Ticks & Bugs

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Taxonomy

- Medically important classes and orders in phylum Arthropoda
  - Class Insecta
    - Diptera
    - Siphonaptera
    - Anoplura
    - Hemiptera (Bugs)
  - Class Arachnida
    - Acarina (Ticks)

Hemiptera (Bugs)

Objectives

Triatominae

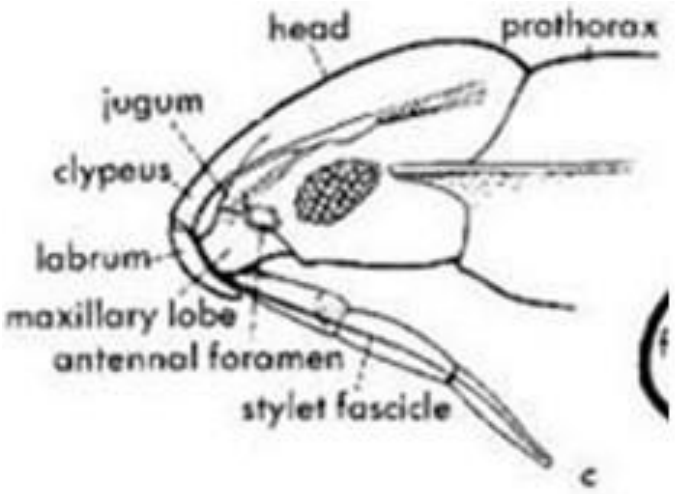
- Briefly describe their important identifying characteristics and outline life cycle and feeding habits
- Briefly describe measures for control

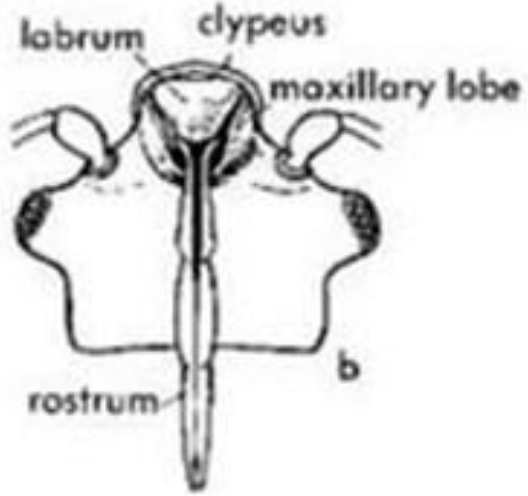
Cimicidae (Bedbugs)

- Name the genus of bedbugs that feed on humans
- Briefly describe their important identifying characteristics
- Briefly describe their feeding habits
- Briefly describe how bedbug infestation can be controlled

Hemiptera

- Order within Class Insecta, known as ‘true bugs’ with about 50,000 – 80,000 species
- Range in size from 1 mm – 15 cm
- Common arrangement of mouthparts
  - Mandibles and maxillae have evolved into a proboscis sheathed within a labium, to form a ‘rostrum’, which is capable of piercing tissues
  - Forewings are hardened or partially membranous
  - Hind wings may or may not be present; if present, they are entirely membranous





Mouth parts have evolved into a proboscis capable of piercing tissues

Triatominae

- First identified as the vector of *Trypanosoma cruzi* by the Brazilian doctor Carlos Chagas in 1909
- Triatominae are a subfamily in Family Reduviidae - has about 150 spp
- Medically important species found only in the Americas
- Most species are haematophagous
- Share the shelter of the host species from which they suck blood
- Also known as cone-nose bugs, assassin bugs or kissing-bugs

Morphology

- Adults are about 2 – 3 cm in length
- Long snout-like head with prominent eyes
- Long, thin antennae on either side of proboscis
- Proboscis is kept bend under head, except when feeding
- Basal parts of forewings are thickened and hard
- Hind-wings are membranous and hidden at rest

Life cycle

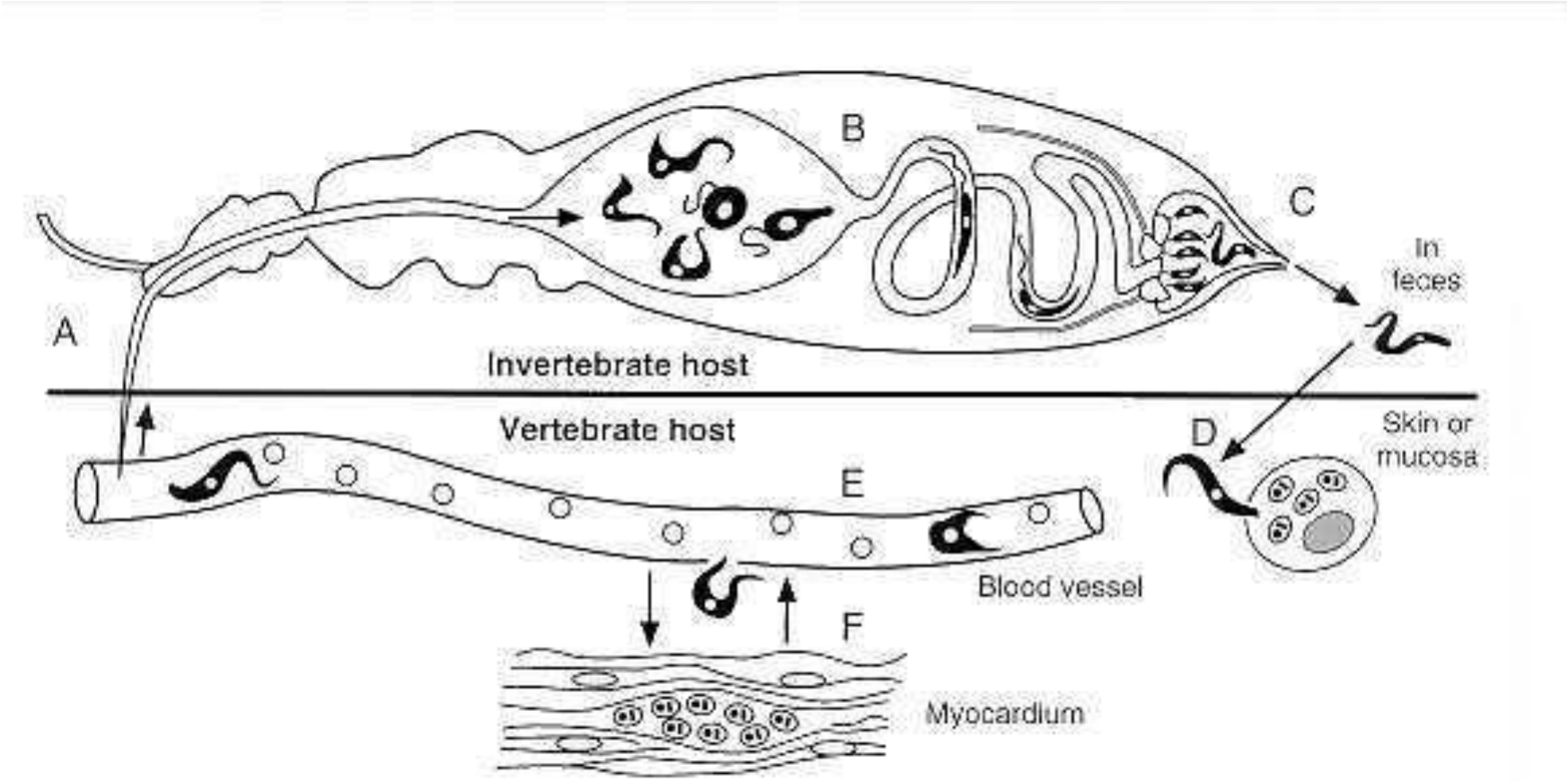
- Incomplete metamorphosis
- Eggs laid in cracks and crevices in walls, floors and furniture
- First nymphs hatch out in weeks – months
- There are 5 nymphal stages
- Each nymphal stage has to take a blood meal before moulting into next stage
- Nymphs and adults of both sexes feed on blood at night
- Feeding is lengthy, may take 10 – 25 minutes
- Defaecate while feeding which is important for transmission of Chagas disease

Ecology

- Triatomine species may be
  - Sylvatic: associated with animals that have burrows in the ground (e.g. rodents, armadillos) or nest in trees (e.g. bats, birds, sloths, etc)
  - Peridomestic: associated with domesticated animals (cattle, sheep etc)
  - Domestic: associated with human dwellings

- The most important vectors are the domestic species:
  - *Triatoma infestans, Rhodnius prolixus, Panstrongylus megistus*

Disease transmission



Transmission is not by bite of the insect but solely through its faeces.

Control measures

- Application of residual insecticides to the interior surface of walls and roofs
- Insecticidal paints
- Plastering walls

Case History

A 17 year old student comes to your medical clinic with an itchy skin rash affecting the posterior aspect of both thighs of 2 days duration. He recalls that this developed after attending a tuition class 2 days back. There was no difficulty in breathing or any other signs and symptoms of systaemic allergic reaction. A bed bug bite was suspected.

1. He was very concerned about any complications and want to know whether he would contact any disease. How would you advice him?
2. How would you prescribe treatments for him?
3. He wants to know how to identify whether it is truly a bed bug infestation?
4. He asks for advice on how to control bed bug infestations.

Bedbugs

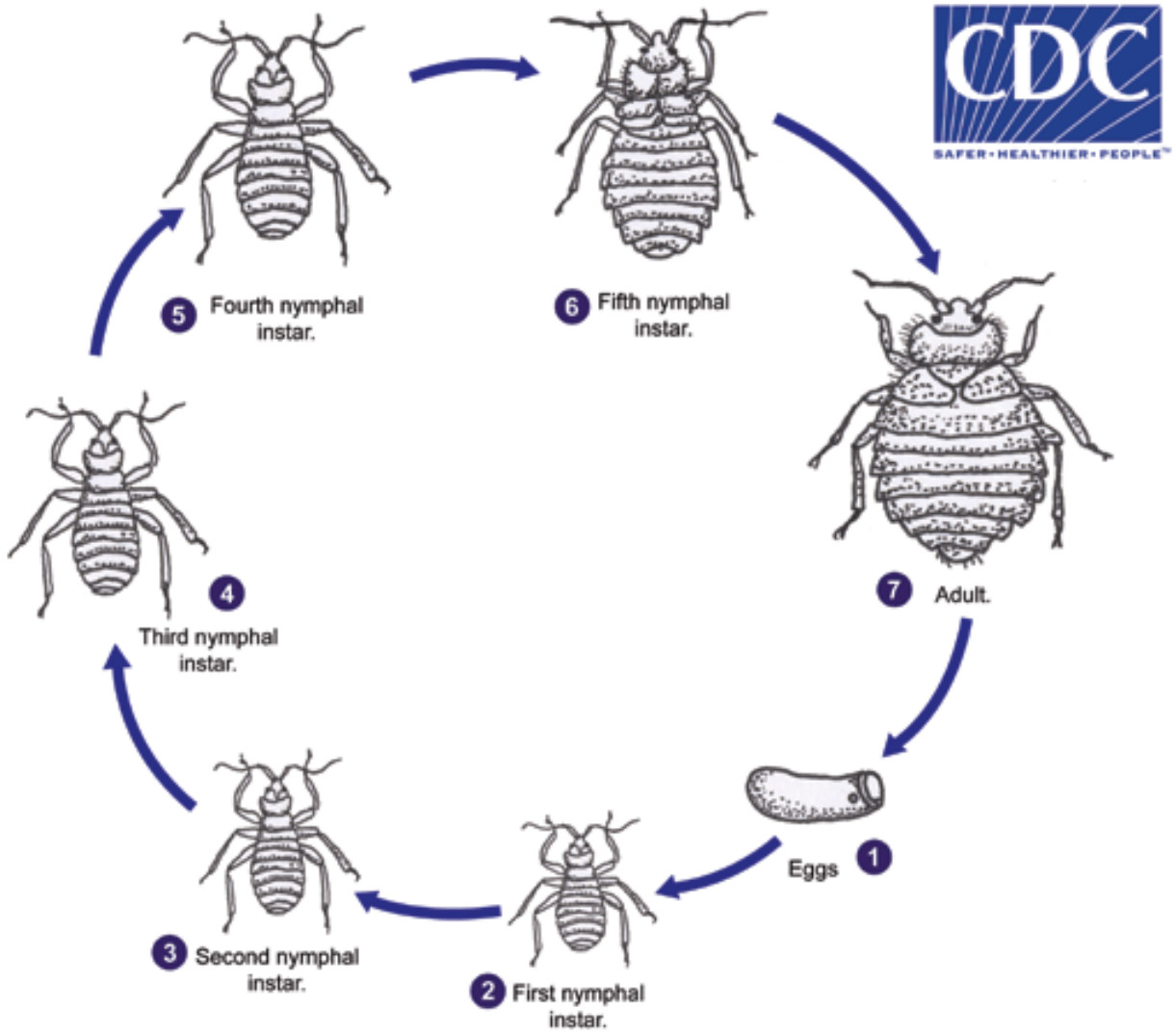
- Wingless insects of the Family *Cimicidae*
- Both sexes are haematophagus
- Live in crevices in beds, chairs, tables and walls in houses
- Commonest species associated with humans is *Cimex lectularius*

Morphology

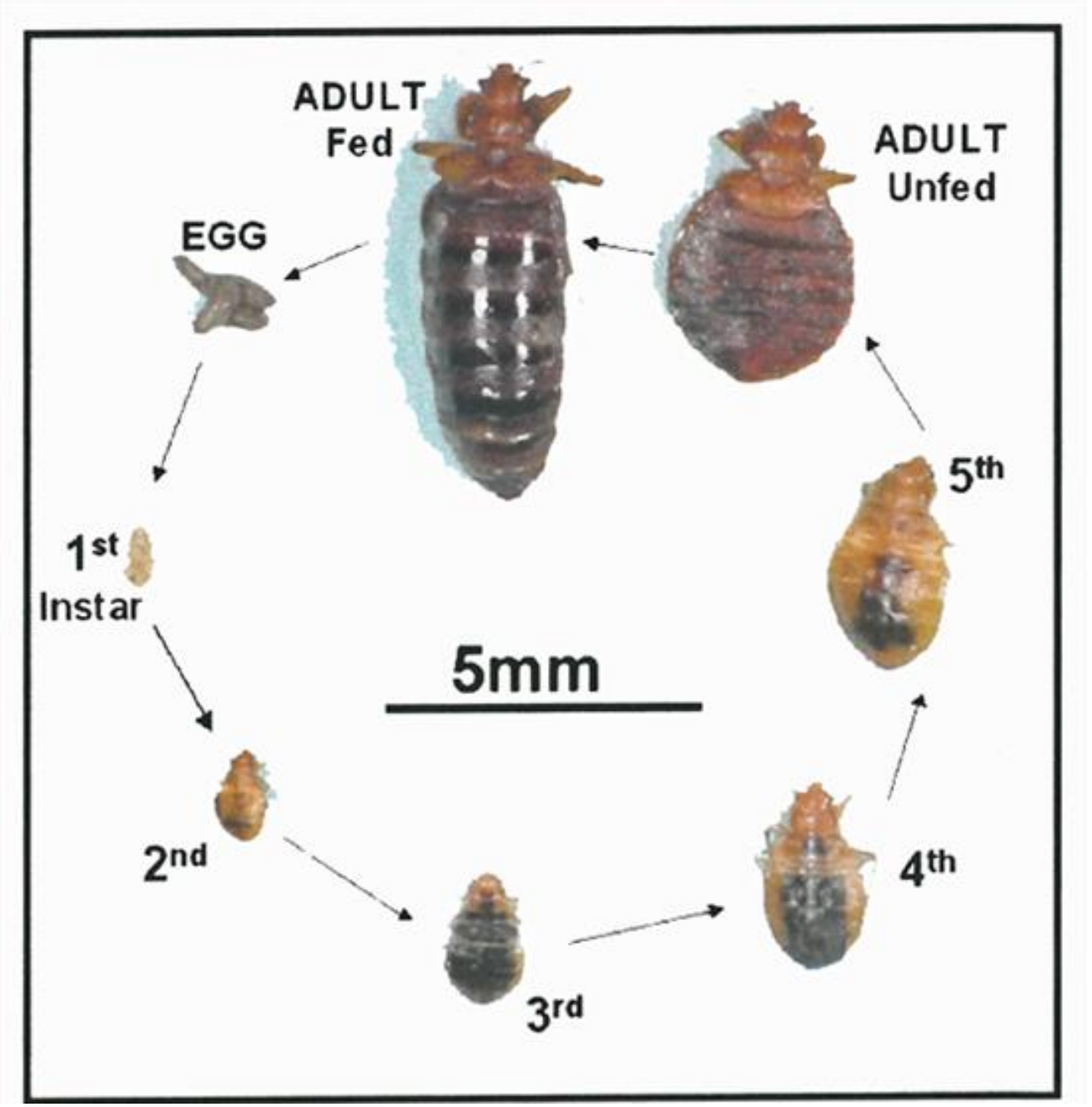
- Oval in shape
- Dorsoventrally flattened
- Wingless
- About 4-7 mm long
- Pale yellow or brown when unfed
- Characteristic ‘mahogany’ brown after a full blood meal
- Short broad head with a pair of prominent compound eyes
- Pair of segmented antennae
- 3 pairs of slender well developed legs
- Abdomen divided into segments

Life cycle

- Females lay eggs in crevices
- Incomplete metamorphosis in life cycle
- All 5 nymphal stages and both sexes of adults feed on blood
- Usually feeds at night
- Do not stay long on humans



Life cycle ……..



Medical importance

- Biting nuisance
- Bites cause skin rashes, allergic reactions with itching
- Not known to transmit any diseases
- In places with severe bedbug infestations it has been reported to cause iron deficiency anaemia

Control measures

- Personal protection
  - Insect repellants
  - Pyrethroid- impregnated bed nets
- Insecticide spraying (DDT, HCH, malathion, carbaryl, pyrethroids)
- Application of insecticidal dust to mattresses and bedding (except infant’s bedding)

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Ticks

Objectives

- Name the 2 families of ticks
- Outline their morphology and feeding habits
- State their medical importance
- Measures for control

Ticks

- Belongs to the Order Acarina (which also include mites)
- Unsegmented body
- Adults have 4 pairs of legs
- Stages in life cycle include
  - Egg
  - Larval stages (only 3 pairs of legs)
  - Nymphal stages
  - Adult

Ticks.....

- Haematophagous ectoparasites of a variety of different animals
- Transmit a range of different bacteria, viruses and rickettsiae that cause human disease
- Two Families
  - Ixodidae (hard ticks)
  - Argasidae (soft ticks)

Ixodidae (hard ticks)

- World-wide distribution
- Medically important genera- *Ixodes, Dermacentor*
- Distinguished from soft ticks by
  - presence of scutum (hard shield)
  - capitulum (head) that projects forward from body

Male hard tick

Engorged female hard tick

Morphology

- Oval in shape
- Flattened dorsoventrally
- Females are bigger than the males
- Females take larger blood meals and hence enlarge more than males during feeding
- Capitulum projects forwards from the body (visible from above)
- Dorsal plate (shield/scutum) is larger in males and covers the entire dorsal surface in males
- Females have a smaller scutum restricted to the anterior part of the body

Habits and behaviour

- Ticks are found on grass / vegetation
- Attach themselves to a passing host to feed for hours or days
- Drop off the host when engorged
- Mouthparts (chelicerae) are embedded in the host to form a tubular channel through which saliva is injected and blood is taken up
- All stages take blood meals
- Some species feed on a variety of hosts including humans which increases the likelihood of disease transmission

Medical Importance

- Vectors of many diseases
  - Bacterial: e.g. Lyme disease caused by *Borrelia burgdorferi* is transmitted by *Ixodes scapularis,* tularaemia caused by *Francisella tularensis*
  - Rickettsial: e.g. Rocky Mountain spotted fever caused by *Rickettsia rickettsii* is transmitted by *Ixodes pacificus,* Q fever caused by *Coxiella burneti*
  - Viral: arboviruses that cause haemorrhagic fevers and encephalitides
- Tick paralysis
  - Neurotoxins pumped into the host with tick saliva cause an ascending motor paralysis; may be fatal

Argasidae(soft ticks)

- Soft ticks have no scutum, and the mouthparts are hidden under the body

- Typically live in the host's nest or burrow and take many short feeds of blood

Adult soft ticks

- *Ornithodoros* spp transmit endemic relapsing fever caused by *Borrelia duttoni*

Managing tick bites

- Tick bites often become infected, especially if the mouth parts are left behind in removing the tick

- Always remove a tick gently – smearing its abdomen with oil, fat, chloroform or ether

- It is recommended to remove the tick as soon as possible and treat the bite wound with an antiseptic

Control measures

- Application of acaricidal preparations to domestic pets (eg. 5% malathion)

- Houses infested with ticks should be sprayed with insecticides such as malathion

Thank You!