Bedbugs: Control & Effective Resistance Management

Insecticide Resistance Action Committee

www.irac-online.org

Appearance

Scientific name: *Cimex lectularius* Linnaeus 1758
Common names: Common Bedbug
Family: Cimicidae
Order: Heteroptera

Occurrence: Worldwide
The predominant species in many tropical countries is the tropical bedbug *Cimex hemipterus*

Dispersion: Passive in 'second hand' furniture and other fitments, with vehicles or in baggage, less frequent in infested objects

Body shape: Oval, extremely flattened (dorso-ventral)
Length: Unfed up to 6 mm, up to 9 mm after engorgement
Color: Unfed red-brown, dark brown after blood meal
Mouth parts: Biting apparatus (proboscis) with 2 bristles, which form a pipe-in-pipe system and is folded under head and frontal thorax in resting position

Importance of Bedbugs as Ectoparasites

History:

Developed countries
After 1950: Strong decrease because of improved hygiene, extensive application of insecticides and increased awareness of the problem
After 1995: Strong increase of the bedbug problems in Europe, North America, Australia and other developed nations because of a reduction in indoor spraying .

Developing countries
Up to now: frequent

Medical Impact

The bedbugs (nymphs and adults) infest humans, pets, rodents but also poultry for blood ingestion.

Symptoms: Intensively itching welts with 5 to >10mm size which are caused by the saliva of the bedbugs and last for a few days in the majority of cases. Searching for a blood capillary causes the bug to bite repeatedly. The bite itself is not usually felt.

In the case of sensitive or allergic persons the bites may cause extensive skin inflammation, asthma, blurred vision and even anaphylactic shock.

Main activity: The bedbugs feed during the night, mostly at dawn every 3 to 7 days at room temperature. The frequency increases near higher temperatures and optimal host conditions.

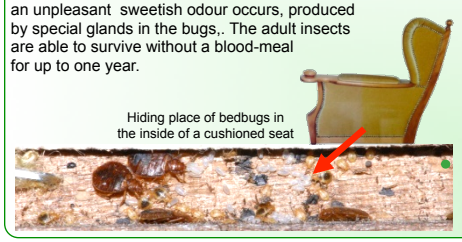
There is no evidence to suggest bedbugs are involved in transmission of pathogens to humans, including the HIV viruses.

Signs of Infestation

During the day the bedbugs rest in very narrow crevices (behind skirting boards, pictures and casings, in light switches, in apertures for cables or pipes, cardboard boxes, in bed frames and mattresses, in chinks of furniture and under detached wallpaper). In the case of heavy infestations an unpleasant sweetish odour occurs, produced by special glands in the bugs,. The adult insects are able to survive without a blood-meal for up to one year.

Bedbug droppings around a door frame

Hiding place of bedbugs in the inside of a cushioned seat



Hiding Places

Bedbugs in a bed frame and in a crevice

Insecticides Suitable for Bedbug Control

Group 1:
Acetylcholinesterase inhibitors

1a: Carbamates	Conc. g/L or g/kg*
Bendiocarb	2.4

1b: Organo-phosphates	Conc. g/L or g/kg*
Chlorpyriphos	2-5
Malathion	20
Pirimiphos-methyl	10

Group 7A:
Juvenile hormone mimics

Juvenile hormone analogues	Conc. g/L or g/kg*
Methoprene	0.9

Additional reading & detailed instructions for the application of insecticides: WHO (2006): Pesticides and their application. WHO/CDS/NTD/WHOPES/GCDPP 6th edition, 114pp

www.who.int/whopes/en/

Group 3:
Sodium channel modulators

Pyrethroids	Conc. g/L or g/kg*
α-Cypermethrin	0.3-0.6
β-Cyfluthrin	0.25-0.5
Bifenthrin	0.48-0.96
Cyfluthrin	0.4
Cypermethrin	0.5-2.0
Cyphenothrin	0.5-1.0
Deltamethrin	0.3 (0.5b)
λ-Cyhalothrin	0.03
Permethrin	1.25
Phenothrin	1.0-2.0
Resmethrin	3
Tetramethrin	1-2

Group 13:
Uncouplers of oxidative phosphorylation via disruption of H proton gradient

	Conc. g/L or g/kg*
Chlorfenapyr**	5.0

Group 15:
Inhibitors of chitin biosynthesis

Benzoylureas	Conc. g/L or g/kg*
Flufenoxuron	0.3

*g a.i./L spray or kg dust
** not included in WHO (2006), but registered for use

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Resistance Management Tools

Resistance to commonly used insecticides was recently described from UK, USA and Canada and is suspected in Australia. Resistance management can be achieved by consequent rotation between the different groups of insecticides according to the IRAC Mode of action classification [MOA]

Application Methods

Residual sprays applied to furnishings, bed frames, door frames, wall cracks etc.; fumigation of selected items; non insecticidal treatment with hot air or steam; launder infested linen in hot water followed by a hot tumble drying; freezing of small items; vacuum; mattress encasements. Non-chemical methods should be combined with the application of insecticides.

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