

Department of Animal Science

MANAGING BED BUGS IN POULTRY FACILITIES

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Bed bugs (*Cimex lectularius*) are a serious reemerging pest in broiler breeder houses. They had all but disappeared in the U.S. until about 25 years ago, when they began an unfortunate comeback. Bed bugs are now frequently reported in human establishments such as hotels, college dormitories and apartment complexes, as well as broiler breeder houses. The **first record of bed bugs in poultry barns dates back to the early 1930s** (Kulash, 1947). However, bed bugs have been around for thousands of years; they are mentioned in medieval European texts and classical Greek writings as far back as Aristotle (Potter, 2012). However, most people in the U.S. still have no knowledge of them and have never seen one. Bed bugs belong to a family of insects called *Cimicidae*. Members of this insect family are small, oval, flat, hard-bodied, flightless insects in which the wings are absent or reduced to stubs. All members of this insect family feed exclusively on blood. Let's look deeper into the problem of bed bugs in broiler breeder houses.

Some bed bug background

Bed bugs (Figure 1) were thought to be largely eradicated from the U.S. for several decades after World War II, except for a few small pockets (Cranshaw et al., 2013). This was likely because most of them had been eradicated by widespread use of DDT and other broad-spectrum insecticides in the 1940s and 1950s (Tabler et al., 2015). What we failed to recognize at the time was that, while infestations worldwide were declining, **insecticide resistance was occurring** in a small part of the bed bug population. Today, we recognize insecticide resistance as a worldwide problem reported in hundreds of insect species, including pyrethroid resistance reported in bed bug populations and implicated as one of the many factors associated with the current bed bug resurgence (Gordon et al., 2014). Again, they are an ancient pest. Bed bugs have been unearthed from archeological digs dating back more than 3,500 years. They hitched a ride to the U.S. on ships during colonial times and gradually moved inland from the coast. This most recent bed bug resurgence has followed a similar pattern, with initial reports of infestations beginning in the late 1990s occurring in locations such as New York, Miami and San Francisco (Potter, 2011).

Bed bug biology

Bed bugs are reddish-brown insects that may resemble ticks or small cockroaches. They are sucking pests with modified mouthparts that form a proboscis that is used to penetrate the skin. It takes about **3 to 10 minutes for an adult bed bug to consume up to six times its weight in blood** in a single meal (Goddard, 2022). They are on the host for only a short time during feeding. After feeding, bed bugs retreat to a hiding place where they remain during daylight hours while the blood meal is digested. Bed bugs are nocturnal, hematophagus (feed on blood), ectoparasites (external, skin surface pests) of birds and mammals. Fortunately, bed bugs are not vectors of any known human or bird disease (Basnet and Kamble, 2019). They are the only hematophagus insects not known to vector disease, making them the focus of studies to determine if there are any clues on how to render other species ineffective at disease transmission (Basnet and Kamble, 2019). The bed bug life cycle consists of the egg, five stages of nymphs (each progressively larger than the preceding stage), and the adult (Steelman, 2000). To develop from one stage to the next, **each immature nymph must take regular blood meals**. Bed bugs are obligate parasites, meaning they cannot survive without feeding on the blood of a host. However, they can go extremely long periods between feedings, if necessary, perhaps up to a year or longer. Adult bed bugs must take a blood meal to continue to reproduce, as a blood meal is required for production of each batch of eggs by the female. But there's no need to try to starve them to death; they can hold out longer than you.

Three to four generations per year are possible and populations can double every 16 days (Machtinger and Martin, 2019). A female bed bug can lay 50 to 350 eggs in her lifetime, but under favorable conditions as many as 550 eggs can be produced. Eggs usually hatch in 6-10 days, but this is temperature dependent and at temperatures below 70 degrees F hatching can take up to 28 days (Roe, 2000). Newly hatched nymphs will immediately seek out a food source, which in a broiler breeder house, is the chickens. Feeding occurs in the dark, usually in the middle of the night or on toward dawn. The bed bug **uses the presence of carbon dioxide and heat** to locate its host. It requires about four days for bed bugs to grow between nymph stages at a temperature of 80 degrees F. Therefore, the entire life cycle from egg to adult requires about 30 days (Steelman, 2000). Adults typically live 9-10 months. Under ideal conditions, **each adult will generally feed once a week**, so many feedings occur during its lifespan (Jacobs, 2015). Cooler temperatures retard development, and activity level declines as the temperature drops below 60 degrees F. Eggs are not laid when temperatures are below 50 degrees F (Machtinger and Martin, 2019).

Resurgence and control

While not all the factors related to this most recent resurgence in bed bug populations are known, it's likely that increased long-range air travel, a reduction in the use of residual insecticides, movement of bed bugs from birds to bats to humans, and the ability of bed bugs to disperse locally all play a role (Steelman et al., 2008). **Passive dispersal is by far the most important method for bed bugs to reach new hosts**. They are very efficient hitchhikers and can be transported in or on luggage, clothing, beds and furniture (Steelman et al., 2008). In a breeder house situation, they can easily and unknowingly be transported from the chicken house to dwellings on clothes, shoes, purses or bags. Bed bugs can arrive at a clean poultry facility as eggs, nymphs or adults attached to egg boxes, clothing, shoes, cages, slats, egg buggies, etc.

(Steelman, 2000). They may also arrive on replacement roosters or on new pullets and roosters delivered when a new breeder flock is placed on the farm.

It only takes one impregnated female being moved onto a clean farm to produce a well-developed infestation in a broiler breeder house within a few months (Tabler et al., 2018). A male is not necessary if the female was impregnated when the move occurred. She will eventually run out of sperm and must mate again to fertilize additional eggs but that's not a problem because she can mate with her own offspring after they become adults. Bed bugs are **extremely difficult to control in a breeder house setting**. There are simply too many cracks and crevices and hiding places where they take can shelter safely. Because, for the most part, they are nocturnal, you may not know you have a bed bug problem until the population becomes so high that they appear in the daytime on eggs coming down the belt and start biting workers gathering eggs. Unfortunately, by the time numbers reach this level, it has become an infestation that is totally out of control.

For some growers, **bed bug infestations can be unnerving to say the least** (McDonald, 2020). This is understandable, because in some individuals, the psychological aspects resulting from a bed bug infestation and bed bug bites can include nightmares, flashbacks, hypervigilance (to keep the bugs away), insomnia, anxiety, avoidance behaviors, and personal dysfunction; **symptoms most often associated with posttraumatic stress disorder (PTSD)** (Goddard and de Shazo, 2012). On an infested poultry farm, it creates discontent among hired labor and infested barns can act as a source for bed bug movement to workers' homes, hitchhiking on clothing, purses, boxes and bags. It is a concern for the integrator about spreading bed bugs to other farms on equipment, as well as a stress point for egg production and the welfare of the flock (McDonald, 2020).

Bed bugs in breeder houses

Unfortunately, there are **few effective classes of insecticides available today** to treat against bed bugs, in part because the predominant use of pyrethroid-based products has resulted in resistance in most bed bug populations. As a result, products like Tempo (cyfluthrin) and permethrin may not kill bed bugs. It may be necessary to use a non-pyrethroid pesticide such as Durashield (chlorpyrifos) or Ravap (chlorpyrifos + dichlorvos). Ravap can be used with birds on the farm (check the label), but Durashield can only be used when the houses are empty and must be mixed and sprayed by a certified pest control person (McDonald, 2020). Other products that have proven useful in the war against bed bugs include Optimate (gamma-cyhalothrin), BP-100 (pyrethrins and piperonyl butoxide), Grenade (lambda-cyhalothrin), and Phantom (chlorfenapyr). In addition, to be successful, insecticide applications must reach the cracks, crevices and hiding places that act as harborage sites for the bugs, which is sometimes difficult to do. Some products are contact sprays, meaning they must contact the bed bug to be effective. Because some significant portion of the bed bug population will remain hidden, contact sprays are often not the best treatment option.

Some animal health supply companies have developed bed bug treatment programs for use on breeder farms between flocks and with birds on the farm. While it is difficult to eradicate every single bed bug on an infested farm (there are simply too many hiding places), there are programs that can keep bed bug numbers at manageable levels. Always follow label directions for all chemicals and make sure to thoroughly spray locations such as nest boxes, including the corners

and under the nest pads, and all cracks, crevices and hiding places. Bed bug eggs may not always be killed by chemical treatment, so spraying will likely need to be repeated about two weeks after the initial spraying to kill recent hatchlings.

Heat can be used as an alternative to chemical spraying when birds are absent from the farm. Sustained **heating of the house to 130 degrees F for a few hours should kill bed bugs and their eggs**. However, the logistics of heating every crack and crevice in a poultry facility to 130 degrees F is particularly challenging. If using heat, there is **risk of collateral damage** and care must be taken not to set the house on fire or melt water pipes or equipment. Before applying heat treatment, an outside perimeter residual insecticide should be applied to kill any bugs trying to escape the heat. Insecticide treatment may also be required in the attic before heat treatment because bugs will move into the attic to escape the heat treatment. Diatomaceous earth has also been used as an alternative to chemical insecticides with various levels of success that appear to be somewhat weather dependent. For example, it seems to work better when the humidity is low compared to high humidity levels.

Be careful. Not every chemical insecticide may be legal in every state. Check with your integrator, local county Extension office or other regulatory official before using any chemical insecticide in or around your poultry houses or home. Even if a product is legal for use in your state, **check with your integrator** before using to make sure it is on their approved list of products deemed safe for use in or around chicken houses. **READ AND FOLLOW ALL LABEL DIRECTIONS FOR SAFE USE OF ANY CHEMICAL PESTICIDE.** Also, use common sense. Pesticides are poisons, so take necessary precautions, handle chemicals carefully, and store in the original labeled container in a safe place away from children, pets and livestock. Do not contaminate water supplies, streams or ponds. Dispose of empty containers in a safe and approved manner and location.

Summary

Bed bugs are difficult pests to control in broiler breeder houses. There are numerous hiding places that complicate eradication. In addition, bed bugs have developed resistance to most of the insecticides used against them. **Use extreme caution to prevent transporting them from farm to home or farm to farm.** Consult an expert pest exterminator or animal health supply facility if you develop a bed bug infestation in a broiler breeder operation. Complete bed bug eradication in a poultry house may be difficult, but the numbers can be reduced to manageable levels.

Figure 1. Adult bed bugs, nymphs and eggshell casings.



Photo courtesy of Dini Miller and Molly Stedfast, Virginia Tech Entomology Department.

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