pesticide, it should be discarded.
- Do not use a professional carpet cleaner without consulting a professional.
- Do not use community laundry machines without consulting a professional. Lingering pesticide can put others at risk.
- Avoid cleaning activities that involve heat, unless directed by an expert. When chemicals heat up, they are more likely to become airborne. A few pesticides may be converted to more toxic chemicals when heated. Some organophosphates are known to do that.^{9,10}

While non-porous items are the easiest to clean, some residue might remain. If items are frequently handled by sensitive people like kids (think about toys and bottles) and the elderly (think about medical equipment, for example), there is potential for ongoing exposure. Depending on the situation, some items may need to be discarded.

Sealants can reduce the spread of some pesticides from contaminated surfaces.^{6,11} However, they may not be appropriate for all surfaces or scenarios. A professional could help you make an informed decision. If you use a sealant, follow the manufacturer's instructions.

It's preferable to follow the pesticide [manufacturer's](#) recommended strategy for cleaning up messes. They are the only ones who know which sticking agents were used in the product, and possibly, how to break them up best.

Where should discarded items and wash-water go?

If you hired a company, they should manage disposal. If not, call your local waste management agency/company. Ask whether or not there are regulations that apply to your situation. They will likely ask you about the pesticide(s) involved, and about the items you plan to discard. Potential questions include:

1. Should contaminated mop-heads and vacuum bags be placed in the trash normally?
2. Can you provide a dumpster for contaminated drywall, carpeting, etc.?

Call your local wastewater authority. Ask whether or not there are regulations that apply to your situation. Potential questions include:

1. How should you handle contaminated mop water?
2. Is it appropriate to launder lightly contaminated items?

What about bleach?

Bleach may react with some pesticide chemicals. Reactions can result in more toxic chemicals, unexpected vapors, or other problems.^{1,4,5} If you have identified the specific product involved, ask the product [manufacturer](#) whether bleach or detergent is recommended. Lacking the necessary information, avoid using bleach. Products that contain sodium hypochlorite are bleach products.

What about ventilation?

If the pesticide is a dust or leaves dust behind, try to minimize air movement. Turn off air-handling systems and close windows. Dry dust can be cleaned using wet methods to reduce its movement into the air. However, adding moisture can cause chemical reactions.¹ Consult a professional before wetting pesticide dust.

If the pesticide is a liquid, ventilation will be helpful. As air moves through the structure to the outdoors, chemicals in the air will be carried out.

What about personal protective equipment, like gloves and goggles?

If the specific product can be identified, read the product label and the Safety Data Sheet (SDS), provided by the manufacturer. They will identify the kind of equipment needed to apply or handle the product. Those instructions are based on the manufacturer's unique knowledge of the product. If the exact product cannot be identified, **don't guess**, and don't rely on a simple internet search. Dozens of products can share the same name, but they might have different ingredients and require different equipment (i.e., gloves, goggles, etc.) for handling.

If the pesticide was applied as a dust, consider using a mask designed for small particles, rather than vapor. Safety glasses that fit firmly against the skin will prevent dust from irritating the eyes. Booty covers may be helpful, especially when shoes have laces or fabrics capable of trapping dust.^{12,13}

If the pesticide was applied as a liquid, consider using a mask designed for organic vapors and small particles.¹³ Protect the skin from contact with liquids used in the cleaning process. Avoid using gloves made of any porous material, such as leather or fabric.¹²

Barrier laminate gloves are highly resistant to chemicals in all eight EPA chemical resistance categories.¹² However, even highly resistant materials will not provide unlimited protection. They need to be replaced or cleaned at the end of each day and rinsed during breaks. [Other materials](#) with lower levels of chemical resistance need to be cleaned or replaced after every 10-60 minutes of contact.

How much pesticide residue has been detected in other homes?

In 2002-03, researchers looked for pesticide residue in vacuum dust and kitchen floor wipe samples in Boston area public housing. Pesticide residues were detected on every kitchen floor and in all vacuum dust. In about half of the homes, vacuum dust contained five or more pesticides. Similarly, all of the kitchen floor wipe samples contained at least three pesticides. Chlorpyrifos and permethrin were most commonly detected in kitchen floor samples, and the median concentrations found were 0.3 and 6.8 micrograms per squared meter ($\mu\text{g}/\text{m}^2$), respectively. A microgram is one millionth of a gram. The maximum concentrations found were 19.5 $\mu\text{g}/\text{m}^2$ chlorpyrifos and 226.5 $\mu\text{g}/\text{m}^2$ permethrin.¹⁴

A similar study in 2002 evaluated pesticide residue in kitchen/dining floor wipes in 20 homes with children in the Salinas Valley of California. They also found chlorpyrifos and permethrin in the majority of homes (95%) in addition to diazinon (95%). The median concentration of chlorpyrifos was 0.046 nanograms per centimeter squared (ng/cm^2), and the maximum concentration found was 0.20 ng/cm^2 . A nanogram is one billionth of a gram. For permethrin (trans), the median and maximum concentrations were 0.23 and 3.6 ng/cm^2 , respectively.¹⁵

In New York state, a combination of farm, rural, and urban households (41) were sampled for pesticide residue in 2000 and 2001. The largest detection was in the carpet of a farm household during the summer months, 33 $\mu\text{g}/\text{m}^2$. The maximum concentration found on a smooth floor surface was 13.6 $\mu\text{g}/\text{m}^2$ of malathion.¹⁶

Among 90 randomly chosen homes in California, over 97% had detectable pesticide residues in floor wipe samples. The highest values detected were less than 2.0 ng/cm^2 .¹⁷

1 milligram (mg) = 1000 micrograms (μg) = 1,000,000 nanograms (ng)

How much pesticide residue is too much for a healthy home?

It may not be possible to remove all detectable pesticide residues from household contents. In part, this is because modern laboratory methods can detect pesticides at very low concentrations. Many pyrethroids (i.e., permethrin, bifenthrin) can be detected in swipe samples if they contain 0.001-0.003 ng/cm^2 .¹⁷ One nanogram is one billionth of a gram, spread over one square centimeter. Just because it's detectable doesn't mean it can cause harm. The dose makes the poison. To determine the risk, an expert will consider the toxicity of the pesticide and the amount of expected exposure from living with contaminated items.³

Are some people more sensitive to pesticide exposure than others?

[Young children](#) and [elderly adults](#) may be more sensitive to the effects of pesticide exposure for physiological reasons. [Pregnant women](#), and people trying to conceive, should also avoid unnecessary exposures, in order to minimize the risk of potential birth defects. There are also individuals with medical conditions that put them at higher risk when exposed to pesticides. If you think neighbors in the building may be exposed, ask them about any medical conditions or sensitivity, and consider actions that will help them keep their exposure(s) low.

What has been done to clean up pesticides in extreme situations of misuse?

When a technician misused a concentrated insecticide containing malathion in Ohio homes in 2010, authorities recommended a screening value of 15 µg/100 cm² on surfaces. Initially, all porous items were removed and discarded. Non-porous surfaces were wiped down with warm water and bleach. After initial cleaning attempts were ineffective, experts recommended more cleaning and removal of baseboards. Further, they recommended a polyurethane sealant on floors where carpeting had already been removed, covered by a new layer of plywood under new flooring.⁶

In conclusion, it may not be possible to easily determine the risk level when pesticides have been misused in a home. In many cases, it takes a team of professionals to determine the best strategy and evaluate its effectiveness. They have to consider effective methods and the risk to workers. They often test residue levels before and after cleanup activities, finding that some methods don't work as expected. Getting professionals involved, such as industrial hygienists, the pesticide product manufacturer, and/or remediation professionals, can lower the risk of cleanup activities and increase your chance of success.

Disclaimer: The information provided in this fact sheet is intended to be helpful as individuals make their own decisions about whether and how to clean up materials within the home. No guarantee of safety or warranty of cleaning effectiveness is intended or implied. None of the information provided can supersede applicable regulations or pesticide product label(s). If decontamination guidance is provided by a pesticide product manufacturer, it should be considered first. No legal obligations or rights are conferred by this document. Any mention of trade names or commercial products does not constitute an endorsement by NPIC or by Oregon State University. The information in this fact sheet does not necessarily represent the view of the US Environmental Protection Agency or that of Oregon State University.

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