
**Continuing Education
Material:**

**ALL ABOUT
BEDBUGS**

ABP, Inc.

ABP CONTINUING EDUCATION MATERIAL

ALL ABOUT BEDBUGS

OBJECTIVES

1. Discuss the biology of bedbugs.
2. Discuss bedbug reproduction and life cycle.
3. List ways to control and manage bedbugs.

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This continuing education material, *All About Bedbugs*, will earn the participant 1.5 contact hours. If you have any questions regarding this information or would like further information on other continuing education opportunities, please contact:

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ALL ABOUT BEDBUGS

BIOLOGY and ENVIRONMENTAL RANGE

Bedbugs are small, wingless bloodsucking parasites that feed on warm-blooded humans and animals. The name “bedbug” comes from the fact that their preferred nesting area is the sleeping areas in homes. They also infest furniture and walls. A bedbug has been called a wall louse, mahogany flat, crimson Rambler, heavy dragoon, chinche, and redcoat. The hatchling bed bugs are about the size of a poppy seed and adults are about 4 to 5 mm in length (¼ inch) and 1.5 to 3 mm in width. Newly hatched nymphs are translucent, light in color and become browner as they molt and reach maturity. They are oval in shape but are flattened from top to bottom. Their color ranges from almost white after molting or a light tan to deep brown or burnt orange. Adult bedbugs have microscopic hairs that give them a banded appearance. The bedbugs may appear as dark red or black when they are full of the host’s blood. Bed bugs use pheromones and kairomones to communicate regarding nesting locations, attacks, and reproduction. Their lifespan varies by species and is dependent on feeding. Bed bugs feed at night and often go unnoticed by the host. Bed bugs have no wings and cannot fly. They can run, crawl and climb and seek shelter in dark cracks and crevices. Bed bugs were virtually eliminated in the United States after the end of World War II due to the commercial use of DDT. About 10 years ago bedbugs began appearing again and since 2005 have been increasing in large numbers. The resurgence is linked to increased travel, both domestically and internationally.

The common bedbug, *Cimex lectularius*, is the species that adapts best to human environments. Bedbugs can survive in temperatures below 61° F where the adults enter semi-hibernation. Bedbugs can survive for at least five days at 14° F but will die after 15 minutes of exposure at (-26° F). They show high desiccation tolerance, surviving low humidity and high temperatures even with one third loss of body weight. Young bedbugs are more susceptible to drying out than older ones. The thermal death point for bedbugs is 113°F and all stages of life are killed by seven minutes of exposure to 115° F. Bedbugs cannot survive high concentrations of carbon dioxide for very long. Exposure to nearly pure nitrogen atmospheres appears to have little effect even after 72 hrs.

BEDBUG FEEDING

Bedbugs feed on humans when other hosts are not available. They are attracted to their hosts primarily by carbon dioxide, secondarily by warmth and also by certain chemicals. A bedbug pierces the skin of its host with two hollow feeding tubes. With one tube it injects its saliva, which contains anticoagulants and anesthetics, while it withdraws blood from its host with the other feeding tube. After feeding for about 5 minutes the bedbug returns to its hiding place. Bedbugs can live up to a year without feeding, but normally they try to feed every 5-10 days. Bedbugs can live six to eight months without a meal. DNA from human blood meals can be recovered for up to 90 days, which allows bedbugs to be used for forensic purposes in identifying who the bedbugs have been feeding on. Repeated exposure to bedbug bites for several weeks may cause some people to become sensitized to the saliva of these bugs. The skin lesion produced by the bite of bedbug resembles those caused by many other kinds of blood feeding insects such as fleas and mosquitoes. **You cannot identify the presence of bedbugs based on the appearance of the bites.** Scratching the bites can make the reaction more intense and lead to a secondary infection. Doctors treat patients with antihistamines and steroids to reduce allergic reactions and inflammation. **Bedbugs are not known to transmit any infectious agents.**

BEDBUG PREDATORS

Natural enemies of bedbugs include the masked hunter, cockroaches, ants, spiders, mites and centipedes. Biological pest control is not very practical for eliminating bedbugs from human dwellings.

BEDBUG REPRODUCTION

All bedbugs mate by traumatic insemination. Because the female has no genital opening, the male pierces her abdomen with his hypodermic genitalia and ejaculates into the body cavity. Especially desperate males sometimes mistake other males for females and sometimes fatally wound the other male. The bedbug alarm pheromone is released when a bedbug is disturbed. An attack by a predator can cause release of the alarm pheromone. Bedbugs also use the alarm pheromone to repel another male that might try to mate with them.

BEDBUG LIFE STAGES

Bedbugs will shed their skins through a molting process throughout the multiple stages of their lives. The discarded outer shells look like clear, empty exoskeletons of the bugs themselves.

Bedbugs must molt six times before becoming fertile adults.

NESTING LOCATIONS

Favorite hiding places for bedbugs include the bed frame, the seams around mattresses and undersides of box springs. Clutter around a room offers other places for the bugs to hide and makes it harder to get rid of them once they have become established. Bedbugs have also been found in schools, healthcare facilities, trains, buses, homeless shelters, movie theaters, cruise ships and offices. Bedbugs stowaway in luggage, furniture, clothing, pillows, briefcases, purses and boxes that are moved between homes, hotels and offices. Used furniture like bed frames and mattresses pose the greatest risk of harboring adults and their eggs. Be very careful when buying used furniture especially from yard sales. New furniture can also have bedbugs if they were transported in a vehicle that has become infested. Bedbugs can also come in from wild animals such as bats or birds and even on family pets.

PESTICIDE RESISTANCE

DDT was used in the 1940's and 1950's to rid the developed world of bedbugs. The resurgent bedbug populations in the 20th century are resistance to DDT and pyrethroid insecticides. The carbamate insecticide is highly toxic to bedbugs but because of its potential toxicity to children, has not been approved by the EPA. Across the U.S. bedbug pesticide resistance has increased dramatically. Sprays that have been used to control cockroaches and ants no longer have an impact on bedbugs.

CONTROLLING BEDBUGS

Bedbugs are elusive and usually nocturnal which makes them difficult to find. Before you try to control or eliminate bedbugs, make sure that you have found at least one real bedbug. Bite could be one of the first clues. Sometimes black or dark brown fecal spots of bedbugs are visible on linens, the mattress or walls near the bed. A coriander –like odor may be detected in heavy infestations. Bright red blood spots are not due to bedbugs.

Make sure that you really have bedbugs before start any removal techniques. If you find a bug that you wish to have identified, use clear tape and place the bug on a sheet of white paper. Take a picture and send it in for identification. You may kill bedbugs by place them in your freezer for an hour or more.

Other ways to capture a bedbug include:

- Use duct tape – wrap tape around the legs of bed with sticky side out so that any bug wandering will get stuck.
- Insect glue traps under the bed to trap bugs – use the non-baited traps.
- Wet or dry moat traps in saucers around bed legs. You can use a cup or saucer containing soapy water or mineral oil and the bedbugs will drown. You can also use talcum powder.
- Carbon dioxide attractant traps to attract bugs – rather expensive and don't eliminate the bedbugs.
- Bedbug sniffing dogs can help confirm the presence of bedbugs and focus on where they might be hiding. Trained dogs can pinpoint infestations with 97.5% accuracy in a matter of minutes.

INSECTICIDES AND FUMIGATION

Make sure to read labels before applying any pesticides. Do not apply any insecticides or pesticide to mattresses or to surfaces that would be in direct contact with a person unless the product states that it is safe for humans, pets, and the environment.

Inert Insecticidal Dusts: These dry dusts consist of finely ground glass or silica powders that can be applied to cracks and crevices or blown into wall voids and into hollow tubular bed frames. The small particles are hard and sharp and can abrade the insect's cuticle causing damage and hastening water loss.

Contact Insecticides: These consist of one or more kinds of pyrethroids that tend to “knock down” bugs that have direct contact with the product or its residue. Sometimes bedbugs avoid treated areas and many bedbugs are resistant to certain pyrethroids.

Insect Growth Regulators (IGR): These products can affect development and reproduction of some insects and can be effective in reducing insect populations but they are very slow acting.

Fumigation: This is highly specialized and is used when there is structural infestation. A building must be emptied of people and pets and then “tented” before the pesticidal gas can be infused into the building. There are monitors put into different places of the building to ensure that the building has had sufficient exposure. After a specified time, the gas is vented into the air and the tarp is removed. The gas concentration must fall to below detectable levels before the building can be reoccupied. Bedbugs can be reintroduced if possessions infested with bedbugs are not also treated. Some companies have special vans to treat a person's possessions. There is also a method by which slow release pesticide strips can be sealed in plastic bags with possessions and exposed to the vapors for several days.

NON-INSECTICIDAL METHODS

Chilling and Freezing: Bedbugs are cold blooded and become inactive at temperatures below 55 ° F. They can just hide and wait, without eating, until the temperature warms up.

Bedbugs and bedbug eggs can be removed by freezing under certain conditions. The longer the time and the lower the temperature below freezing, the greater the chance of killing bedbugs and their eggs. The bedbugs die because ice crystal form in their tissues and from water loss because of the low humidity. Possessions or homes can be treated by freezing also, but this is only practical in seasonal homes and care must be taken to prevent pipes from freezing. Some companies offer directed release of carbon dioxide directly onto furniture and around baseboards. This method may not penetrate into cracks and crevices.

Drying: Water loss with cause bedbugs and bedbug eggs to die. Low humidity environments such as cold can cause water loss due to evaporation. The only way to restore water balance is by blood feeding.

Heat: Bedbugs will begin to have diminished reproductive output at temperatures of 100°F. As the temperature continues to rise, bedbug survival rate decreases. Temperatures of 110°F and above will kill bedbugs and their eggs. There are specialty companies that have industrial strength heaters to achieve these temperatures. Small items like luggage can be treated by being placed in the sunlight in a close car during the summertime.

Steam: There are commercial devices that can direct steam (water vapor produced by boiling water) into cracks and crevices. Steam that comes into direct contact with bedbugs and their eggs will kill them. Steam will have little effect on bedbugs that are hiding in protected areas.

Laundering of Clothing: Bed bugs and their eggs will be killed by normal laundry methods as long as HOT water is used. Putting clothes in a hot dryer can have the same effect- with or without laundering first. Traditional dry cleaning methods should also kill bedbugs and their eggs.

BEDBUG MANAGEMENT

Managing bedbugs generally requires cleaning, room modifications and insecticidal treatments. Always confirm the presence of bedbugs before considering any kind of treatment. Reduce clutter to limit hiding places. Thoroughly clean all the rooms in the residence. Use a vacuum to remove bugs from cracks and crevices and bed frames. Mattresses and box springs can be permanently encased with special mattress bags in which the bugs will die. To keep bugs from crawling onto a bed, pull the frame away from the wall, keep bed linens from touching the floor and wrap tape, sticky side out, around bed legs. Caulk and seal holes where pipes and wires come through walls and floors. Use a professional exterminator rather than try to use pesticides yourself because of the risks involved. All secondhand clothing should be washed and dried in a hot cycle before bringing them into the house. You might also consider purchasing a portable heating unit for items that cannot go into a dryer. Some pest management companies offer heat treatment which raises the room's temperature beyond that in which bedbugs can survive. After returning from a trip, unpack in the garage and make sure luggage is vacuumed and clothes are washed and dried immediately rather than sitting in the laundry room. Remember that each bedbug needs just one full blood meal to develop to the next stage. Under ideal conditions, adult bedbugs can survive more than one year between feedings.

REFERENCES

1. <http://identify.us.com/bed-bugs>
2. <http://www.diy-life.com/2010/08/27/bed-bugs/>
3. <http://en.wikipedia.org/wiki/bedbug>

All About Bedbugs – Self-Assessment Quiz

Please place all answers on the Continuing Education Registration Form.
Mail form to ABP, Inc. to be graded so that you can get your P.A.C.E. certificate.

1. **Which statement is correct about bedbugs?**
 - a. A bedbug has been called a wall louse.
 - b. Newly hatched nymphs are dark brown in color.
 - c. Bedbugs have wings and can fly.
 - d. Bedbugs first appeared in the USA after WWII.

2. **The thermal death point for bedbugs is:**
 - a. 61 °F
 - b. 98 °F
 - c. 113 °F
 - d. 120 °F

3. **What is the chemical that attracts bedbugs?**
 - a. oxygen
 - b. nitrogen
 - c. hydrogen
 - d. carbon dioxide

4. **Which statement is correct about bedbugs and their feeding habits?**
 - a. Bedbugs must feed every 5-10 days or die.
 - b. Bedbugs have only one feeding tube.
 - c. Bedbugs can be useful in forensic cases.
 - d. Bedbugs are identified based on the appearance of their bites.

5. **How many times must a bedbug shed its skin before becoming a fertile adult?**
 - a. 3
 - b. 6
 - c. 9
 - d. 12

6. **Which of the following are nesting locations for bedbugs?**
 - a. furniture
 - b. family pets
 - c. boxes
 - d. all of the above

7. **What smell has been associated with bedbug infestation?**
 - a. coriander
 - b. cinnamon
 - c. cloves
 - d. sulfur

8. **A bedbug can be captured by which of the following ways?**
 - a. Use of a baited insect glue trap.
 - b. Use of vegetable oil in a saucer around a bed leg.
 - c. Use of electrical tape with the sticky side out around bed legs.
 - d. Use of a saucer containing talcum powder around bed legs.

9. **Which non-insecticidal method about killing bedbugs is correct?**
 - a. Freezing will kill only bedbug eggs.
 - b. Water loss will cause bedbugs to die.
 - c. Normal laundering with cold water will kill bedbugs.
 - d. Direct steam will kill all bedbugs.

10. **Bedbugs can be managed by which of the following methods?**
 - a. Encase mattresses in special mattress bags.
 - b. Wash and dry secondhand clothing in a hot cycle before bringing items into the house.
 - c. Unpack luggage in the garage and clean with a vacuum before bringing into the house.
 - d. All of the above.