

Bed bugs in Toronto

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1. What is a bed bug?

Bed bugs belong to the insect order Hemiptera, the true bugs, most of which are winged insects adapted to sucking plant sap. One family of this order, Cimicidae, has evolved as wingless, blood-sucking parasites on warm-blooded hosts.

There are 91 species in this family of ectoparasites (parasites that live on the exterior of the host organisms). Most of these species live in the nests of either birds or bats. But two species have evolved as ectoparasites of humans – the common bed bug, *Cimex lectularius*, and the tropical bed bug, *Cimex hemipterus*.

2. The history of the bed bug

The human-host relationship may have evolved when humans still lived in caves and were exposed to cave bats. According to Usinger (1966), the two species of *Cimex* that feed on humans are related to Old World bat-infesting members of the genus that originated in the Palearctic region. These species were inadvertently spread by explorers to Africa, Australia, and the New World and became cosmopolitan urban pest species.

In the early 20th century, with the introduction of central heating, the common bed bug spread farther north and became a more serious pest in parts of northern Europe than it had previously been. But with the development of synthetic insecticides such as DDT and spray systems during the Second World War, humans finally gained the upper hand (Usinger, 1966).

Over the past half a century, bed bugs have become a rarity, associated with the most marginal of human living conditions. Unfortunately, to the consternation of urban entomologists and public health officials, bed

bugs are once again on the rise. A general global resurgence has been reported in Asia, Europe, North America, and Australia.

The reasons for this phenomenal resurgence are not yet clearly understood. Many factors may be playing a role. Among these factors may be:

- changes in registered pesticides, use patterns, residual levels, and pesticide resistance;
- socioeconomic conditions leading to increased levels of homeless people living under conditions in which it is difficult to maintain hygiene;
- a populace that has forgotten how to monitor for and control bed bugs;
- greater mobility that allows bed bugs to spread more quickly to a wide number of establishments, including hostels, shelters, bus stations, dormitories, prisons, hospitals, and hotels.

3. The bed bug problem in Toronto

In Toronto, reports of bed bugs by pest control companies and pest control officials started to increase in 2001. Homeless people told street nurses that bed bugs were a priority medical issue in 2002. By 2003, at least a dozen shelters, hostels, and other forms of public housing were known to have ongoing problems with bed bugs, despite spraying by pest control companies.

In November 2003, a special meeting was organized by Hostel Services of the Toronto Shelter Housing and Support Division, at which advocates for homeless people, shelter personnel, street nurses, public health officials, a university entomologist, and a professional pest control services manager came together to draw up an action plan.

4. Causes for concern

The rise of bed bugs is a concern for many reasons. First, the nocturnal blood-sucking habits of the bugs induce anxiety, worry, stress, and sleeplessness for those infested. The initial bite, though usually painless, may develop into a welt that remains itchy for weeks. With scratching and subsequent infections, these welts can develop into severe skin conditions. This psychological torment alone should justify public health concern.

When the conditions of shelters are such that homeless people prefer not to use them for fear of bed bugs, and sleep in the streets instead, the societal investment in shelters is undermined.

At the same time, the potential of bed bugs for spreading disease cannot be overlooked. According to Harwood and James (1979), bed bugs fulfil all the conditions of efficient carriers of disease (disease vectors). They can be infected with many disease organisms. Ebeling (1978) reported that the organisms associated with plague, relapsing fever, tularemia and Q fever survive for long periods in bed bugs. Olson (2000) found that bed bugs may play a minor role in the transmission of hepatitis B virus, but not other viruses such as HIV.

Although they have not yet been implicated in the spread of any human epidemics, the medical community should maintain a high level of vigilance, given their disease-carrying potential, the ever-evolving dynamics of disease organisms, and the potential of bed bugs to serve as vectors of blood-borne diseases from person to person. However, for practical purposes, bed bugs are officially considered only as medical nuisance pests, not as carriers of disease.

Finally, bed bugs may be a biological indicator of changing social conditions and might foretell the resurgence of other ectoparasites such as lice and fleas and their associated diseases.

For all of these reasons, the situation merits attentive monitoring. At present, it is not clear to what extent,

if at all, such monitoring is currently in place in the Toronto Public Health system.

If the resurgence of bed bugs in shelters and other public facilities is not contained, there is the risk of a continuous and escalating growth in the source populations, leading to larger-scale infestations, which will require more frequent and costly control efforts later.

As the source populations grow, the rate of spread will inevitably increase and bed bugs will start to appear in hotels, apartments, theatres, restaurants, public transit, hospitals and eventually detached single family homes.

Most pest control operators and entomologists who have been consulted on this problem agree that Toronto is still at the low end of a potential exponential population growth curve for bed bugs and that the problem is destined to get much worse in the next several years. The City's reputation as a desirable travel destination, already battered by the recent SARS outbreak, might be further tarnished.

We want to stress that Toronto is not alone or unique in experiencing a bed bug resurgence. Furthermore, the current situation does not signal any failure on the part of the shelter system or the public health department. But as one of the many cities experiencing this problem, it does seem that greater attention to this issue is warranted.

5. Testing for bed bugs

We conducted an experiment to trap bed bugs using sticky tape. We tested three widely available adhesive tapes and one commercial glue trap by placing a few live healthy adult bugs on the tape to see if they would get stuck. We found that the best way to trap bed bugs was with carpet tape (poster tape and packaging tape were not effective) and with the commercial glue traps.

We then installed glue trap squares and/or carpet tape in eight rooming house rooms thought to be infested. After one week, we removed and inspected these squares and tape with a hand lens.



In three of the infested rooms, we did not catch any bed bugs with the tape or glue traps. In the other five rooms, we caught several, from a minimum of three bugs in one room to a maximum of 14 in another.

While this study was only preliminary, it did indicate that adhesives can help in monitoring and controlling bed bugs. Less tacky tapes, such as packaging tape, can also be pressed onto carpets and floors and then peeled off to quickly assess a room for the presence of bed bugs. This method can be used to find dead bugs or shed skins that signal the presence of bed bugs.

Double-sided tapes with stronger adhesives, such as carpet tape, can trap bed bugs and can be applied to the floor around beds, to bed legs or bed framing to trap bugs. Glue traps can also be used under bed legs to trap bed bugs and to prevent their access to beds.

6. Getting rid of bed bugs

Residents in multi-unit dwellings need to be informed that bed bugs are a reality and anyone can get them. They should watch for them and report them as soon as they are seen or suspected. Early reporting and action improves the chance of quick control.

Bed bugs can be controlled in part using professional chemical pesticide products such as Tempo (cyfluthrin), Prelude (permethrin) and Ficam (bendiocarb). Other consumer products contain pyrethrins or diatomaceous earth. These products, like all pesticides, must be used strictly according to their directions.

However, Integrated Pest Management (IPM) includes non-chemical control techniques such as sticky traps. Adhesive pest management has greatly diversified in recent years from the original flypaper to a wide variety of traps and tapes for flying and crawling pests in both agricultural and urban situations. Adhesive traps are one of many mechanical and physical controls that deserve further investigation and should be included in modern integrated pest management for bed bugs.

Bed bug infestations can sometimes be substantially suppressed without pesticides by cleaning and sanitizing dwellings, laundering bedding and clothing, frequent vacuuming, and other mechanical means such as using a scrub brush to scrape bugs and eggs off the seams of mattresses. These mechanical controls may not kill every bug or egg on the first try, but should be effective when repeated on a regular basis and used in conjunction with pesticide treatments.

Individuals in group-living situations should not leave bed bug control efforts entirely to pest control personnel and should not rely exclusively on the man-

agement to do pesticide spraying. Each resident must make an effort to remove bed bugs by regular cleaning, laundering, vacuuming, brushing mattress seams, and using sticky traps or tape around bed legs. Such activities should be seen as part of personal space management and hygiene.

Bed bugs can occupy almost any narrow space or crevice, sometimes at a considerable distance from beds. Thus, identifying and eliminating such places is an important part of a control strategy. Ways of doing this, for example, are to remove or re-glue wallpaper, or to caulk, putty, or varnish cracks in wood bed frames, flooring, and moulding.

Vacuuming can remove eggs and bed bugs in all stages of development. Canister vacuums with attachments, particularly the brush attachment, should be used to get into corners, mattress seams, and crevices in upholstered furniture. The attachments should then be cleaned and the vacuum bag disposed of. Mattresses and box springs can also be put inside plastic mattress bags or wrapped in plastic film and taped to exclude bed bugs from access to their favourite hiding places.

Bed bugs can survive periods of sub-freezing weather for at least several weeks, but succumb relatively quickly to high temperatures. A temperature of 45°C for one hour is reported to be lethal to all stages, including eggs. Steaming is an effective way of killing bed bugs in mattresses, carpets and baseboard crevices. Additional experimental studies should be conducted to evaluate heaters that could be used to control bed bugs.

At least two generations of North Americans are unfamiliar with bed bugs and the maintenance needed to keep them under control. Greater educational efforts need to be made by public health officials to re-instill this knowledge.

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