

**Killing Bed Bugs With Insecticide Resistance:**

**The Difference between  
Neurotransmitter Chemicals and  
Mechanical Killing Agents**



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## Killing Bed Bugs With Insecticide Resistance: The Difference between Neurotransmitter Chemicals and Mechanical Killing Agents

A study conducted by entomologists at Ohio State University finds **bed bugs are becoming resistant to the specific pesticides formulated to eliminate them.** They found bed bugs may have boosted their natural defenses by **generating higher levels of enzymes that can cleanse themselves of common pyrethroid-based pesticides.**

This is not the first study to conclude bed bugs are increasing their resistance to pesticides or neurotransmitter chemicals. There have been numerous studies that come to the same conclusion.

**With these developments in mind, it is important to understand the difference between neurotransmitter chemicals and mechanical killing agents when it comes to combatting bed bugs.**

### How Neurotransmitter Chemicals Work

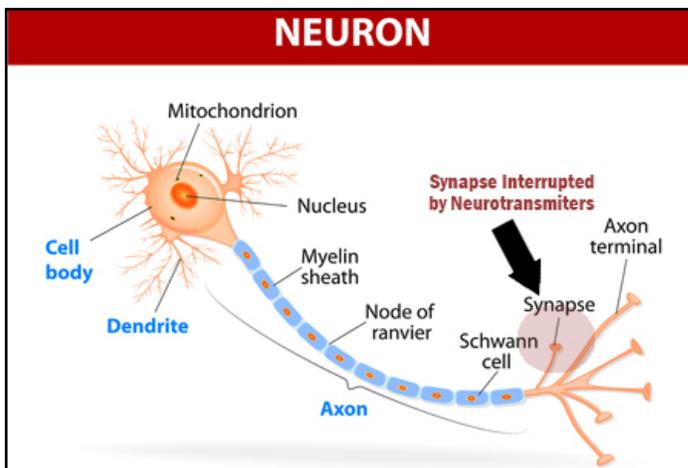
**The most common pesticides for eliminating bed bugs contain pyrethrin and pyrethroids.** These formulations **cause death by attacking the bug's nervous system via entry through the shell.**

Once inside the bed bug's body, the insecticide disrupts the nerve-impulse transmission, stimulates nerve cells and causes tremors, spasms, paralysis, and eventually death.

Studies have discovered bed bugs have evolved **three improved biochemical defenses against these common pesticide ingredients.** They have developed:

1. Higher levels of detoxification enzymes,
2. Nerve cells better able to withstand the chemical effects, and
3. A thicker shell that blocks insecticides better

The most active of these defense mechanisms are found in the bug's shell, improving the bug's ability to block or slow the insecticide from reaching the nerve cells. Once the insecticide penetrates the shell, the additional defensive measures prevent the toxins from attacking the bug's nervous system.





To combat this evolving bed bug resistance to insecticides, manufacturers will add additional ingredients (synergists) to circumvent the detoxification mechanism of the bed bugs. Basically, more chemicals are added to the formulation to increase the toxicity of the insecticide.

These new, boosted formulations may work for a while. However, according to Fang Zhu, Ph.D., Washington State University, evidence shows when bed bugs are exposed to lethal doses of pyrethroids, they begin to develop resistance within a few generations -- which can be less than one year.

### **Problems with Neurotransmitters**

In addition the bed bugs' ability to generate defensive mechanisms against chemicals, there are other issues to consider.

Pyrethrins degrade rapidly, meaning there is no residual kill effectiveness.

More significant is the research pointing to the effects on humans and pets. A study conducted by the University of California, Davis, discovered disturbing effects of pyrethroids on pregnant women. **Children of mothers residing in a one mile radius of agricultural pyrethroid insecticide applications just before conception or during third trimester were at greater risk for both Autism Spectrum Disorders (ASD) and Developmental Delay (DD).**

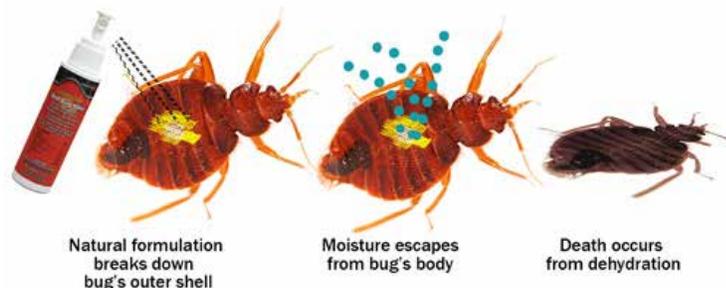
### **How Mechanical Killing Agents Work**

Mechanical Killing Agents work differently, bypassing the need to be absorbed into the insect's body to attack the nervous system.

Therefore, they are not subject to the same immune response that bed bugs are developing for neurological agents.

A Mechanical Killing Agent causes the onset of mortality without having to enter the bug's body. The precisely manufactured formulation works immediately to break down the bed bug's outer waxy layer, thus causing a fatal rupture of the exoskeleton and death by dehydration.

LIGHTS OUT Bed Bug Killer is an example of a Mechanical Killing Agent and is the non-toxic alternative to pyrethroid-based pesticides. It is made with ingredients which qualify for the 25 (b) exemption in the EPA Pesticide Regulations or considered G.R.A.S (Generally Regarded As Safe).





### **Third Party Efficacy Certification**

When considering a non-toxic, Mechanical Killing Agent to address bed bug infestations, be sure to **look for third-party certification assuring effectiveness.**



The American Academy of Entomological Science (AAES) has tested LIGHTS OUT Bed Bug Killer and has certified it begins the onset of bed bug mortality within minutes and is effective in eliminating bed bug infestations.

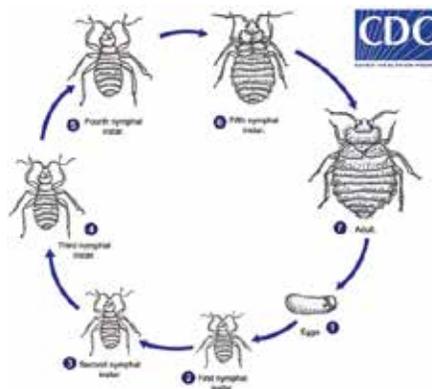
### **Residual Kill Requirements**

Female bed bugs lay about five eggs each day throughout their adult lives, which can be between 6 and 12 months. Eggs hatch in about 4 – 12 days and go through five nymphal stages, each one requiring a blood meal before molting to the next stage.

This is significant, as experts point out **a single, fertilized female bed bug can infest an entire apartment building.**

They can move quickly, too. In lab experiments, **bed bugs have been shown to wander more than eight feet in just five minutes.**

This is why **there must be a mechanism for continued, residual killing.** Many exterminators will contract for return visits to address this requirement.



The composition of a Mechanical Killing Agent, such as LIGHTS OUT, addresses the need for residual kill.

The AAES certification of LIGHTS OUT also confirms the formulation’s ability to adhere to treated surfaces for thirty days and continue to kill bed bugs emerging from their hiding places, as well as bed bug nymphs.

For more information about LIGHTS OUT Bed Bug Bio-Pesticide, visit [www.QuestSpecialty.com](http://www.QuestSpecialty.com)

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