■ Insecticidal soaps and silica aerogels provide a least-toxic control that you can employ if all else fails;
■ All other pesticides should only be used as a last resort

Steps to take when admitting patients with bed bugs:

■ Launder clothing in hot water (at least 120ºF). Clothing, footwear, area rugs, toys, stuffed animals, backpacks and other non-launderable items can conveniently be de-infested by heating them for a period of time in a dryer at most settings. A typical clothes dryer run for five minutes at low, medium or high heat produced temperatures of about 140, 150 and 180°F, respectively –plenty hot to kill bed bugs. While certain items may require professional dry-cleaning, utilizing conventional washers and dryers may help limit the spread of bed bugs.
■ Infested "Dry clean only" clothes can be placed 'dry' in a dryer for 30 minutes on medium heat without damaging the clothes while killing the bed bugs. Enclose clothes in plastic bags when moving them through the facility.

Telling Patients about Bed Bug Infestations

We recommend patients be told that they appear to have a bug infestation, that bed bugs rarely cause serious medical problems, and that the facility staff and the residents need to work together to eliminate bed bug problems. It may also be helpful to explain that bed bugs have re-emerged over the past five years for largely unknown reasons, and that the issue is not a result of anything the patient has done.

This information is taken from several sources, including Beyond Pesticides' article, "Got Bed Bugs? Don't Panic," published in the Winter 2010-20011 issue of Pesticides and You (read more online www.beyondpesticides.org/bedbugs), and from IPM in Health Care Facilities project consultants Tom Green of the IPM Institute of North America in Madison, WI and Luis Agurto of Pestec in Oakland, CA.

Bed Bugs:

Guidelines for Prevention, Monitoring, and Intervention

Prepared by the Integrated Pest Management in Health Care Facilities Project

Maryland Pesticide Network
and Beyond Pesticides
www.beyondpesticides.org/bedbugs

Prevention

■ As with all pest prevention under an IPM program, seal up cracks and crevices that will allow entry and exit of pests, including doorsweeps, window screens, etc.;
■ Remove any animal habitats near, attached to, or inside the facility, such as bat roosts or bird nests in the eaves, roof or attic, and exclude animals from entry;
■ Trap and remove host animals and nests;
■ Remove debris and clutter from facilities (inside and out).
■ If possible, keep beds away from the walls;
■ Encase mattresses and box springs in zippered, bed bug-proof covers, which deny access to hidden areas and trap those already inside. After a year, bed bugs trapped inside will die. It will also make monitoring easier.

Monitoring

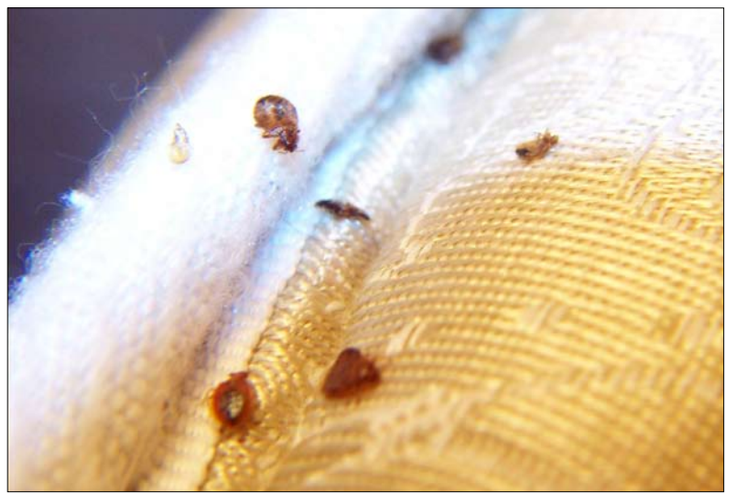
■ Regular IPM monitoring in general facility areas should include indications of bed bug infestations;
■ Have housekeeping staff regularly check for signs of bed bugs;
■ All staff need to be trained on identifying bed bugs and to allay fear, staff need to be educated about the limited health effects of bed bugs. These insects do not carry disease. Some people do not show any signs of bites while others may have many bites and react with localized swelling;
■ If possible, inspect new patients' belongings- clothes, wheel chairs and any other articles on admission for any evidence of bed bugs;
■ Use bed bug barrier under beds and sofas to trap bed bugs traveling from floor.

Where to Look

When not feeding, bed bugs breed and reside in cracks and crevices of bed frames or headboards and along the seams, folds, or 'buttons' of mattresses, or within box spring frames. Bed bugs do not restrict themselves to beds: up to half of the bugs in an infestation will be away from beds. The more severe the infestation, the further bugs, eggs, and hatchlings will be found from a bed. Rusty-orange stains can indicate infestation.

Bed bugs can be found in:
■ Cracks and crevices of the floor, plaster or ceiling moldings;
■ Window and door casings, moldings, cracks in plaster, picture frames;
■ Along the edge of carpeting;
■ Under loose wall paper and switch plates and outlets;
■ In drapery pleats, the upholstery of sofas or chairs or the folds of clothes hanging in the closet;
■ In the cracks and crevices of night stands or bureaus;
■ Inside clocks, phones, televisions and smoke detectors, etc.

Investigate the possible cause of the infestation. By getting rid of the source, you will help rid the infestation in your facility. Bed bugs, including eggs, may be carried from infested areas to non-infested areas on clothing, in luggage, in furniture or bedding. They can also travel between rooms. Rodents, birds, and bats can serve as alternative hosts.



Identifying Bed Bugs

Adult bed bugs are flat, elliptical, and between 1/8" to 1/4" inch wide. With a reddish-brown color, they appear somewhat like a flattened apple seed. Immature bed bugs are about the size of a pin head and yellowish to reddish purple. Bed bugs can survive a year on a single feeding. They are usually active at night, feeding on sleeping hosts.

Bed Bug Bites

Human reactions to bedbug bites can range from swelling and pain to nothing at all. Bed bug infestation can rarely be identified solely by the appearance of the bites since they resemble bites caused by other blood feeding insects, such as mosquitoes and fleas.

Intervention

It is not necessary to treat all rooms/units in the facility -- just the affected and adjacent units.

Pesticides are not a first line of response nor are pesticides always needed to eliminate bed bugs. The consensus among IPM experts is that there is very little value to interior perimeter treatments with pyrethroids or pyrethrins. For example, an article in *Pest Control Technology* magazine a few years ago noted that pyrethroids, commonly employed to kill or prevent bed bugs "are not providing more than 50% mortality as residuals and as direct contact insecticides." Bed bugs are highly adaptive, with resistance to these insecticides being observed within generations of a single infestation. In addition, use of these insecticides exposes patients' visitors and staff to health risks such as exacerbation of respiratory illnesses, Parkinson's disease, and other documented health effects. Instead, treatments with borates or diatomaceous earth are more effective and far less toxic to residents and staff.

The focus of an IPM bed bug program is monitoring, prevention and physical elimination. Frequent (at least every 2 weeks) monitoring inspections and follow-up treatments are recommended.

Appropriate staff (Maintenance, Housekeeping) should:

- Carefully inspect furniture, linens and belongings brought into the facility for bed bugs or rusty-orange stains that indicate infestation;
- Fill cracks, nooks or crannies in bed frame, floors, walls, the edge of baseboards and moldings with sealant;
- Re-glue loose wallpaper;
- Alert the IPM Coordinator so that the vendor's technician can be notified.

Your vendor should:

- Have access to using canine 'helpers' to sniff out bed bug infestations;
- Use vacuum bugs for visible bugs and debris;
- And either steam clean, use a thermal/heating system to kill bugs and eggs or use frozen CO2 to kill bugs and eggs.

Vacuuming bed bugs

"Standard" non-chemical intervention for removal of bed bugs and eggs should include dismantling and treating bed frames, upholstered furniture, drapes, rugs, etc., for vacuuming/steaming. All furniture must be thoroughly vacuumed/steamed, with shelves, detachable furniture legs, etc., removed to reach crevices. Walls and floors must be thoroughly cleaned. Better results are achieved by scraping the end of the suction wand repeatedly over the harborage area. Vacuum bags are immediately discarded. Brush attachments enhance the potential for spread by allowing bugs and eggs to adhere to the bristles.

Steam Cleaning

Steam temperatures of approximately 220°F kill bedbugs and eggs on contact. "Dry-steam" and other low-moisture systems are best, as they reduce the possibility of mold growth. Low-moisture steamers are available from such companies as AmeriVap Systems (tel: 800-763-7687) and Hi-Tech Cleaning Systems (tel: 866-606-1355). Vendors should use a commercial-grade steamer with variable steam outputs and multiple attachments. Larger brush heads are better as smaller diameter tips are less efficient and frequently emit too much pressure, causing bugs and eggs to be blown off the substrate and scattered rather than eliminated. Steam can be used to treat almost any area where bed bugs are found or suspected. Avoid treating finished wood surfaces or delicate items that might be damaged by high heat."

Thermal Treatment

Heat must be applied evenly throughout a structure to kill bed bugs wherever they are hiding, including inside walls. Thermal treatment uses fans and a heat source; the area is heated to 140°F and held until all areas within the space are heated to 120°F. A whole room can be heated, or items may be enclosed in thermal units placed within a room.

Cryonite Treatment

Cryonite® is being offered by some vendors that claim it is a successful non-toxic and chemical-free method of killing bed bugs and eggs. It is a pressurized carbon dioxide "snow" that kills bed bugs and eggs by rapid freezing. The system is optimized for crack and crevice treatment.

Some vendors provide mattress and box spring encasements in order to encase both the mattress and box spring in zippered (plastic) covers, which deny the bugs access to inner, hidden areas and trap those already inside. After a year, bed bugs trapped inside will die. Encasement is necessary if an infested bed is to be kept. They also help protect new bed components until the current infestation is eliminated. Heavily infested or damaged mattresses, frames and headboards may warrant disposal. Infested items to be discarded should be bagged or wrapped to prevent dislodgement of bugs en route to the dumpster.

Least-toxic chemical controls

Thorough treatments (spaced approximately two weeks apart) as outlined above should eliminate most bed bug infestations. In the case of a severe infestation where the above is insufficient, intervention can include the following:

- Clean vacuumed areas (see above) with diluted borax (2 oz per quart of water);
- A residual treatment with fresh water diatomaceous earth (avoid products that include pyrethrins/pyrethriods in combination with diatomaceous earth);
- Wall void treatment with sodium borate or food-grade diatomaceous earth;