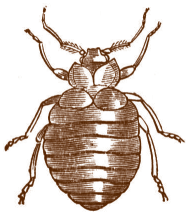

Bed Bug Treatment Using Insecticides

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Introduction

The U.S. Environmental Protection Agency (EPA) is responsible for protecting people from exposure to pesticides. To do this, they have very strict toxicity testing methods that chemical manufacturers must use to determine how harmful exposure to these pesticides may be to mammals (people, dogs and cats) or the environment. The test results are carefully reviewed by the EPA before a pesticide product is allowed to be sold in the United States.

If a pesticide is found to be either too toxic or it lasts too long in the environment it will never be registered for use. However, those pesticides that are not long-term environmental contaminates and that have very low mammalian toxicity will be allowed to be used, under strict conditions. For instance, those pesticides that do not produce harmful effects (either acute or long-term effects) at a particular dose, will still be required to have a 100-1000-fold margin of safety before they can be used in the human environment. In other words, a product dose may be reduced 100-1000 times before it can be registered (See the Food Quality protection Act for more information). As you can imagine, some pesticides may no longer kill pests at such a low dose, and never come to market.

The use of those products that pass the toxicity testing and margin of safety is still restricted by the pesticide label. The pesticide label is a legal document that is attached to every pesticide. The label specifies where a product can be used, and for what pest. The label also lists locations where the product cannot be applied. The label lists the protective clothing that must be worn when applying the product and how the environment is to be protected from exposure. The federal label does not just apply to pest management professionals, but also to consumers. If you use a pesticide in a way that is not in accordance with the label you can receive a civil penalty for breaking a federal law.

Why is all of this important? It is important because bed bugs live indoors and there are relatively few pesticides that are labeled for indoor use (fewer are labeled for bed bug control). The reason for this is that people (particularly children) and pets have a greater risk of exposure to indoor pesticides. Consequently, the EPA has reduced the number of pesticides that are allowed to be used in indoors. While the reduction of indoor toxicants has greatly reduced the potential for human exposure to insecticide, it has also reduced the number of chemical tools we have available for bed bug treatment. At the time of this writing, we have no labeled insecticide product that is capable of eliminating a bed bug infestation. Instead, pest management professionals conduct very thorough inspections, and then apply a combination of products to assault the bed bugs from several angles at once. This is both time consuming and expensive. The treatment process is typically repeated at two week intervals (to treat any nymphs that have hatched) until the bed bugs are gone. On the following pages are descriptions of the different types of products that professionals can legally use for bed bug treatment.

Liquid Insecticide Sprays

Insecticides are pesticides that are formulated to kill insects. All pesticides that are used to kill bed bugs are insecticides. Insecticide sprays are formulated by mixing a small volume of insecticide (the active ingredient is typically formulated at 0.03 percent-0.5 percent concentration) into a large quantity of water inside a spray tank. The sprays are applied in cracks and crevices and along baseboards where bed bugs hide (see illustration). If the bed bugs themselves are sprayed in the process they will usually die from the application. However, these sprays are also supposed to leave behind active residues that kill bed bugs after the product has dried. Unfortunately, laboratory studies have found that bed bugs are not very susceptible to dried insecticide residues and do not typically pick up a lethal dose from simply walking across the sprayed area. Instead bed bugs have to sit on the dried residues, sometimes for several days, to suffer any lethal effects. But if the spray is applied in cracks where the bed bugs rest, the dried residues have a much better chance of killing the bed bugs harboring there.

Aerosol Insecticide Sprays

Aerosol products are insecticides formulated with a propellant that allows them to be sprayed out of a can into cracks and crevices. Many types of insecticides are formulated as aerosols, so the labels on these products may list very different directions regarding where the product can be applied. For example, one aerosol label may say that the product can to be sprayed directly on an infested mattress, while another product label does not allow the spray to be applied on fabric surfaces. **It is very important that your pest management professional be knowledgeable about the label directions for each product.** Like the liquid insecticides, aerosols work best when the live bed bugs are sprayed with the product directly. However, a few aerosols leave residues that are active for several days after their application.

Insecticidal Dusts

Dusts have the advantage over liquid insecticides in that bed bugs walking on dusted surfaces will become covered in the dust making direct exposure to the insecticide impossible to avoid. There are several insecticidal dusts that are labeled for bed bug control. These dusts contain some of the same active ingredients that are used in the liquid insecticide formulations.

The labels for insecticidal dusts allow them to be applied in protected cracks and crevices where there is very little risk of the dust drifting out into open areas. Dusts can be used in wall voids to intercept bed bugs travelling from one apartment unit to another. They can be puffed in behind baseboards, electrical outlets and other protected locations where bed bugs like to hide. One of the disadvantages of dust is that they cannot be used in as many areas as the liquid formulations. This is because dusts are easily moved on air currents, and they present an inhalation hazard for humans. Dusts have strict label directions as to where they can be placed in the indoor environment.

Insecticide Resistance

It is important to note that many of our insecticide products (not all) are formulated using a specific class of insecticides that has low toxicity to mammals but high toxicity to insects. These insecticides are called pyrethroids. Pyrethroids are synthetic toxicants that target the insect nerve system. Pyrethroids cause the nerves to fire continuously until the insect loses control of its bodily functions and dies. Many of the liquid spray products, aerosols, and dusts contain pyrethroid insecticides. Unfortunately, pyrethroid insecticides have been used so much throughout the world that many bed bug populations have developed resistance to them. Resistance means that the bed bugs have the ability to survive the pyrethroid exposure. Resistant bed bugs are also able to pass the resistance to their offspring. The development of resistance has contributed the to the current bed bug population explosion. This does not mean that pyrethroids will not kill bed bugs. It means that not all of the bed bugs will die. Those that survive will go on to produce resistant offspring. Therefore, these insecticides if used alone will not eliminate an infestation.

Insect Growth Regulators (IGRs)

As the name suggests, an insect growth regulator interferes with an insect's ability to develop from a nymph into a reproductive adult. There is only one insect growth regulator that is labeled for bed bug control. This IGR is hydroprene. There are two insecticide products formulated with hydroprene, one is a liquid insecticide that can be used alone or mixed in a tank with another liquid insecticide, and the other is an aerosol formulation. The way that these products are supposed to work is that they are sprayed into cracks and crevices where young bed bug nymphs will come in contact with the dried residues. The IGR residues mimic insect growth hormones in the young bed bug's body. These artificial hormones cause the bed bugs to develop incorrectly. The nymphs continue to molt, but are supposed to be incapable of reproduction as adults.

Recently laboratory studies have shown that hydroprene does not sterilize bed bugs. Instead, the IGR exposure results in many bed bugs dying during or shortly after the process of molting to adulthood. However, those bed bugs that survive the final molt are still able to feed, mate and produce at least one batch of eggs, even if they die shortly afterward. These studies on the effects of hydroprene were conducted in the laboratory where immature bed bugs were constantly exposed to the IGR. The affect of hydroprene on a population living in someone's apartment is still not known.

Repellents

Many people have been interested in identifying insecticide products that might repel bed bugs from certain locations, like the bed. Many liquid insecticide products that we use for bed bug control are repellent to other insects such as cockroaches and ants. However, none of our current insecticide products appear to be repellent to bed bugs, particularly after they have dried. The bed bugs do not avoid insecticide treated surfaces, and will sit directly on repellent residues until they become agitated from intoxication and can no longer sit still. For whatever, reason, bed bugs do not recognize repellent chemicals the way that other household insects do.

The fact that bed bugs cannot be repelled is bad news for people who would like to use a repellent to keep bed bugs from biting. Many consumer insecticides have been misused by people putting these products on their beds or on their bodies in an attempt to keep bed bugs from feeding on them at night. So far, no insect repellent or insecticide product has been able to stop bed bugs from biting.

Consumer Use Products

There are a number of insecticide products available at home stores and over the internet that are labeled for indoor use. However, the majority of these products are formulated using pyrethroid chemistry due to the relative safety of the active ingredients. Because modern bed bugs are highly resistant to pyrethroids, most of the consumer products have very limited efficacy. Unfortunately, because the products do not work very well consumers have the tendency to over use these products. For example, many people have tried to eliminate bed bugs using total release aerosols (indoor foggers or bug bombs). When their first two bombs fail to solve the problem they then set off many bombs in their apartment. This is very dangerous. There have been numerous instances in which people have blown out their windows because of the increase in interior pressure created by these bombs! The bombs also leave oily residues all over the walls and carpeting, creating an exposure risk. If you have tried this yourself, you have also seen that multiple bombs still fail to kill all of the bed bugs! This is because the bed bugs are resistant to pyrethroids bombs, but are you? Be sure to read the label on consumer pesticides and never use more product than the label allows.

Insecticides Products Purchased over the Internet

The United States Environmental Protection Agency has recently become very concerned about people purchasing insecticides manufactured in other nations over the internet. Many nations do not require the rigorous safety testing that insecticides are subjected to in the United States. Some nations also use active ingredients that are no longer registered for use (specifically indoor use) in the United States. While most of these products may not be overtly dangerous, we have no way of knowing what the exposure risk might be if these products are used in the indoor environment. Because these products are not registered in the United States, they are illegal to apply.

Summary

There are relatively few insecticide products registered for indoor use. Those that are registered are primarily from one chemical class, the pyrethroids. Bed bug populations in the United States are known to be resistant to pyrethroids, therefore **no single insecticide is capable of eliminating a bed bug infestation if used alone.** Pest management professionals will typically use a variety of insecticide products to attack the bed bug infestations from several angles at once. However, they will also have to use many non-insecticidal treatment measures as well.

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