

## A Case of Imported Bedbug (*Cimex lectularius*) Infestation in Israel

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*Cimex lectularius*, the common bedbug, was a well-known parasite in human dwellings until the end of the Second World War. With the introduction of modern insecticides, especially DDT, and improved hygiene in developed countries, the prevalence of bedbug infestation decreased dramatically. Although they never disappeared, bedbugs have been reported very rarely in these countries, including Israel [1]. In the last 25 years, the author of the present report – who consulted hundreds of patients with ectoparasitic infestations – did not diagnose a single case of bedbug infestation in Israel.

Since the mid-1990s the number of reports of human bedbug infestations has increased significantly, primarily in the United States, the United Kingdom and Brazil, and later in various countries in Europe. With increasing international travel and trade, resistance to insecticides, and the shift from broad-spectrum insecticides to more selective control tactics such as insect-specific baits for cockroaches and hormonal growth regulators for fleas, the parasite reappeared in developed countries [2,3].

This report describes the introduction of bedbugs into Israel by a young man who returned home after a visit to South America and the USA.

### Patient Description

A 22 year old Israeli male who had traveled for several weeks first in South America (Argentina, Brazil and Peru) and later in the USA (Los Angeles and New York) returned to his apartment in the Tel Aviv area. A few days later he observed reddish spots on his body, which were accompanied by intense pruritus. The bites were concentrated on the hands, legs and neck area. He was treated repeatedly with

scabicides and systemic corticosteroids but there was little improvement in his clinical symptoms. The patient, who was living alone, noticed new bites on his skin for several weeks, and then discovered on his body some crawling insects. They were sent to our laboratory and identified as adult and nymphal stages of *C. lectularius* [Figure].

The patient's apartment was treated unsuccessfully with pyrethroids. After the second treatment with methyl bromide fumigation, no new bites appeared on the man's body and no bedbugs could be found in his apartment.

### Comment

*Cimex* belongs to the family of "true bugs" known as Cimicidae. Two species are associated with humans, *C. lectularius* and *C. hemipterus*, which are cosmopolitan or found in tropical and subtropical regions respectively. The bedbug develops through four nymphal stages and five molts during a period of 6 weeks. It is a flat oval, brown, wingless insect. All active developmental stages feed only on blood, and hatching into the next stage, the instar, requires a blood meal. The insect has piercing, sucking mouthparts that are inserted into the skin of the host and withdraw a blood meal. Prior to feeding the common bedbug adult is 3–5 mm in length and brownish in color. After feeding the body elongates and widens and the color changes to dull red. The adult *C. lectularius* fully engorges in 10–20 minutes, after which it returns to its refuge. Under optimal conditions, the adult bedbug feeds once a week. The major attractants appear to be human body temperature and carbon dioxide production. Following mating and feeding, the female lays three to four eggs daily, which are cemented to rough



Nymphal stage of the bedbug

surfaces within dark crevices. Each female can produce approximately 200 eggs in a lifetime. An adult bedbug can survive for up to 24 months without taking a fresh meal. Bedbugs are active at night, while during the day they rest in concealed dry places, including mattresses, bed frames, furniture, floorboard cracks, wallpaper pockets, window and door casings, picture moldings, and suitcase seams. Infestation of bedbugs can often be detected by their unique offensive odor, which is due to secretions from their glands. The parasites disperse by walking between rooms in infested buildings. Passive dispersal is the most important means by which wingless bedbugs reach new hosts. They can be transported by humans in clothing, luggage and furniture. They have been detected while people are traveling by foot, car, train, ship and airplane [4,5]. In addition to humans, bedbugs can also infest a wide range of hosts, including bats, chickens and domestic animals.

The initial bite of a bug is usually not felt; later the bite site itches, swells, burns, becomes inflamed or forms a weal and is very disturbing for the victim. There may be a central punctum at the site of the bite. The recurrent bites are often concentrated on the arms, legs and back, as well as on the face around the eyes. Lesions frequently present in linear or clustered arrangements. The reaction varies from small purpuric maculae to significant bullous eruptions. Effects of a bite vary between individuals but may persist for a week or more in susceptible persons. Rarely, when a person is hypersensitive, an asthmatic reaction occurs. The host's initial erythematous reactions to bedbug bites are probably caused by vasodilatory substances in their saliva. The salivary gland protein nitrophorin has been shown to be an antigen, which stimulates an allergic immunoglobulin E-mediated hypersensitivity whose late-phase response can result in bullous cimicosis. Apart from the discomfort caused by the bite, bedbugs have been known to cause secondary infections and psychological distress. Chronic cimex infestation can cause nervousness, lethargy, pallor, diarrhea, and even iron deficiency.

Bedbug infestations often require expensive ongoing inspections and treatments, disposal and replacement of infested beds and other furnishings, and quarantine of infested areas. In public facilities, they result in adverse publicity and litigation by people who have been bitten. Cimicid infestations have resulted in multimillion dollar costs to the hotel industry, poultry industry, and private and communal households. Costs arise from payment for pest control, damage to social reputation, replacement of infested infrastructure, and claims for monetary reparation.

Although they have not been linked to transmission of any disease, bedbugs have been shown to harbor the causative organisms of plague, relapsing fever, tularemia, Q fever and Wolbachia. It was shown that hepatitis B virus persisted after an infectious blood meal in bedbug bodies for

up to 35 days after the infectious blood meal. It was passed trans-stadially through one molt regardless of instars, was shed in fecal droplets for up to 35 days after the infectious blood meal, but was not passed transovarially. It remains to be shown whether, under natural conditions, the bedbug is able to transmit any known blood-borne pathogen to humans.

Cutaneous management of infestations in humans is conservative, directed primarily at ameliorating the patient's symptoms. Topical medium-strength corticosteroids and appropriate wound care for superficial erosions are usually adequate. Sedating low dose oral antihistamines can be given to decrease pruritus, especially at night. Secondary infection is an indication for appropriate oral antibiotic therapy. Bullous skin reactions may be treated with short courses of oral corticosteroids. Rare cases of anaphylaxis require acute intervention by emergency personnel.

Indications of bedbug presence include discrete reddish-brown bloodstains on sheets and mattresses, as well as flecks of excrement at the portals of hiding places. With high insect loads, an intense malodor caused by large amounts of oily secretion from the parasite's body can be detected. The severity of home infestation can often be determined thorough inspection of mattresses, bed frames, furniture, wallpaper pockets and picture moldings. Special nocturnal searches are often required as the definitive diagnosis depends upon collection and identification of the bugs [4,5].

Effective treatment is dependent upon thorough insect extermination. Employing effective insecticide measures and controlling the importation of unknown furniture and baggage will successfully eliminate infestation. The patient's history will reveal exposure risk, such as a recent vacation, time spent in recreational facilities, acquisition of antiques, rodent exposure, and visitors. Measures should be taken to eliminate neighboring bat and bird habitats because they act as

refuge sites following eradication. Both the infested and adjoining rooms should be inspected and treated thoroughly. This often requires vacuuming, filling in wall holes and floor crevices, discarding old furniture, and dismantling and spraying mattress components with insecticides.

Appropriate chemicals – malathion, pyrethrin, dichlorvos, permethrin, and diethyltoluamide – must make direct contact with all affected surfaces. The discovery of live bedbugs 2 weeks after appropriate treatment measures is indicative of continued infestation. The services of a professional exterminator may be required. It should be noted that high levels of resistance to pyrethroid insecticides were detected in populations collected from homes in Kentucky and Ohio in the United States and this might explain why the first treatment with pyrethroid insecticides in the case described here was unsuccessful.

Increased public awareness is required to minimize the risk of acquiring or transporting bedbugs, to prevent it from reestablishing itself in developed countries such as Israel.

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