Bedbugs: Control & Effective Resistance Management

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

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.

Bedbugs: Fed

Bedbug droppings around a door frame

Hiding Places

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Hiding Places

Bedbugs in a bed frame and in a crevice

Cupboard between carpets and walls

Control & Effective Resistance Management

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.

Insecticides Suitable for Bedbug Control

Group 1: Acetylcholinesterase inhibitors

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Conc. g/L or g/kg*</th>
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</thead>
<tbody>
<tr>
<td>Carbaryl</td>
<td>0.5-2.0</td>
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<tr>
<td>Malathion</td>
<td>0.25-1.0</td>
</tr>
<tr>
<td>Clothianidin</td>
<td>0.03</td>
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<tr>
<td>Methoprene</td>
<td>0.12</td>
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</tbody>
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Group 2: Mitochondrial electron transport inhibitors

<table>
<thead>
<tr>
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<th>Conc. g/L or g/kg*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bendiocarb</td>
<td>1.5</td>
</tr>
<tr>
<td>Chlorpyriphos</td>
<td>0.5</td>
</tr>
<tr>
<td>Malathion</td>
<td>0.25</td>
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</tbody>
</table>

Group 3: Sodium channel modulators

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Conc. g/L or g/kg*</th>
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</thead>
<tbody>
<tr>
<td>Deltamethrin</td>
<td>0.25</td>
</tr>
<tr>
<td>Cyphenothrin</td>
<td>0.5-2.0</td>
</tr>
<tr>
<td>Permethrin</td>
<td>1.25</td>
</tr>
<tr>
<td>Phenthothrin</td>
<td>1-2.0</td>
</tr>
<tr>
<td>Resmethrin</td>
<td>0.3</td>
</tr>
<tr>
<td>Tetramethrin</td>
<td>1-2.4</td>
</tr>
</tbody>
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www.who.int/whopes/en/