

I INSECTS AND THE CITY



*Direct and indirect health effects
of bedbug infestations*

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Outline of the presentation

- A quick biology
- Medical diagnosis
- Health effects

Bed bug biology

- Scientific name :
 - *Cimex Lectularius*
- Oval flattened body (female is more round), without wings → 4 to 7mm long.
- Food source :
 - Human blood
 - Feeding time : 10-15 minutes
 - After having fed, 4 to 7 days without feeding
 - Attracted by vibrations, heat, odors and CO₂



Bed bug biology

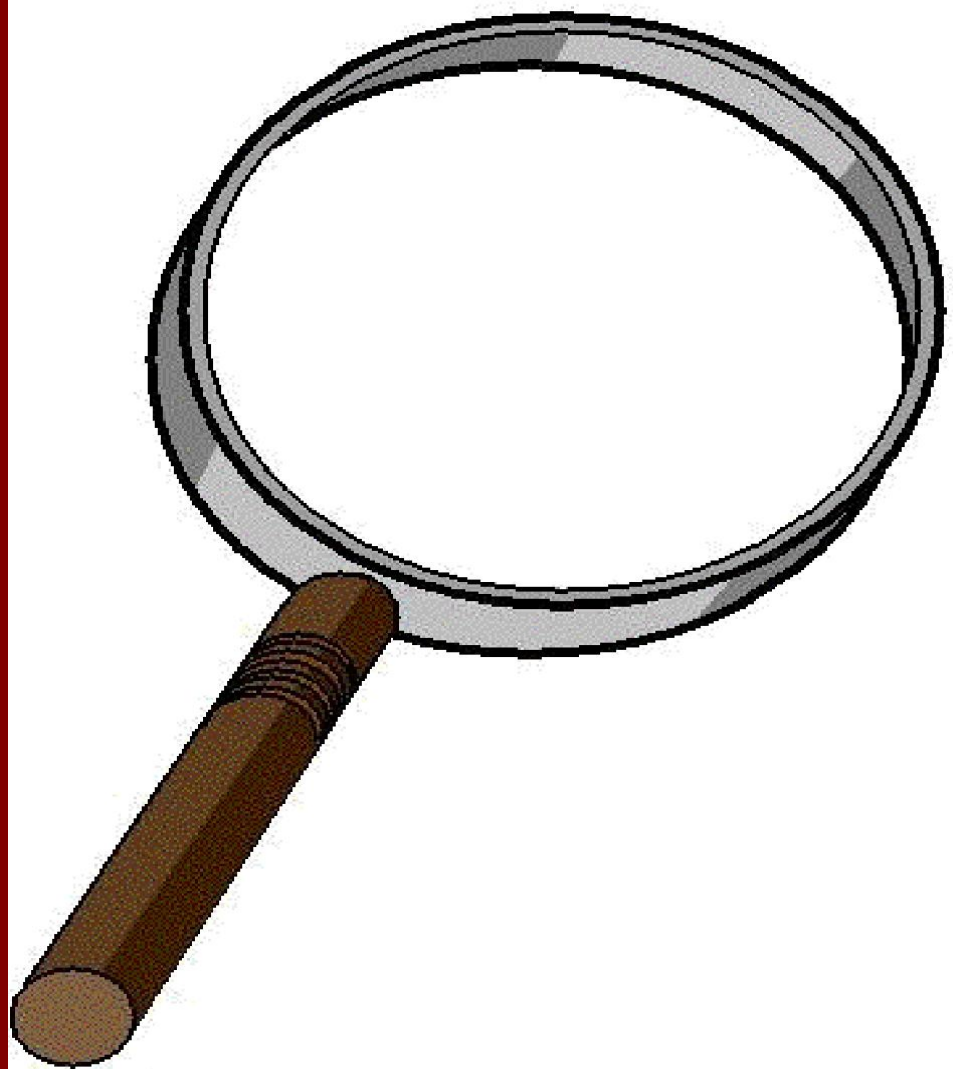
- Unlike lice, bedbugs do not stay on the human body after a blood meal.
- Maximal activity between 03:00-06:00 am *
- Red, visible and very vulnerable to natural predators
 - Photophobic
 - Thigmotactic
 - Near its feeding sites, hence beds, bed boxes, furniture or any object close to the bed
 - Lays its eggs in the same areas

At risk sites

- Buildings with many night visits by different individuals.
- Increase risk of transmission and proliferation
 - Hospitals
 - Motel/hotel
 - Multiplex
 - Halfway houses
 - Student housing
 - Long term care center
 - Etc.
- Transmission risks greater than prolifération risks
 - Daycare
 - Schools
 - Skyscrapers
 - Used goods stores
 - Etc.



How to establish the diagnosis



Medical diagnosis

- Lesion sites
 - Areas that are exposed during sleep
 - Arms and shoulders
 - Legs
 - Rarely in the face
 - Cluster or linear configuration
- Timing of the lesions
 - Lesions are present when one wakes up in the morning
 - Pruritus is more intense in the morning. Diminishes during the day.
- Morphology of the lesion
 - Erythematous indurated papules
 - Usually a central punctum
- Who is bitten
 - Bedbugs are attracted by heat, hence will bite preferentially the individual that emits more heat.
- Context
 - When only bed bugs can bite (hence not exposed to other biting insects)

Health effects



Health effects

- Dermatologic (allergic and infectious)
- Mental health
- Improper insecticide use
- Access to health services

Dermatological problems associated with bed bugs

- Type 1 allergic reactions
 - Erythematous macules
 - Erythematous papules
 - Urticarious papules
 - Bullae (sometimes hemorrhagic)
 - Anaphylaxis
- Type 3 allergic reactions
 - Serum sickness
- Type 4 allergic reactions
 - Papular urticaria
- Hypertrophic scarring and cheloids
- Cellulitis

Type 1 allergic reactions

Erythematous papules

- Indured erythematous papules
 - Central punctum
 - Grouped and sometimes linear
- Four out of five individuals will have this reaction
- Resembles a mosquito bite
- Treatment of symptoms
 - Topical corticosteroids

Type 1 allergic reactions

Giant urticaria

- Giant urticaria
- Formation of wheals with intense pruritus
 - Rare
- Treatment of symptoms
 - Oral antihistaminics

Type 1 allergic reactions

Bullae (sometimes hemorrhagic)

➤ Treatment :

- Oral corticosteroids and antihistaminics
- Topical corticosteroids
- Prophylaxis with oral and topical antibiotics



Fletcher CL, Ardern-Jones MR, Hay RJ. Widespread bullous eruption due to multiple bed bug bites. *Clin Exp Dermatol* 2002;27:74- 5.

Liebold K, Schliemann-Willers S, Wollina U. Disseminated bullous eruption with systemic reaction caused by *Cimex lectularius*. *J Eur Acad Dermatol Venereol* 2003;17:461 - 3.

Type 4 allergic reactions

Papular urticaria

- Papules from 3 to 10 mm, sometimes with an overlying vesicle
- Last from several days to several months
- Cluster configuration
- More often in kids 2 to 5 years old
- Treatment: topical corticosteroids



Health effects : Dermatological differential diagnosis

- Scabies

- Usually found in both hands and covered area of the skin (axilla, peri-umbilical regions).
- Acral furrows
- Mite is identifiable with microscope



- Fleas

- Ankle and calf
- Domestic animals are often present

- Bites by mosquitoes, black flies, horse flies, etc.

- Similar lesions
- Exposure history to those biting insects.



Health effects : Dermatological differential diagnosis

- Drug reaction
- Allergic contact dermatitis
- Atopic dermatitis
- Gianotti–Crosti syndrome
- Pityriasis lichenoides et varioliformis acuta
- Ecthyma
- Dermatitis herpetiformis

Skin infections

- Cellulitis :
 - Bacterial infection of the skin
 - Usually follows scratching because of pruritus
 - Rare
 - Treatment : antibiotics

Anxiety and sleep quality

- No formal studies
- Non published case reports
 - Vulnerable individuals may decompensate → may lead to worsening of depressive and psychotic states
- Association between mental health is demonstrated for pruriginous diseases and insect bites (but not bed bugs)
 - Anxiety
 - Sleep quality
 - Social isolation



Montreal case series (non published)

- Social isolation
 - Adult: 16/27 (59%)
 - Children: 3/25 (12%)
- Sleep quality
 - Adult: 17/27 (63%)
 - Children: 19/25 (76%)

Sleep quality and health effects

- Variable attention and poor focus
- Mentally slow and inaccurate
- Emotionally labile
- Unreliable memory
- Risk taking
- Weak executive decision making
- Feel tired, stressed, exhausted
- No insights or creative solutions

Sleep quality and health effects

- Obesity
- Hypertension
- Diabetes
- Inflammatory markers increased
- Increased mortality

Interaction between disabilities and infestations

- Groups with functional or cognitive disabilities
 - Inability to protect themselves
 - Severe infestations for these individuals

Anaemia

- Anaemia
 - Case report of a patient that developed anaemia because of a severe infestation (ad 52g/L)

Pritchard and Hwang. (2009) Severe Anemia from Bedbugs. *CMAJ*.
181(5):287-238.

Infections

- Bed bugs do not transmit blood borne viruses.
 - Logical from an evolutionary standpoint?
 - Biologically plausible
 - However, bed bugs only attack humans (unlike, for example, ticks and mosquitoes)
 - Limits the possibility of zoonosis
 - Usually only one human (unlike mosquitoes)
 - Any potential infectious agent would have a very low basic reproductive rate

Health impacts of inappropriate use of pesticide

- Improper use of pesticides
 - Pyrethrinoid
 - Organophosphates
 - Carbamates

Health impacts of inappropriate use of pyrethrins

- Acute effects
 - Paresthesia
 - Inhalation possibly associated with exacerbation of asthma and rhinitis
 - May be lethal if important quantities are ingested.

Health impacts of inappropriate use of organophosphates and carbamates

Acute effects

- Cardiovascular
 - Bradycardia, hypotension
- Respiratory
 - Rhinorrhea, bronchorrhea, bronchospasm, cough, severe respiratory distress
- Gastrointestinal
 - Hypersalivation, nausea and vomiting, abdominal pain, diarrhea, fecal incontinence
- Genitourinary
 - Incontinence
- Ocular
 - Blurred vision, miosis
- Glands
 - Increased lacrimation, diaphoresis

Chronic health impacts of inappropriate use of pesticides

- Possibly cancer and developmental problems (cognitive and motor)

Health Impacts

- **In areas with chronic bed bug infestations**
 - **Almost always accompanied by**
 - **Water infiltration**
 - **Cockroach**
 - **Often with**
 - **Mice**
 - **Rats**
- **Hence asthma, rhinosinusitis, URTI, etc.**

Future research on health problems

- Asthma

Conclusion

- Bed bugs is a public health problems
- Health effects are direct (dermatological), indirect (pesticide)
- Probably affects mental health
- Often is accompanied by other housing risk factors affecting health