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(الجزء النظري)

الفصل الدراسي الثاني

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قسم علم الحيوان

2023-2022

بيانات الكتاب

الكلية :العلوم

الفرقة :الرابعة

التخصص :علم الحشرات

تاريخ النشر :الفصل الدراسي الثاني

2023-2022

رؤية كلية العلوم

التميز في تعليم العلوم الاساسية والبحث العلمي للمساهمة في التنمية المستدامة

رسالة كلية العلوم

تقديم تعليم مميز في مجالات العلوم الاساسية وانتاج بحوث تعليمية تطبيقية للمساهمة في التنمية المستدامة من خلال اعداد خريجين متميزين طبقاً للمعاير الاكاديمية القومية وتطوير مهارات وقدرات الموارد البشرية وتوفير خدمات مجتمعية وبيئية تلبي طموحات مجتمع جنوب الوادي وبناء الشراكات المجتمعية الفاعلة .

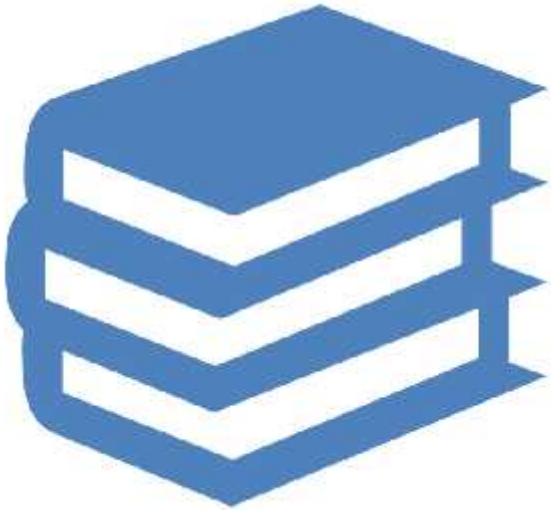
رؤية القسم

خريجون وباحثون متميزون علمياً وبحثياً في دراسة ضرر ونفع الكائنات الحيوانية خدمة للمجتمع وتنمية للبيئة

رسالة القسم

يسعى قسم علم الحيوان والحشرات بكلية العلوم جامعة جنوب الوادي من خلال ما يقدمة من برامج تعليمية باستخدام الوسائل العلمية والتعليمية المتطورة والتي تكشف عن المزيد من ضرر ونفع الكائنات الحية وباحثين وخريجون متميزين علمياً وبحثياً ينتفع بهم المجتمع وترتقي بهم الامة .

Course contents



weeks	Contents
1	Historical introduction
2	Scope; training; objectives; method; importance of ecology; control of insect-borne diseases; vector control
3	How arthropods cause and carry disease?
4	Cockroaches and beetles
5	Bugs
6	The lice
7	midterm exam

8	Mosquitoes
9	Horseflies, deer flies, and snipe flies
10	Houseflies Bloodsucking muscoid files, Tsetse flies, Horn flies
11	Myiasis
12	Louse flies and fleas
13	Ticks and mites
14	Revision

Aims, Objectives and outcomes

This course will provide the fundamental information necessary for understanding the role of arthropod vectors in the transmission of different pathogens to human.

Following a general review of the morphology, life cycle and classification of arthropods,

the epidemiology and pathogenesis of associated diseases.

the principles and methods of vector control.

Medical Entomology

This is a branch of entomology which deals with arthropods which affect the health and well-being of man and vertebrate animals.

In other words, medical entomology is the medical science directly concerned with vectors that affect human and animal health.

There are also other branches of entomology.

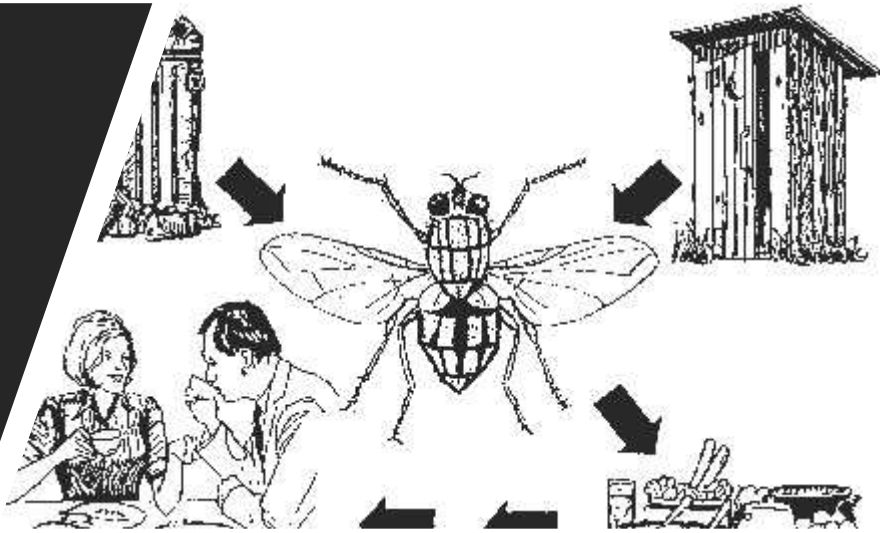
Industrial Entomology& Economical Entomology:

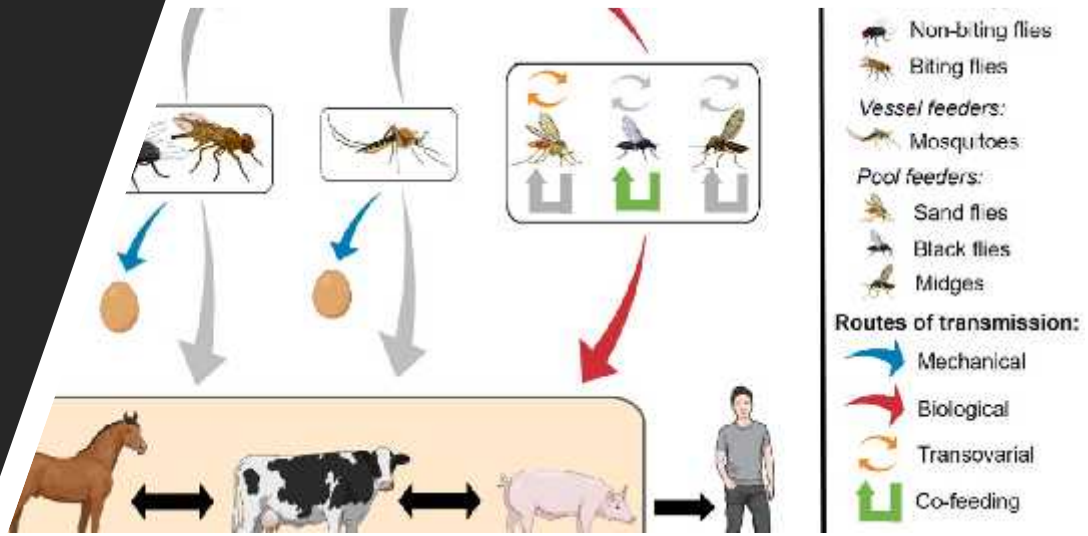
deals with industrially or economically important arthropods (industrial pests).

Agricultural Entomology: dealing with arthropods that affect plants and animals.

How insects transmitting diseases ?

- Mechanical
- Biological





Mechanical disease transmission

Disease agents are carried from one host to another by arthropods simply mechanically carried by the body parts

wings,
mouth parts
hairs, feces, vomitus

In this type of disease transmission no change takes place in the number, form or developmental stages of the organism, but simply deposited in the body, food or drink of the host.

Biological disease transmission

The agent will exhibit changes in form and or number of developmental stages in the arthropod before entry to the host.

This includes :

Propagative

cyclodevelopmental

cyclopropagative

Propagative

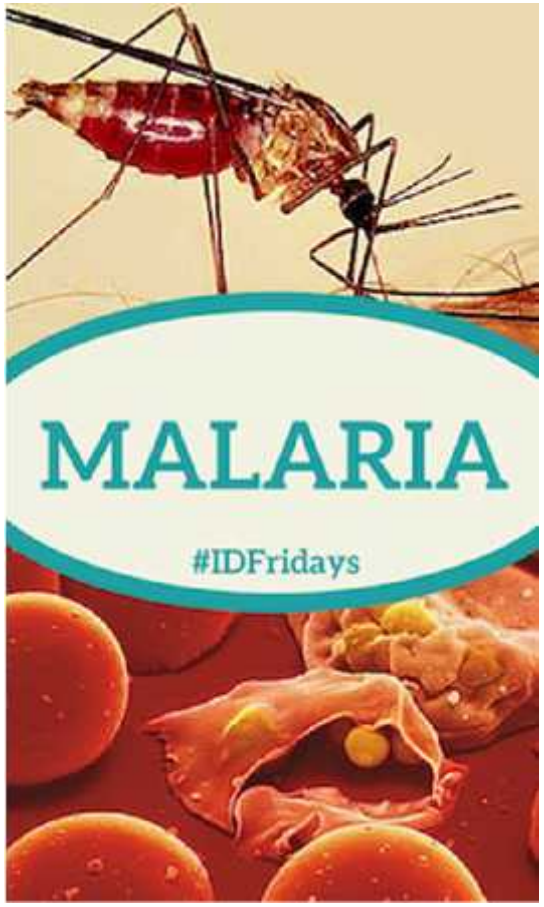
- **In propagative type of disease transmission only the number of pathogens increases**
- **the developmental stage remain constant.**
- **The diseases plague and typhus are good examples of propagative type of disease transmission.**

Cyclo-developmental

- **In this type of disease transmission, only the developmental stage (form) of the disease pathogen is changed (small to big, immature to matured stage, etc.),**
- **while the number of the pathogenic organism remains constant.**
- **Example Filariasis**

Cyclo-propagative

- **This type of disease transmission is a combination of both propagative and cyclo-developmental.**
- **the disease pathogen undertakes a change both in number and developmental form (stage).**
- **Example Malaria.**



How arthropods cause and carry disease?

Chain of infection:

For each arthropod-borne disease there is a chain of events which leads to the successful transfer of an infection by an arthropod vector from one animal to another.

This chain consists of several links:

1) First link:

- **The developmental cycle of the pathogen within the body of an appropriate host**

This link may be broken by medicinal treatment, as in malaria.

2) Second link:

- **Involves the vector, its access to infection, its feeding habits, its manner of ingesting food, the structure of its mouth parts, etc.**

How arthropods cause and carry disease?

3) Third link:

- **Represents the progress of development of the pathogen within the body, stomach, or other organs of the vector.**

4) Fourth link:

- **Represents the manner in which the now infectious micro-organism leaves the body of the now infectious vector and enters the body of the next susceptible animal.**

5) Fifth link:

- **the successful completion of a cycle similar to that of the first link but in the body of another host animal after the intervention of an arthropod vector.**

How arthropods cause and carry disease?

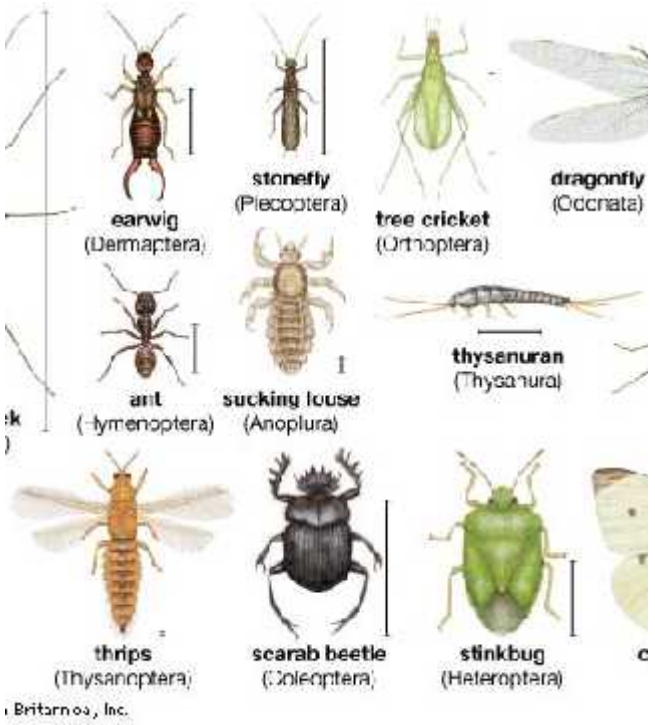
Examples:

- **1- simple contamination by means of germ-laden cockroaches coming in contact with food, milk.**
- **2- simple mechanical inoculation of Anthrax bacilli by means of contaminated horsefly mouth parts, or inoculation of sexually mature malaria plasmodia by an Anopheles mosquito**
- **3- Regurgitation of plague bacilli upon the skin by fleas while biting.**
- **4- Fecal contamination where trypanosomes of Chagas' disease**
- **are deposited on the skin when the bug bites.**

Pathological conditions caused by arthropods.

The two major relationships may be designated as:

A) pathological conditions caused directly by arthropods.



1- Entomophobia.

2- Accidental injury to sense organs.

3- Envenomization.

4- Dermatosis.

5- Myiasis

6- Allergy

Pathological conditions caused by arthropods.

1- Entomophobia.

Insects and spiders, even though they may be wholly innocuous, frequently cause man acute annoyance and worry which may eventually lead to a nervous disorder with sensory hallucinations.

2- Accidental injury to sense organs.

Various species of insects, like other minute objects, may accidentally enter the eye; this is most likely to be true of small flying insects. Some of these, notably several species of rove beetles, Staphylinidae, cause extreme pain because of an irritating secretion.

Pathological conditions caused by arthropods.

3- Envenomization.

Venoms of insects cause reactions which are remarkably characteristics.

-The effects may be classified under the following:

1- hemolytic (rupture of red blood cells **)**

2- hemorrhagic

3- neurotoxic

4- vesicating (causing pimple or blister **)**

Pathological conditions caused by arthropods.

The venoms are introduced in the following ways:

- **By the bite, as bed bug**
- **By the sting, as of bees, wasps**
- **Urticating hairs, as with the brown tail moth**
- **By contact, as with vesicating fluids from blister beetles.**

Pathological conditions caused by arthropods.

4- Dermatosis.

- Various skin irritations are caused by arthropods by bites or by skin invasions.
- Skin irritations commonly result from the bites of such insects as mosquitoes, fleas, lice, and bedbugs.
- Various species of burrowing mites cause skin irritations known as acariasis.

Pathological conditions caused by arthropods.

4- Myiasis.

- An invasion of organs and tissues of human and beast by maggots, the larvae of Diptera.
- The larvae of blowflies, bluebottle flies, and greenbottle flies commonly occur in accidental intestinal myiasis.

5- Allergy caused by insects.

The condition of being specifically hypersensitive to certain insect proteins is a fairly common and widespread phenomenon among persons working habitually with bees or collections of dead insects, or exposed for longer periods to crushed insect parts, scales of butterflies, moths.

Pathological conditions caused by arthropods.

The two major relationships may be designated as:

B) Arthropods as vectors of pathogenic organisms.

1- Accidental carries

2- Obligatory vectors involving some degree of development.

Pathological conditions caused by arthropods.

1- Accidental carries:

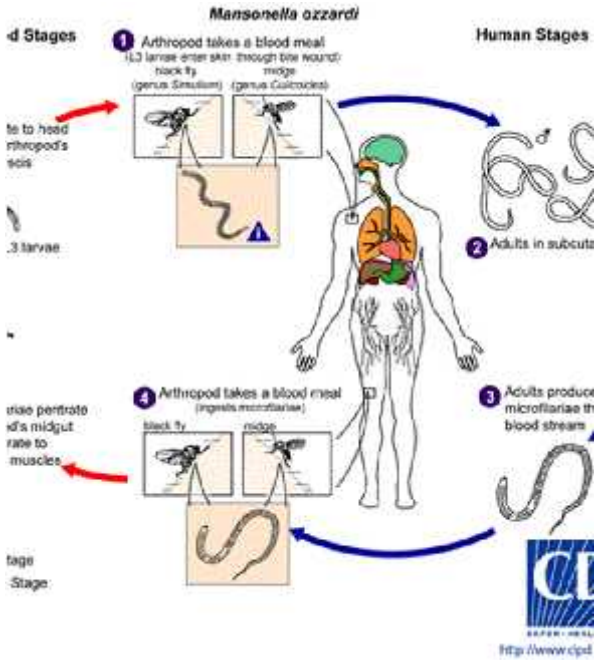
Many species of insects may accidentally contribute to the transmission of various filth diseases.

- coprophagous fly larvae, which feed on and develop in human excrement, may transfer bacteria taken up in this stage through the pupal stage to the mature flies.
- contaminated piercing mouth parts, in which these organs in the act of feeding become contaminated with blood-inhabiting pathogenic organisms, and simple inoculation may result from the next feeding.

Pathological conditions caused by arthropods.

2- obligatory vectors involving some degree of development.

- Arthropods as intermediate hosts of helminths.
- Numerous arthropods serve as intermediate hosts of many species of parasitic worms.
- There are about 150 known species of worms parasitic in vertebrates which have arthropods as intermediate hosts and for which the primary hosts are known.



Cockroaches

Order Blattaria

Cockroaches

- Cockroaches of today are direct descendants of the huge ancient cockroaches (Paleoblatta)
- Some reaching about six inches in length
- They are usually covered dorsoventrally with smooth tough integument.
- Varying in color from reddish-brown to black in the more pestiferous house-invading species.
- Green, or orange and other colors, in tropical species.

Cockroaches

- The head is flexed backward and downward when at rest.
- The antennae are filiform.
- Two pairs of wings in most species.
- In some species the wings are vestigial.
- In others the wings are well developed in the males and short in the females.

Cockroaches

Feeding habits:

- The mouth parts are biting-chewing type.
- Feed on a great variety of foods (**omnivorous**).
- With preference for starchy and sugary materials.

Cockroaches

- They sip milk, nibble at cheese, pastry, meats, grain products, sugar, sweet chocolate.
- Feed on book bindings, the inner lining of shoes, dead insects, their own cast-off skins , fresh and dried blood and excrement.
- No edible material available for human consumption is exempt from attack by these vile insects.

Cockroaches

Feeding habits:

- (**Nocturnal insects**) They feed principally at night, hence we live in ignorance as to their disgusting and dangerous feeding habits.
- Roaches habitually disgorge portions of their partly digested food at intervals and drop their feces wherever they go.
- Also discharge a nauseous secretion from both the mouth and from glands opening on the body, imparting a typical "cockroach" odor to food and dishes with which they come in contact.

Cockroaches

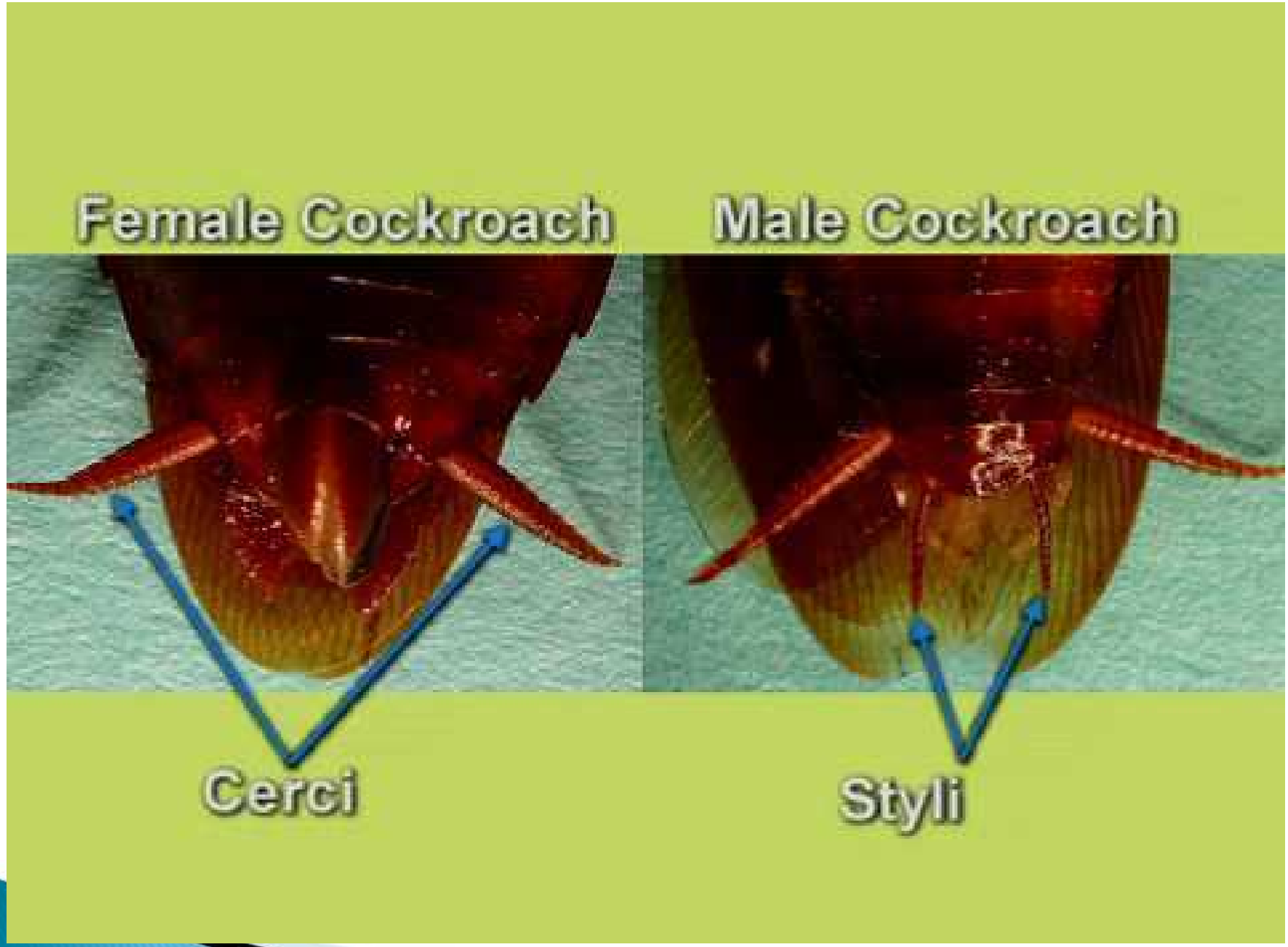
Species of health importance:

- There are about 2,250 species of cockroaches belonging to 250 genera.
- Occur throughout the world but are chiefly tropical.

American cockroach
Periplaneta americana (Linn.)

- Family **Blattidae**
- Very large (30-40 mm in length).
- Reddish-brown species.
- Native to Mexico and Central America, but now widely distributed over the earth.
- Both sexes have long wings, which are frequently used in flying short distances.
- 16 eggs in ootheca, occasionally 18-24.

Periplaneta americana


Female Cockroach
Male Cockroach
Cerci
Styli

Australian roach
Periplaneta australasiae (Fabr.)

- Family **Blattidae**
- Like *P. americana*, a cosmopolitan species.
- Reddish-brown in color.
- Has a strong **straw-colored streak extending about one third of the way down the outer margins of the wing covers** (tegmina)
- as well as a yellow area around the margin of the pronotum forming a **double dark area on the dorsum**.
- wings are well developed in both sexes.

Periplaneta australasiae

Oriental cockroach
Blatta orientalis (Linn.)

- Family **Blattidae**
- Also as the "black beetle”.
- Very much darker than the German roach.
- Is dark brown to black in color.
- It is about 25 mm in length.

Oriental cockroach
Blatta orientalis (Linn.)

- The wings of the female are rudimentary
- In male the wings do not quite reach the tip of the abdomen.
- Enormous colonies of the Oriental cockroach are often found in damp basements where food is available.
- 16 eggs in ootheca.

Female

Male

Blatta orientalis

German cockroach
Blatella germanica (Linn.)

- Family **Blattellidae**
- It is the best known and probably the most widely distributed species.
- Native to Europe.
- Measuring from 14 to 16 mm in length.
- Pale yellowish-brown in color with **two dark brown longitudinal stripes on the pronotum.**

German cockroach
Blatella germanica (Linn.)

- Both sexes are fully winged.
- The female carries the egg capsule partly protruding from the tip of the abdomen until hatching time.
- Its activities at the kitchen or around water and heat pipes.
- 30-40 eggs in ootheca, with maximum 48.

Female

Male

Blatella germanica

Brown-banded or tropical cockroach
Supella supellectilium Serv.

- Family **Ectobiidae**
- Resembles the **German cockroach** in appearance but is **smaller**. (absence of two dark pronotal stripes)
- Size (10-12 mm).
- Has **two yellow cross bands, one at the base of the wings and the other is farther back**.
- The wings do not quite reach the tip of the abdomen.
- Adults fly readily when disturbed.
- The species is a gregarious.

Brown-banded or tropical cockroach

Supella supellectilium Serv

- Hides in cupboards and pantries, invades all rooms of the house.
- Seems to prefer "high locations, such as shelves in closets, behind pictures.
- It is rapidly becoming cosmopolitan.
- Average 18 eggs in ootheca.
- Female drops egg capsule after a day or two and attaches it to some bit of debris

Female

Male

Supella supellectilium

Cockroaches
Life history

- The eggs are assembled in leathery bean shaped capsules, **ootheca**.
- Females carried the ootheca for sometimes, often weeks.
- Usually partly protruding from her abdomen until just before hatching, then dropped.
- The number of eggs within each capsule varies with the species.
- Many egg capsules are produced during the lifetime of the female cockroach
- as many as 90 by the American cockroach, 18 by the Oriental, and but 4 to 6 by the German cockroach.

Life cycle

Cockroaches

Life history

The length of the incubation period varies with temperature and humidity:

- **American cockroaches 32-53 days.**
- **Oriental 42-81 days.**
- **German 28 days.**

Ootheca

Cockroaches
Life history

- On hatching, the young cockroaches are almost white.
- Quite wingless.
- The skin is cast on emergence, with a second molt usually in three or four weeks, followed by other molts several weeks until maturity is reached.

Cockroaches
as a vector

Mechanical transmission:

- Can acquire specific bacteria by crawling over cultures and then deposit the bacteria on food.
- There were more bacteria on the **hind pair of legs than on the other two pairs of legs.**

probably due to the fact that the insect's hind legs are more constantly in contact with surfaces and that the forelegs are very frequently brushed clean by means of the antennae.

Diseases transmitted by Cockroaches

- Carries pathogenic viruses **poliomyliyis**
- **Protozoa** as *Entamoeba histolytica* , *Tricomonas hominis*, *Balntodium coli.*
- **Bacteria** as *Staphylococcus aureus* , *Echerichia coli* , *Salmonella* sp. and Cholera
- Carried on the **legs** of roaches and found in the **feces** passing through the alimentary tract.

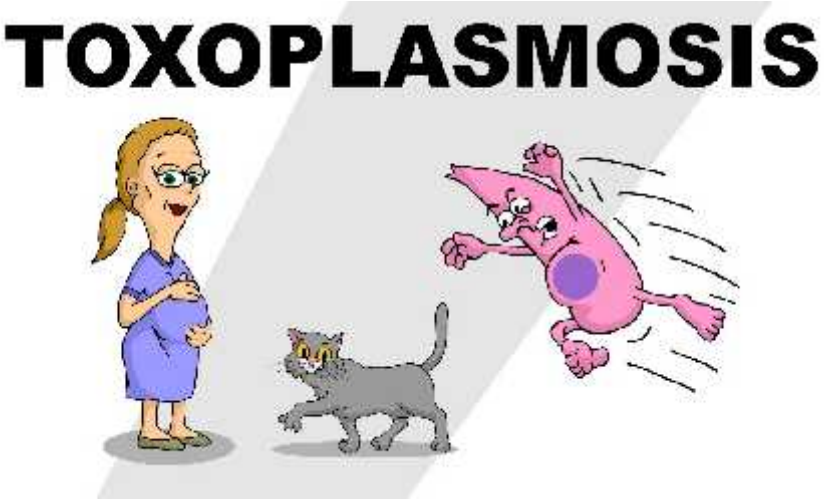
Diseases transmitted by Cockroaches

- They act as intermediate host of **Nematodes** parasites
- Filaria in **elephantiasis**
- ***Toxoplasma***
- Some people are **allergic** to cockroaches.

Poliomyliyis

Cholera

Elephantiasis



Cockroaches Control

- Kill the individual intruders at once in any convenient way.
- Do not let them gain a foothold by providing them with food.
- Fill up cracks in walls.
- Open, clean and carefully kept spaces, permitting plenty of daylight.

Cockroaches
Control

Application of an insecticide:

1- For use against cockroaches a mixture is made of **sodium fluoride** (25 per cent by volume) and tested **pyrethrum** powder (75 per cent).

- This mixture is applied by means of a dust gun to all cracks and crevices and places where cockroaches may be in hiding.

2- **DDT** .

3- **Chlordane** .

4- **Organophosphate and carbamate can added to baits**


DDT
INSECT KILLER


ORTHO
ORTHO-KLOR 10
Chlordane
Dust

Beetles
Order Coleoptera

- Largest insect order
- Elytral fore wing , membranous hind wing.
- Wings are not used in flight.
- Mouth parts are strongly mandibulate.
- Metamorphosis is complex.
- larvae are commonly known as "grubs"

Beetles

Scavenger beetles:

- Feeds on dead animals.

They may carry infection in at least two ways:

- 1- **mechanically** on their legs, mouth parts, or body, or in their excreta after feeding on infectious material. (e.g. Anthrax).
- 2- **Intermediate hosts** of helminths.

Beetles

Scavenger beetles:

1. **Family: Staphylinidae (rove beetles)**

- feed on carrion.
- Dung.
- Decaying animal matter.

Rove beetles

Beetles

Scavenger beetles:

2. Family: Silphidae

- commonly known as **carrion beetles, burying beetles.**
- Feeds on dead animals.
- They deposit their eggs on the dead animals , and the larvae feed on the decomposing flesh .

Carrion beetles

Beetles

Scavenger beetles:

3. Family: Dermestidae

- Known as **hide beetles, larder beetles, museum pests**.
- Small oval or elongate beetles.
- Often dotted, grayish, or brownish in color.
- The hairy larvae as well as the adults feed on dead animals, museum specimens, wool, cured meats, cheese, and many other animal as well as vegetable products.

Beetles

- ***Anthrenus scrophulariae*** (carpet beetles).
- Serious household pest.
- May enter the ears of persons and cause much discomfort.

Carpet beetles

Dermestidae

Beetles

Diseases

- **Tapeworm**.
- **Canthariasis** (ingesting beetles)
- **Blisters**, many beetles possess a vesicating substance in their body tissues which produces blisters when coming in contact with the skin.
- **Poisonous to poultry** (Scarabaeidae).
- **Annoyance** (Staphylinidae and Asian lady bugs).

Cantheriasis

Blisters

Beetles

Control

- When beetles become a pest problem, identify the pest beetle.
- inspection and cleaning.
- find the source of the infestation and remove anything that is infested.
- Chemical control using insecticides (**DDT, ,Chlordane , Organophosphate and carbamate)**

Bugs
Order Hemiptera

Dr. Amr Badawy

Order Hemiptera

- About 48,000 species,
- Heteroptera (hemelytra fore wings)
- The Homoptera (membranous both wings).

Includes such important phytophagous families as the Aphididae (plant lice), Cicadidae (cicadas or harvest flies), Cicadellidae (leafhoppers, sharpshooters), Membracidae (tree hoppers) and many others of great agricultural importance, particularly many important vectors of plant diseases.

Heteroptera

- The true bugs.
- Characterized by a jointed suctorial proboscis attached anteriorly.
- Flexed under the head when not in use.

Heteroptera

- The true bugs are separated into two divisions:

1. Gymnocerata:

antennae are conspicuous and capable of being moved freely in front of the head, e.g., *Cimex lectularius*

2. Cryptocerata:

- Antennae are concealed in small concavities and are closely pressed to the under side of the head,
- e.g., *Lethocerus americanus* the giant water bug.
- Metamorphosis is simple.

THE BEDBUGS
Family Cimicidae

- Includes the bedbugs, swallow bugs, and the poultry bug.
- characterized by:

1. Very short, broad head, broadly attached to the prothorax.
2. Oval body.
3. well developed compound eyes, absence of ocelli.
4. Four -jointed conspicuous antennae.
5. Three jointed proboscis lying in a groove beneath the head and thorax.
6. Very short pad-like hemelytra.

THE BEDBUGS
Family Cimicidae

- The bodies are broad and flat enabling the bugs to creep into narrow crevices.
- A nasty pungent odor is attached to the group as a whole with few exceptions.
- They are night prowling and bloodsucking in habit, some feeding on birds and bats and others on human.

THE BEDBUGS
Family Cimicidae

- Berlese organ is located in the IV or V abdominal segments.
- The presence or absence of this organ and its particular location when present provides a character useful in identification of species.

THE BEDBUGS
Family Cimicidae

The three principal genera of this family are :

1.***Cimex*** the cosmopolitan bedbug

e.g. *C. lectularius*

2.***Eciacus***

- e.g. *Eciacus hirundinus* (the European barn swallow bug).
- Filiform, third and fourth segments of the antennae only a little thinner than the first and second.

Eciacus

Cimex

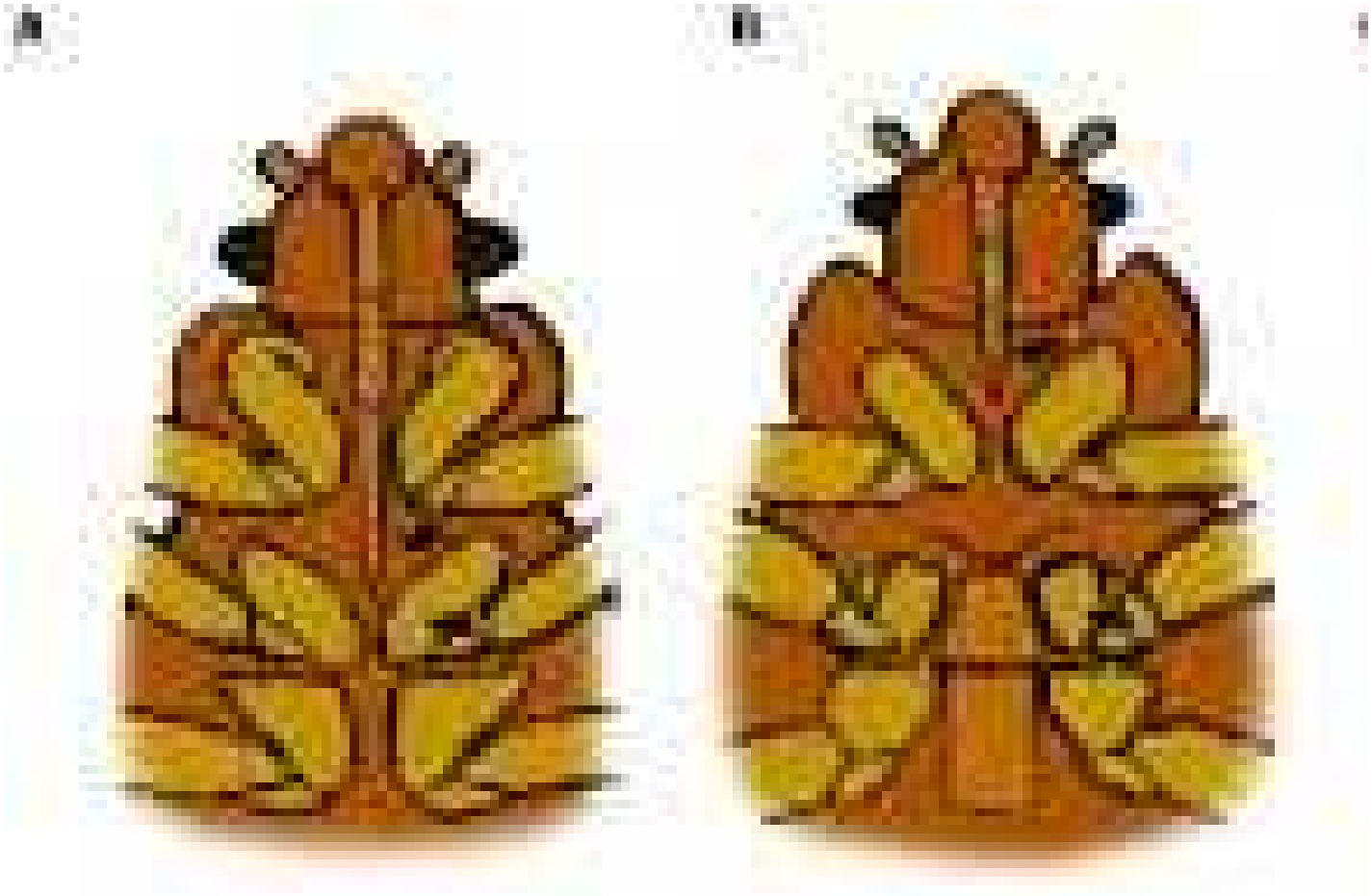
THE BEDBUGS
Family Cimicidae

3. ***Haematosiphon***

- In which the rostrum is long, reaching to the posterior coxae.

e.g. *Haematosiphon inodora*

- Infests poultry.



Haematosiphon ***Cimex***

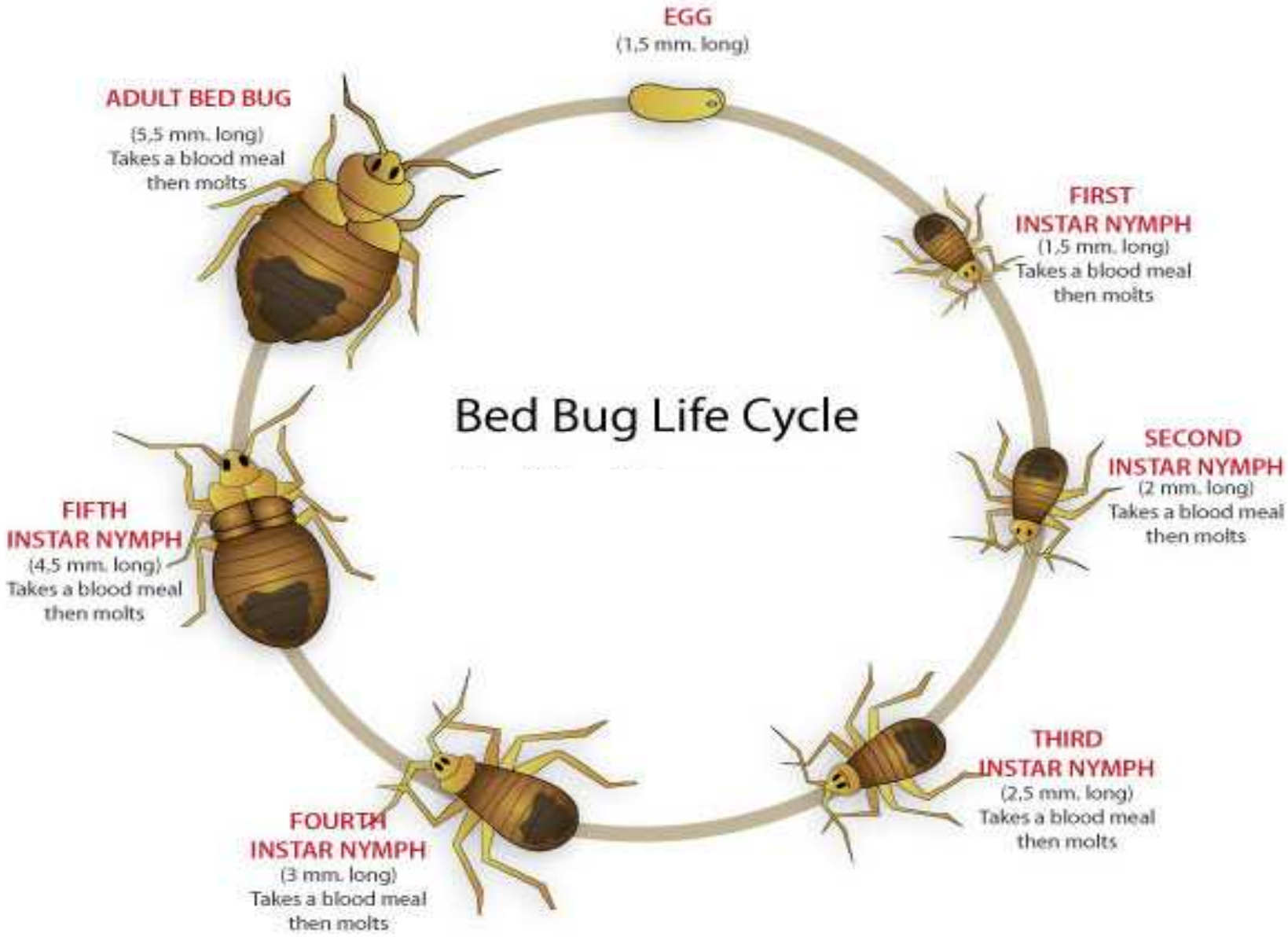
Cimex lectularius

- Size is 4 to 5 mm in length and 3 mm in breadth.
- It has flattened bodies.
- The adult is reddish brown in color.
- The young are yellowish white.
- Hiding in crevices during the day.
- They are nocturnal in their feeding habits.
- At night they are very active, crawling out of their hiding places

Cimex lectularius

Cimex lectularius

- Traveling considerable distances to attack their victims.
- They hide in the wooden beds and mattresses.
- Bedbugs are gregarious.
- The females deposit eggs in batches from 10 to 50, totaling from 200 to 500 eggs.
- spread out in a yellowish patch.


EGG
(1,5 mm. long)
FIRST
INSTAR NYMPH
(1,5 mm. long)
Takes a blood meal
then molts
SECOND
INSTAR NYMPH
(2 mm. long)
Takes a blood meal
then molts
THIRD
INSTAR NYMPH
(2,5 mm. long)
Takes a blood meal
then molts
FOURTH
INSTAR NYMPH
(3 mm. long)
Takes a blood meal
then molts
FIFTH
INSTAR NYMPH
(4,5 mm. long)
Takes a blood meal
then molts
ADULT BED BUG
(5,5 mm. long)
Takes a blood meal
then molts
Bed Bug Life Cycle

Cimex lectularius

- The eggs are large and yellowish white in color.
- Oviposition occurs during a period of two to three months, apparently limited to the spring and summer months.
- Commonly favored by warm rooms during the winter.
- The young hatch from 7 to 30 days(usually about ten days), according to temperature.

Cimex lectularius

- The time required for development from egg to maturity is given as from 45 days to 11 months.
- Normally fed individuals may survive from 54 to 316 days under ordinary room-temperature.
- Without food adults may survive from 17 to 42 days.

Cimex lectularius

- Bedbugs molt five times.
- The minute wing pads characteristic of the adult insect.
- One meal is taken between each molt and one before egg deposition.
- An average period of 8 days is required between moltings.
- Metamorphosis is simple.

Cimex lectularius

Methods of distribution:

- The introduction of one impregnated female might furnish the nucleus for a well developed colony in a few months.
- Public conveyances are commonly means for the dissemination of bedbugs.
- Migration from house to house by way of water pipes, walls.
- Easily carried in clothing, travelling bags, suit cases, etc.


NATIONAL
GEOGRAPHIC
CHANNEL

Bedbug bites

- The bite produces marked swellings and considerable irritation.
- The bite is produced by piercing organs, it is probable that puncture by these stylets.
- Produce little pain.
- The welts and local inflammation are caused by a specific poison secreted by the salivary glands of the insect and introduced in the act of feeding.

Bedbug bites

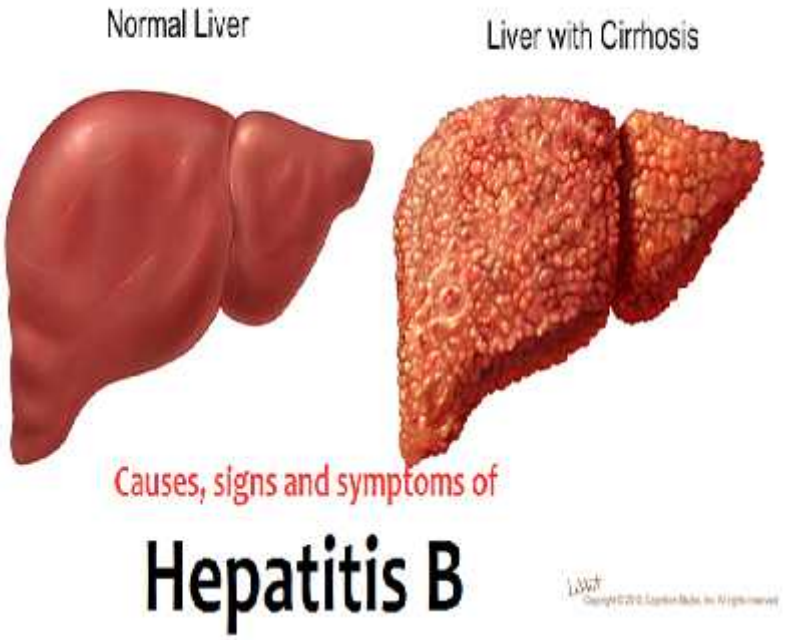
- The bedbug is able to engorge itself completely with blood in 3 to 5 minutes.
- The fact that bedbugs are obliged to feed at least five times either upon the same or a different host in order to reach maturity.

Disease transmission

Bed bug are capable of transmitting plague and other septicemic infections.

- Anthrax.
- Hepatits B virus.
- Causing iron deficiency in infants.

Anthrax


Normal Liver
Liver with Cirrhosis
Causes, signs and symptoms of
Hepatitis B

Bed bug control

How to kill bed bugs ?????

Bed bug control

- Keep home clean
- Floors, walls and furniture of infested houses should be sprayed or fumigated with:

1. 5% DDT.
2. Lindane **(** HCH. Hexachlorocyclohexane)
3. 1-2% Malathion.
4. 0.5% Diazinon.
5. 0.5% Dichlorvos (DDVP)
6. 0.1-0.2 % pyrethrins.
7. Diatomacous earth powder


MALATHION
50% EC
DANGER


DICHLOROVOS 76% EC
DDVP King
DDVP
Krushi Crop Science


SOUTHERN AG
NATURAL PYRETHRIN CONCENTRATE
CAUTION


LINDANE
LOTION
POISON


POISON
Diazinon
FORMULATED IN AUSTRALIA

THE CONENOSES

kissing bugs, and assassin bugs

THE CONENOSES
kissing bugs, and assassin bugs

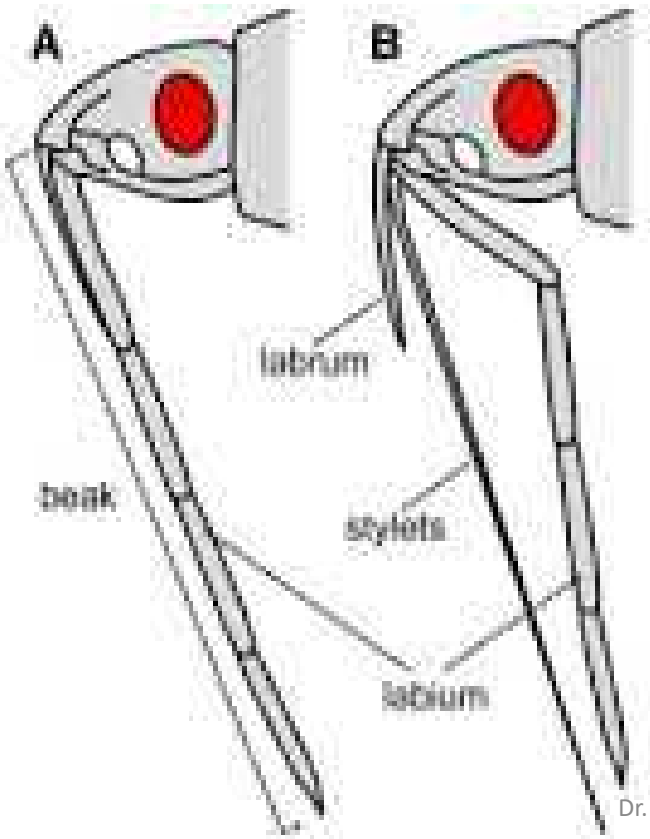
- **Family Reduviidae**.
- There are over 2,500 species divided among 15 subfamilies.
- The subfamily **Triatominae** comprises those members of the family which feed exclusively on blood of vertebrates.
- Head of these insects is more or less elongated or cone-shaped (conenoses).

THE CONENOSES
kissing bugs, and assassin bugs

- The head has remarkably free movement.
- Large compound eyes.
- The ocelli, if present are located behind the compound eyes.
- Three-jointed proboscis can be thrust forward.
- In repose lies beneath the head.

THE CONENOSES
kissing bugs, and assassin bugs

- The piercing stylets can be extended far beyond the tip of the proboscis.
- The long, slender, 4 or 5 segmented antennae are situated in front of the eyes or on the border of the head.
- The prothorax is strongly developed.
- Most of the species are able to fly well.



THE CONENOSES

Life history

- The size of Tritomine bugs adults 4.5 cm.
- Brown-black colored.
- The pronotum has a very conspicuous yellow triangle shape.
- Meso and meta thorax are completely hidden dorsally by folded hemielytral fore wings.
- Hind wings are membranous.

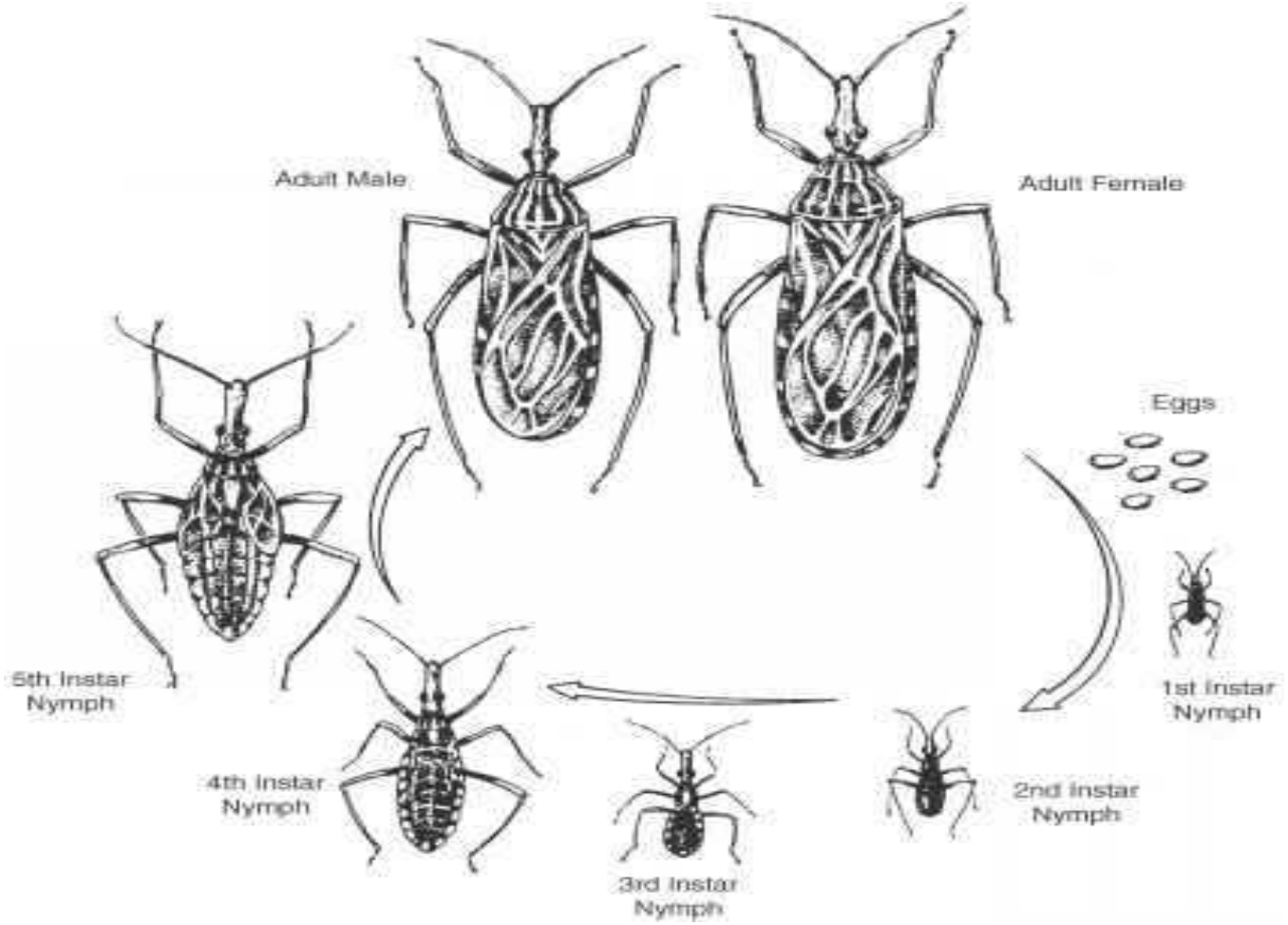
THE CONENOSES

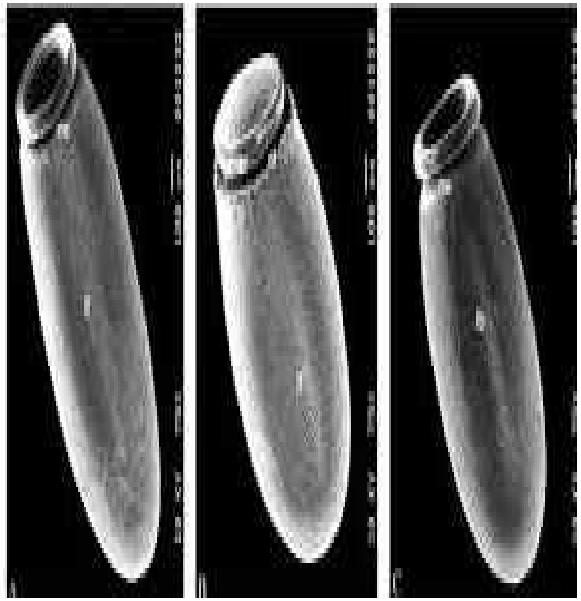
Life history

- Legs are long and slender, ends with pair of small claws.
- Abdomen is oval mostly covered with wings, except the lateral margins which bent upwards and visible dorsally .
- Eggs are large, smooth and barrel shaped with fringed caps.

THE CONENOSES
Life history

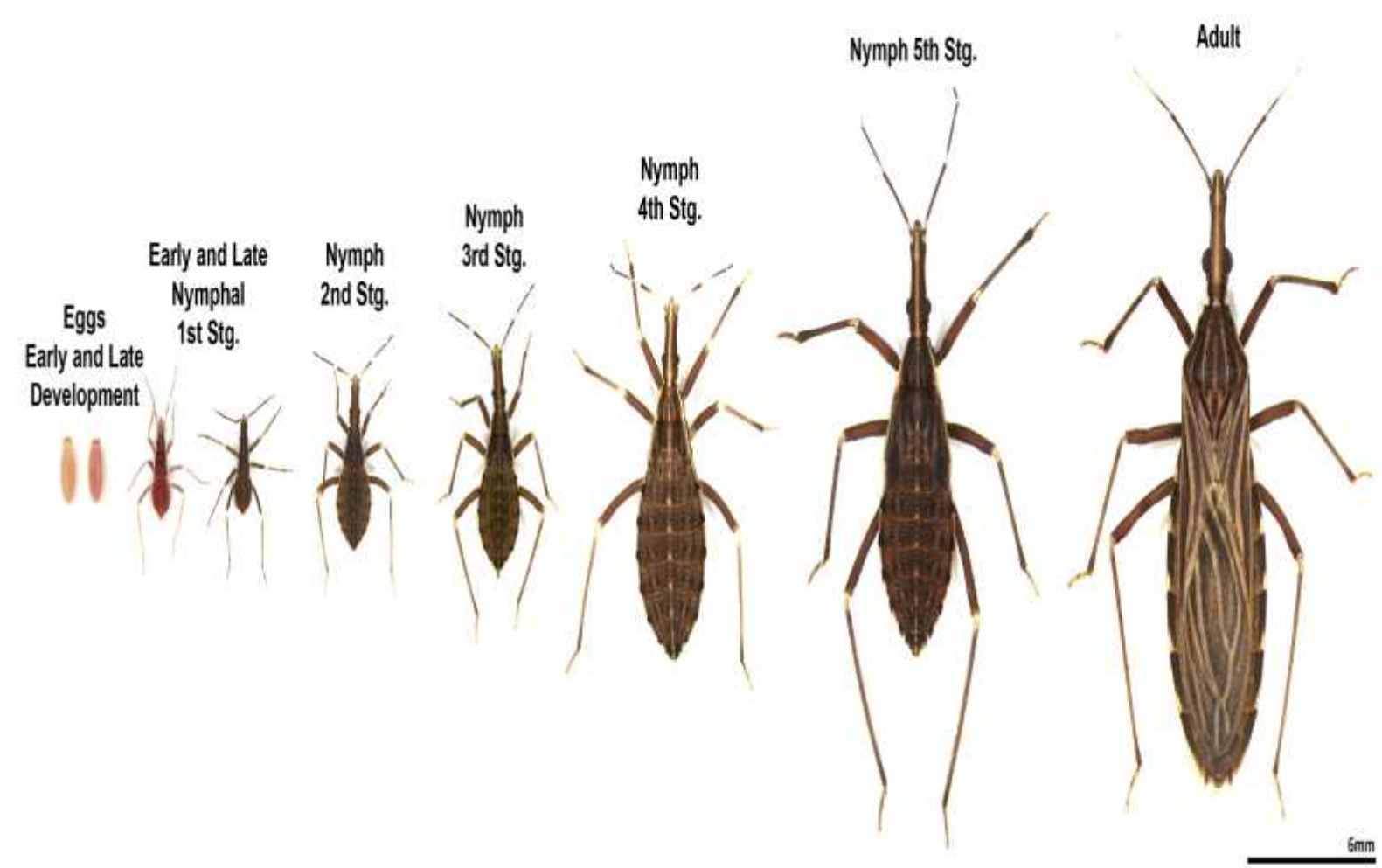
- Female deposited eggs on the dusty corners.
- Eggs are commonly deposited singly, but sometimes in small clusters.
- Eggs numbers vary from dozen to 600.
- The incubation period varies from 8 to 10 days to nearly a month.


Adult Male
Adult Female
Eggs
1st Instar Nymph
2nd Instar Nymph
3rd Instar Nymph
4th Instar Nymph
5th Instar Nymph



THE CONENOSES
Life history

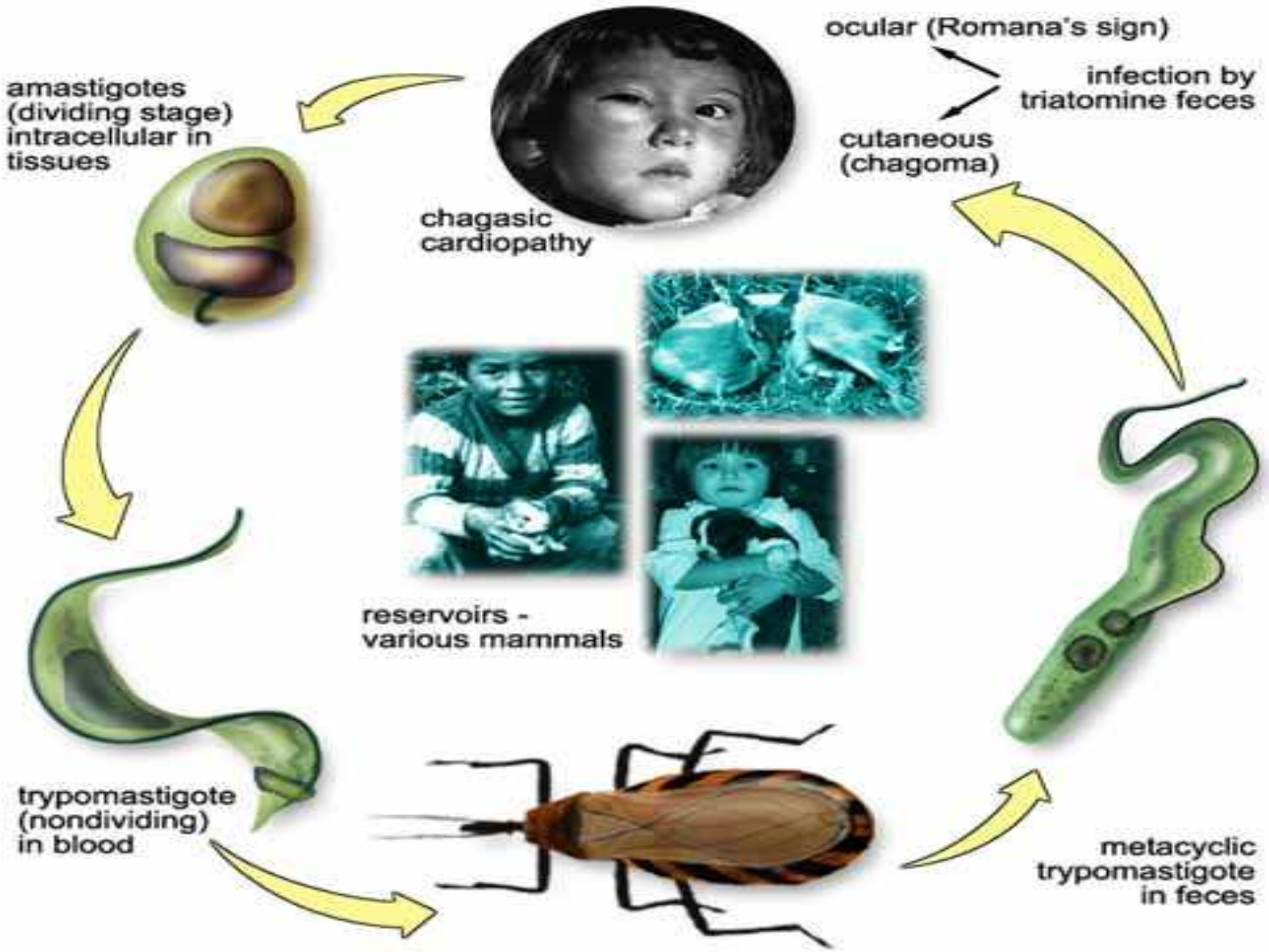
- The newly hatched nymphs are wingless.
- Five nymphal instar.
- One generation a year.


Eggs
Early and Late
Development
Early and Late
Nymphal
1st Stg.
Nymph
2nd Stg.
Nymph
3rd Stg.
Nymph
4th Stg.
Nymph 5th Stg.
Adult
6mm

THE CONENOSES
medical importance

- Chagas' disease
- Triatominae are vectors of *Trypanosoma cruzi*.
- The most apparent symptom of Chagas' disease in most cases is the swelling of the eyelid and face.
- The disease is most prevalent in children.
- it causes a high, long continuous fever, facial edema and anemia.


Chagas Disease
Kissing Bug


ocular (Romana's sign)
infection by triatomine feces
cutaneous (chagoma)
amastigotes (dividing stage) intracellular in tissues
chagasic cardiopathy
reservoirs - various mammals
trypomastigote (nondividing) in blood
metacyclic trypomastigote in feces

THE CONENOSES
control

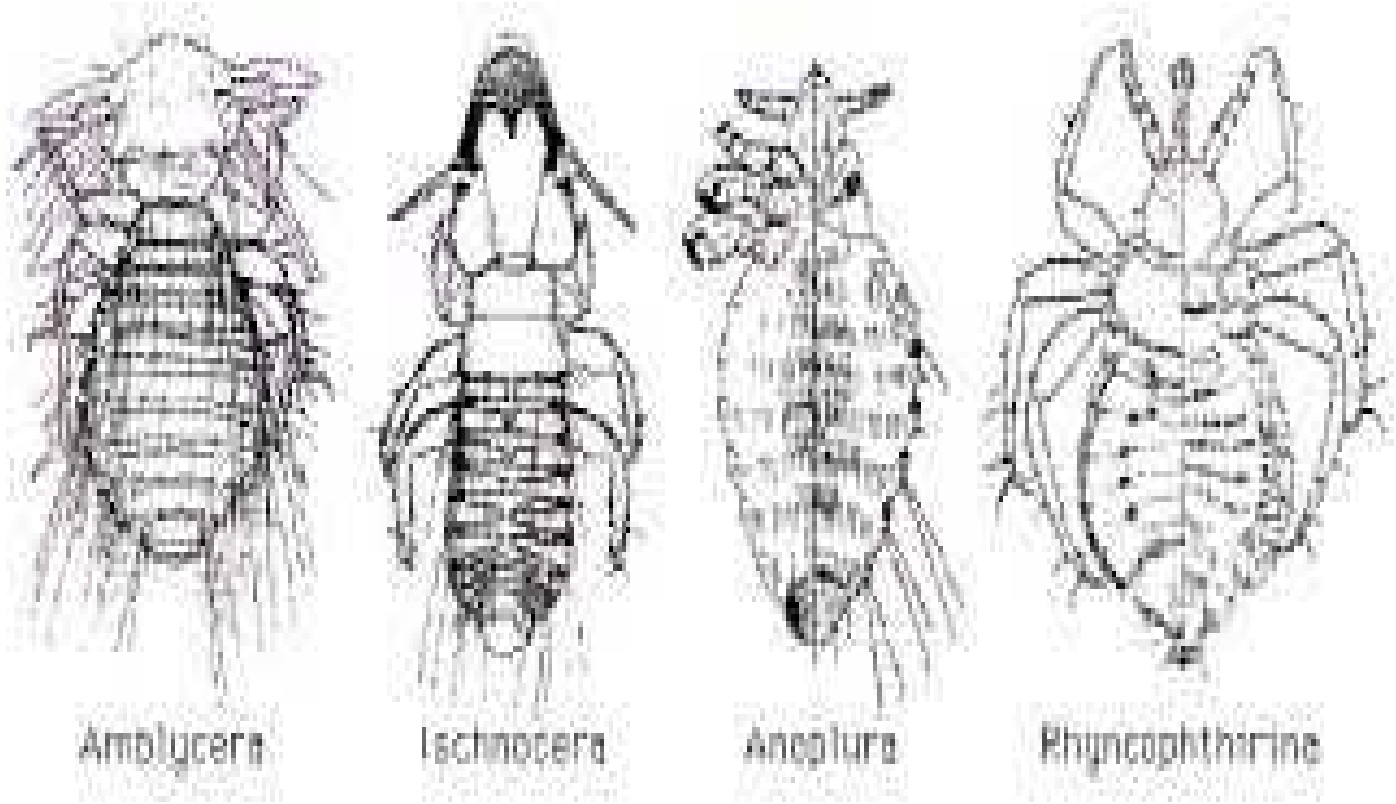
- Applying residual insecticides to the interior surfaces of walls and roofs of houses.

1. Lindane &1.25 % HCH, .
2. 2.5% Dieldrin.
3. DDT.
4. Malathion.
5. Porpoxur.

THE SUCKING LICE

Order Anoplura

Dr. Amr Badawy


Amblycera
Ischnocera
Anoplura
Rhyncophthirina

General characteristics

- Bloodsuckers parasitize on mammals.
- Wings are absent.
- Metamorphosis is simple.
- The body is flattened.
- The legs are adapted for clinging to hairs and feathers .
- Having proboscis at the tip of the head.

Blood sucking lice of man

Consists of three major types:

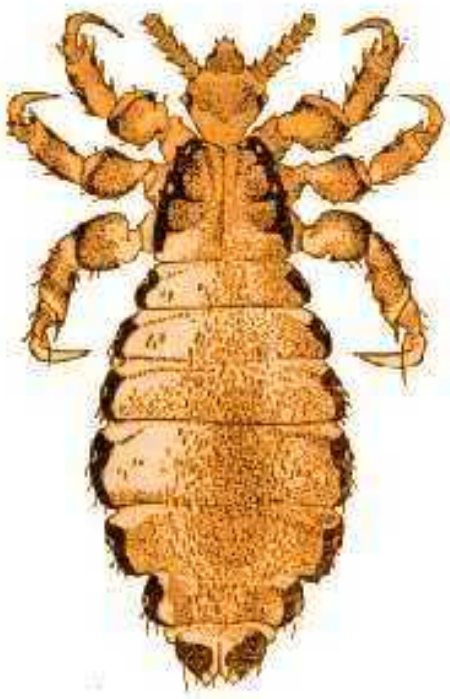
1. **Body louse** (*Pediculus humanus corporis*)
2. **Head louse** (*Pediculus humanus capitis*)
3. **Pubic or carb louse** (*Pthrius pubis*)

- It is difficult to separate **head** and **body** louse morphologically
- Worldwide distributed but often more common in temperate areas

The body louse

Pediculus humanus corporis

- Infest the clothing where it comes in close contact with the body.
- The male averages 2 mm in length and the female 3 mm.
- Eyes are very small
- Pair of short 5 segmented antennae.
- Three pair of legs for ceiling.
- Sucking and piercing mouth parts

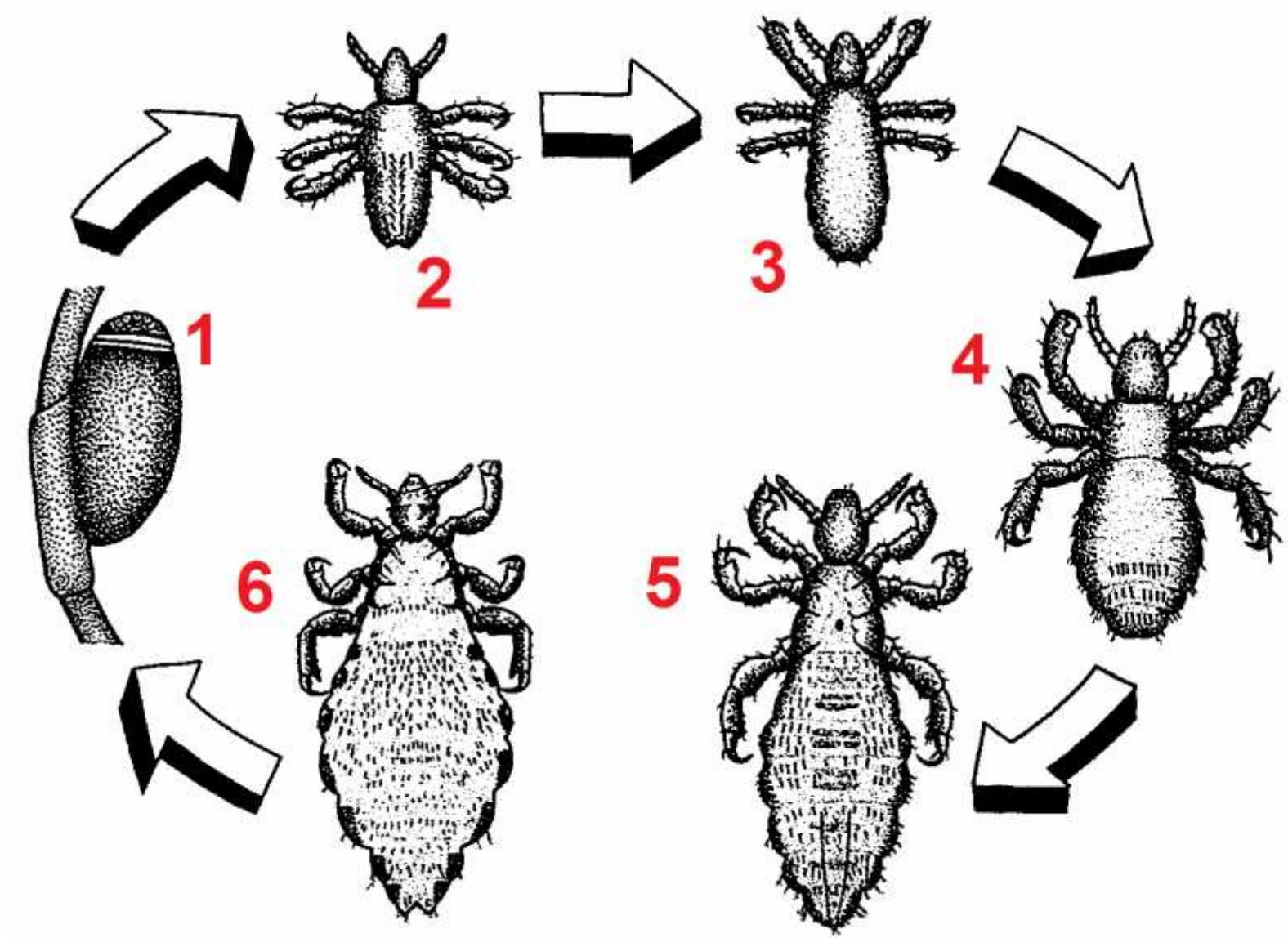


Pediculus humanus corporis

Pediculus humanus corporis

life cycle

- Incomplete metamorphosis with three molts.
- The number of eggs deposited by the female ranges from 50 to 150.
- Eggs are glued to the hair.
- Hatch in from 5 to 10 days.
- Three weeks usually covering the entire cycle from egg to egg.

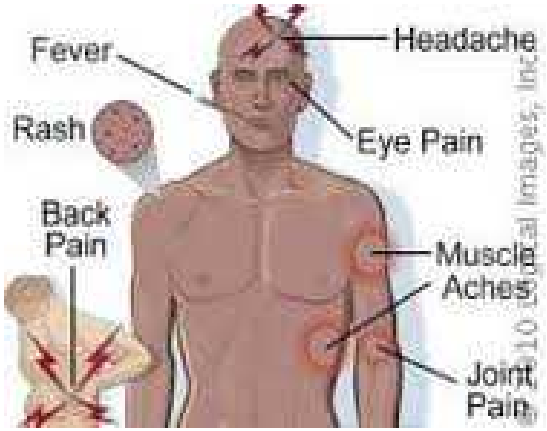

1
2
3
4
5
6

Pediculus humanus corporis

Diseases

- **Pediculosis**
- **Trench fever (five-day fever)**
- **Relapsing fever**

Pediculosis



fever

Pediculus humanus corporis

Control

- Changing and washing clothes in hot water more than 60 degrees.
- In epidemic situation
- DDT
- HCH
- Temephos
- Sevin
- Baygon.

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The human head louse

Pediculus humanus capitis

- This species occurs on the head
- Gray in color.
- The male averages 2 mm in length and the female 3 mm.
- Eyes are very small
- Pair of short 5 segmented antennae.
- Three pair of legs for ceiling.
- Sucking and piercing mouth parts

Pediculus humanus capitis

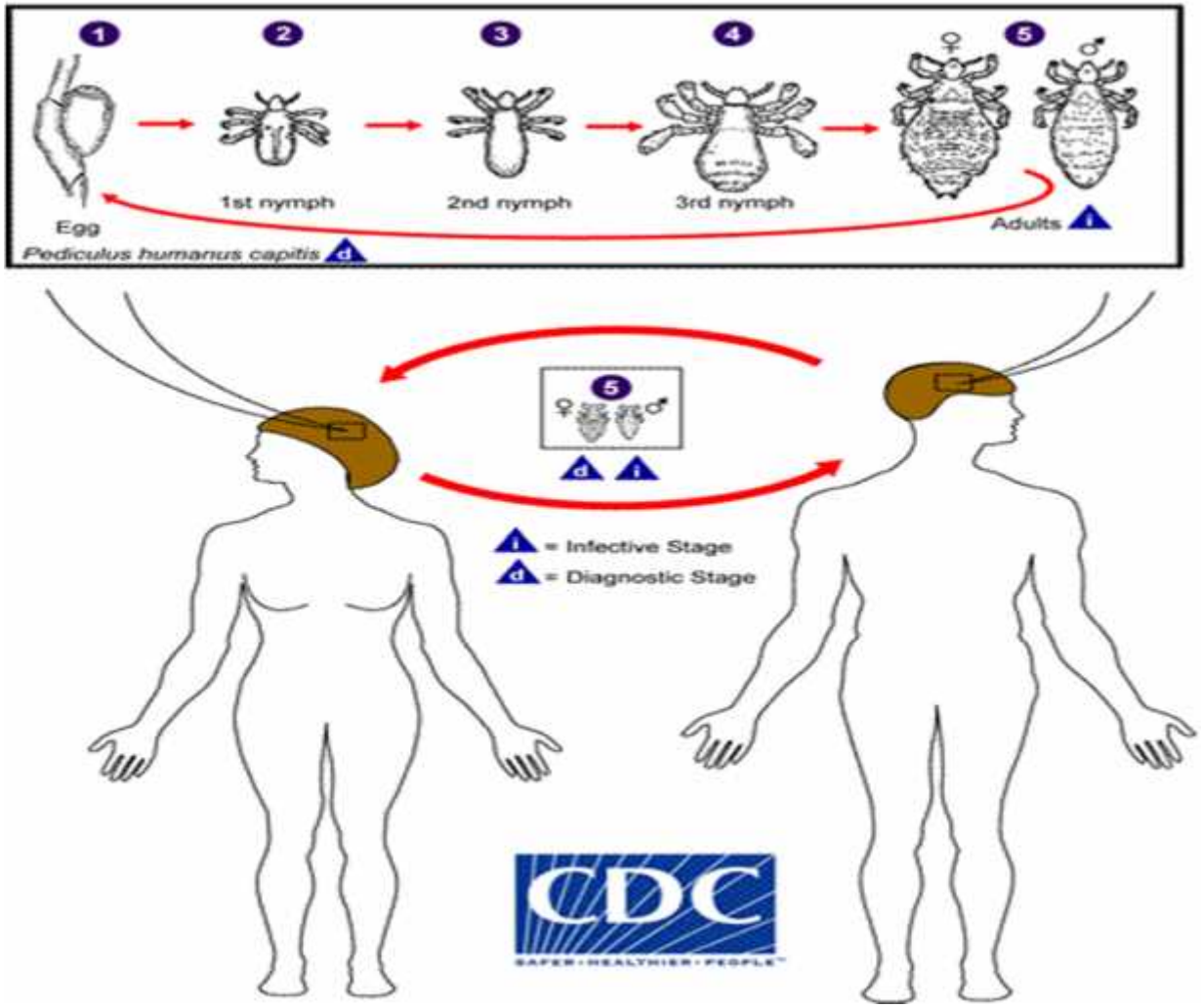
Dr. Amr Badawy

Pediculus humanus capitis

Life cycle

- Similar to body louse

except eggs are cemented to the base of the head, especially above ears and back of the neck.


1
2
3
4
5
1st nymph
2nd nymph
3rd nymph
Egg
Adults
Pediculus humanus capitis
d
i
= Infective Stage
= Diagnostic Stage
CDC

Pediculus humanus capitis

Diseases

- There is no evidence that this lice are transmitting diseases to human
- Some times can be a transmitter of:

1. Rickettsia الركيتيسية
2. Spirochaetes
3. Impetigo الجرب

Rickettsiae

Spirochaetes

Impetigo

Pediculus humanus capitis

Control

- Regular washing with soap and warm water.
- Eggs can be removed by steal comb which have closely set fine teath.
- Shaving the head
- Insecticides :
- DDT
- HCH
- Permethrin
- Baygon
- Sevin.

The pubic louse

Phthirus pubis

- Easily recognized by **its crab-like** appearance.
- Size from 1.5- 2 mm in length.
- Nearly broad as long.
- Grayish white in color.

Phthirus pubis

Dr. Amr Badawy

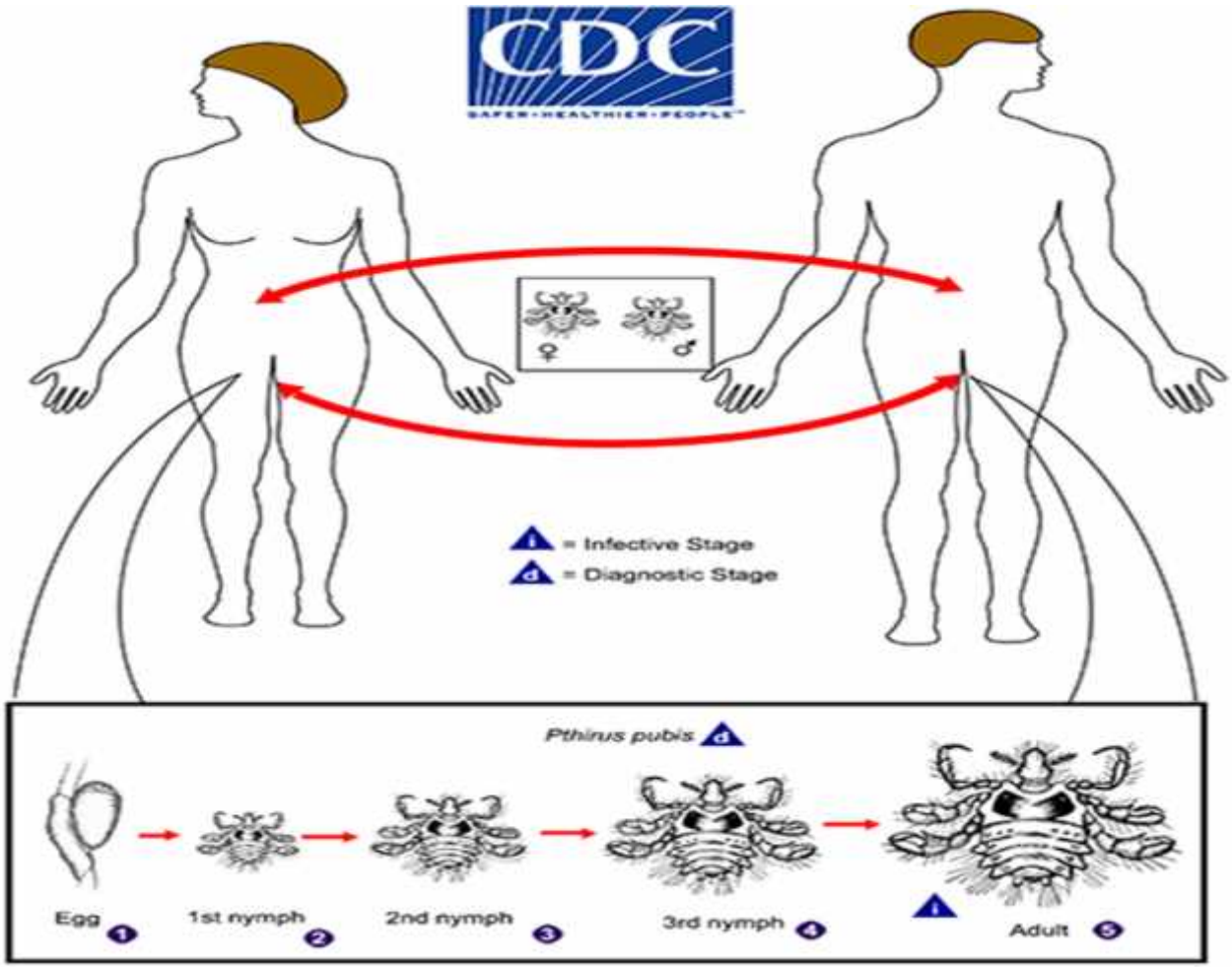
The pubic louse

Phthirus pubis

- It infests the pubic regions and armpits , more rarely other parts of the body such as the mustache, beard, eyelashes, and eyebrows.
- stationary in their habits.
- Remaining attached for days at one point with mouth parts inserted into the skin.

Phthirus pubis
life cycle

- Life cycle as in head louse.
- Female deposited 150-200 eggs.
- Eggs are smaller than those of body and head louse.
- Eggs are cemented to the pubic hairs.
- Eggs take 6-8 days to hatch.
- Nymphal stages last for 10-17 days.
- Life cycle is about 17-25 days.


CDC
i = Infective Stage
d = Diagnostic Stage
Pthirus pubis d
Egg 1
1st nymph 2
2nd nymph 3
3rd nymph 4
i
Adult 5

Phthirus pubis

Diseases

- **Louse porn typhus.**
- **Allergic reaction due to their bites, blue spots may appear on the infested parts of the body.**

Louse porn typhus

Allergic reaction

Phthirus pubis

Control

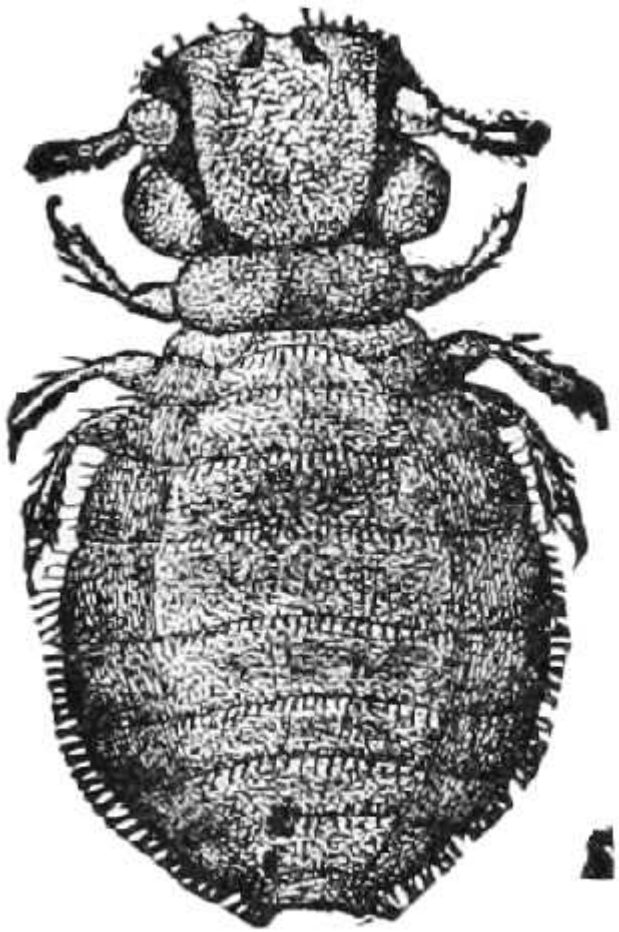
- Shaving pubic hairs.
- Insecticides:
- DDT
- HCH
- Malathion
- Sevin


I DIDN'T
KNOW
THAT

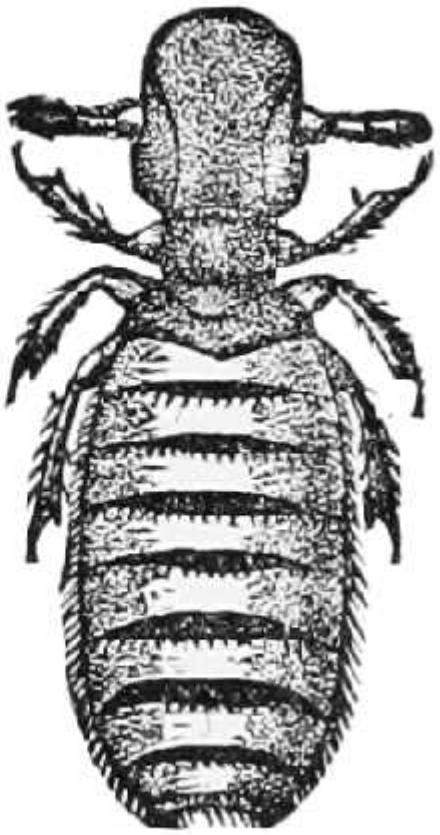
THE BITING LICE

Order Mallophaga

Dr. Amr Badawy



a



b

The biting lice

Mallophaga

Divided into two suborders:

1. Amblycera:

- with **short**, **clavate** or **capitate**, four-segmented antennae, concealed in shallow cavities on the under side of the head.
- **four-segmented maxillary palpi, mandibles horizontal**

Dr. Amr Badawy


©Damir Repić

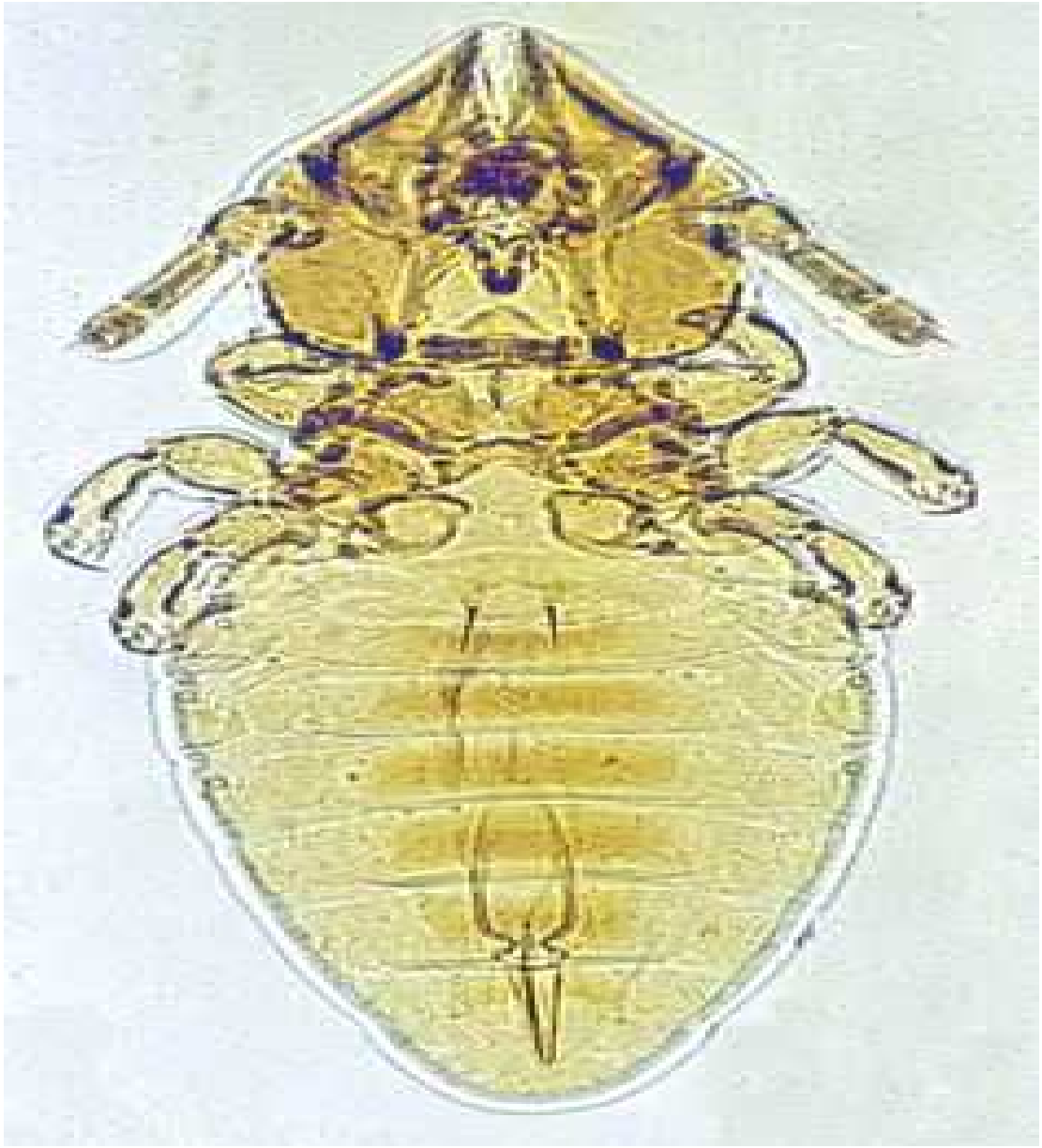
The biting lice

Mallophaga

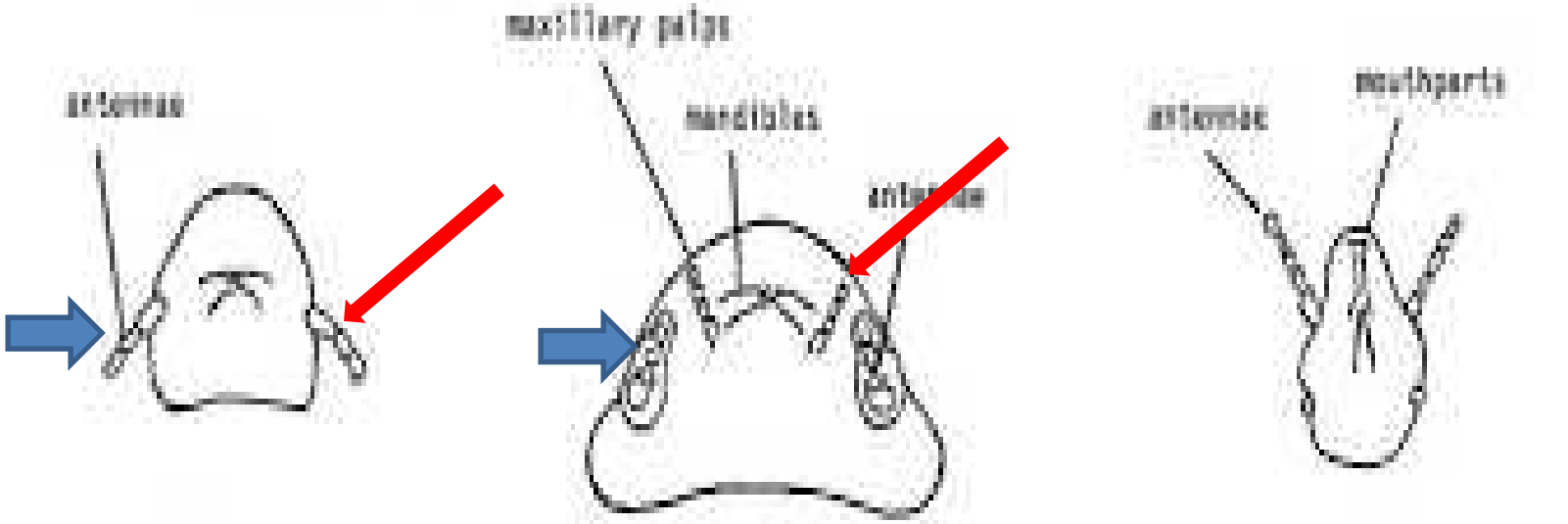
Divided into two suborders:

2. Ischnocera:

- with **short**, **slender** three- or five-segmented, exposed antennae.
- **no palpi, mandibles vertical.**



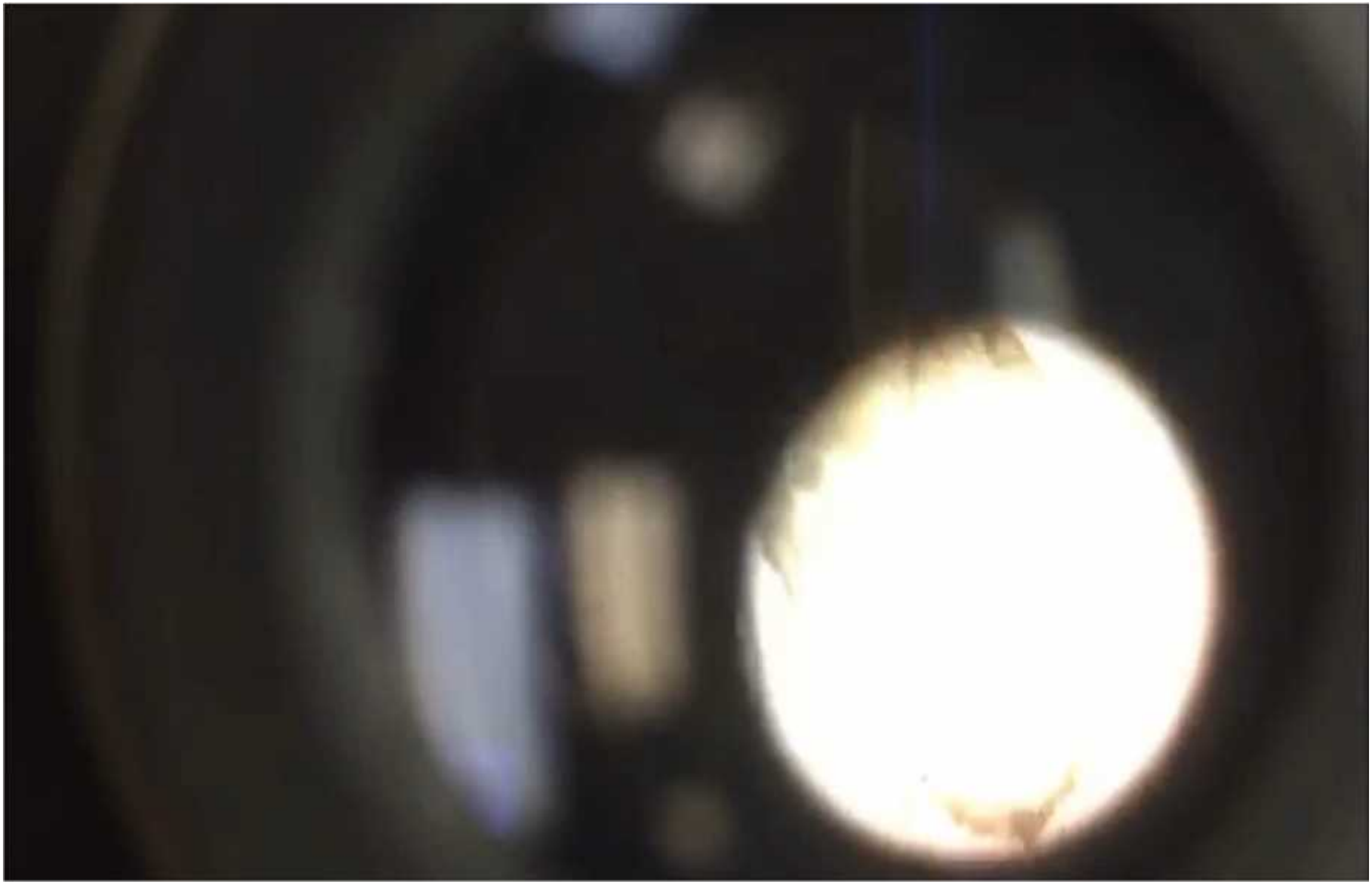
Different lice suborders



Ischnocera
Trichodectes canis

Amblycera
Menopon gallinae

Anoplura
Haematopinus suis



Injury done by biting lice

- Largely restricted to poultry
- The injury is largely due to irritation or to itching caused by the creeping insects and their continuous bitting at the skin.
- **This irritation causes the host to become restless, thereby affecting its feeding habits , proper digestion and egg production.**

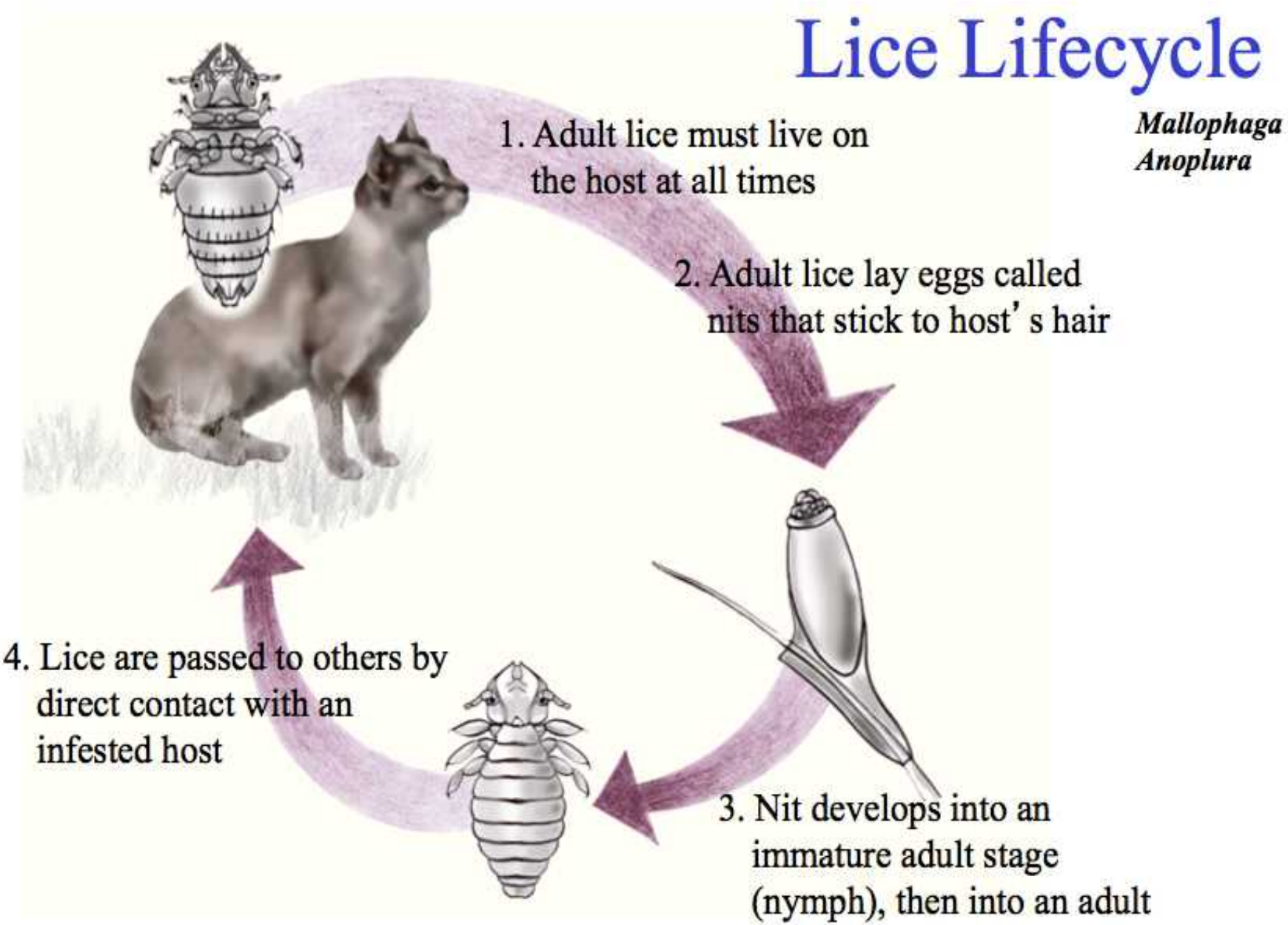
The biting lice

life cycle

- Female deposited 60 white eggs, attached to a single feather.
- Incubation period varied depending on temperature from 9-14 days.
- There are three instars.
- Total life cycle is 24-51days.

Lice Lifecycle

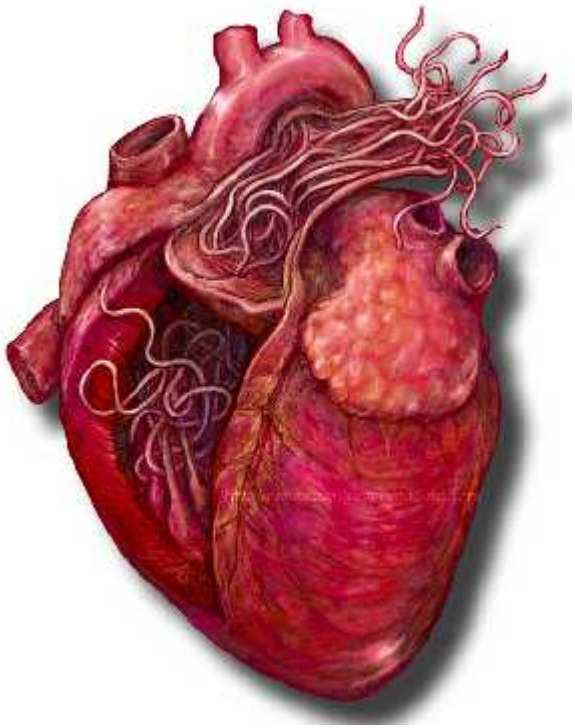
Mallophaga
Anoplura



The biting lice

Diseases

- filarial heartworm



The biting lice

Control

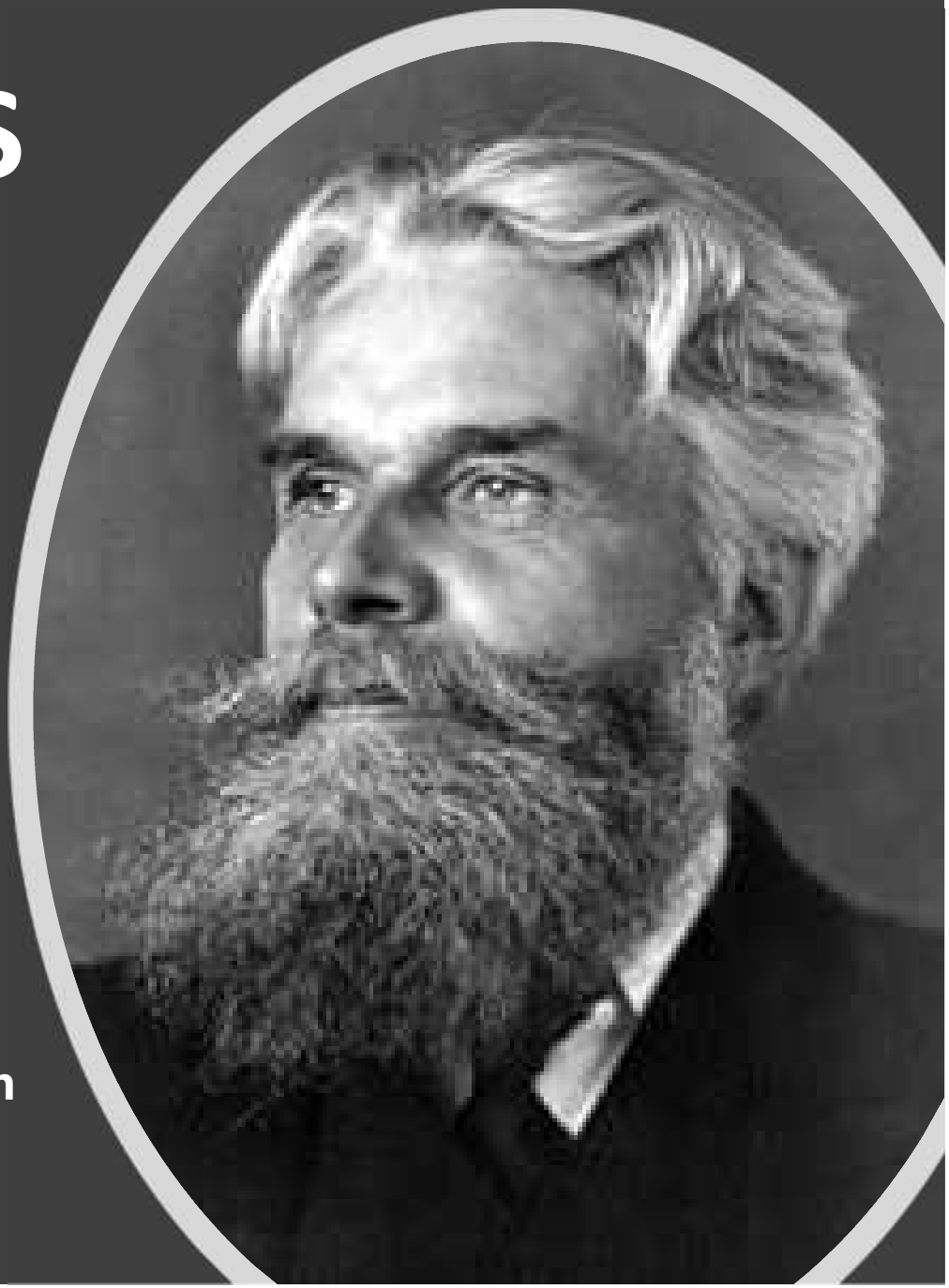
- **Sodium fluoride (Dusting , dipping or pinching).**
- **application of 40 per cent nicotine**
- **DDT**
- **HCH**

MOSQUITOES

If you would see all of Nature gathered up at one point, in all her loveliness, and her skill, and her deadliness, and her sex, where would you find a more exquisite symbol than the mosquito?

-- Havelock Ellis, 1920

Author of the first medical textbook in English on homosexuality in 1897



Mosquitoes
The Family Culicidae

- Worldwide distribution
- > 3450 species and subspecies (38 genera)
- Great habitat diversity
- Approximately 40 million years older than humans (fossils from Eocene, 38-54 mya)
- **Anophelinae** (subfamily) **-** *Anopheles*
- **Culicinae** (subfamily) **-** *Aedes*, *Culex*, *Haemagogus*, *Mansonia*, and all other genera

Mosquitoes

The most important man biting mosquitoes belong to the genera:

1- *Anopheles*

2- *Culex*

3- *Aedes*

4- *Mansonia*

5- *Heamagogus*

6- *Sabethes*

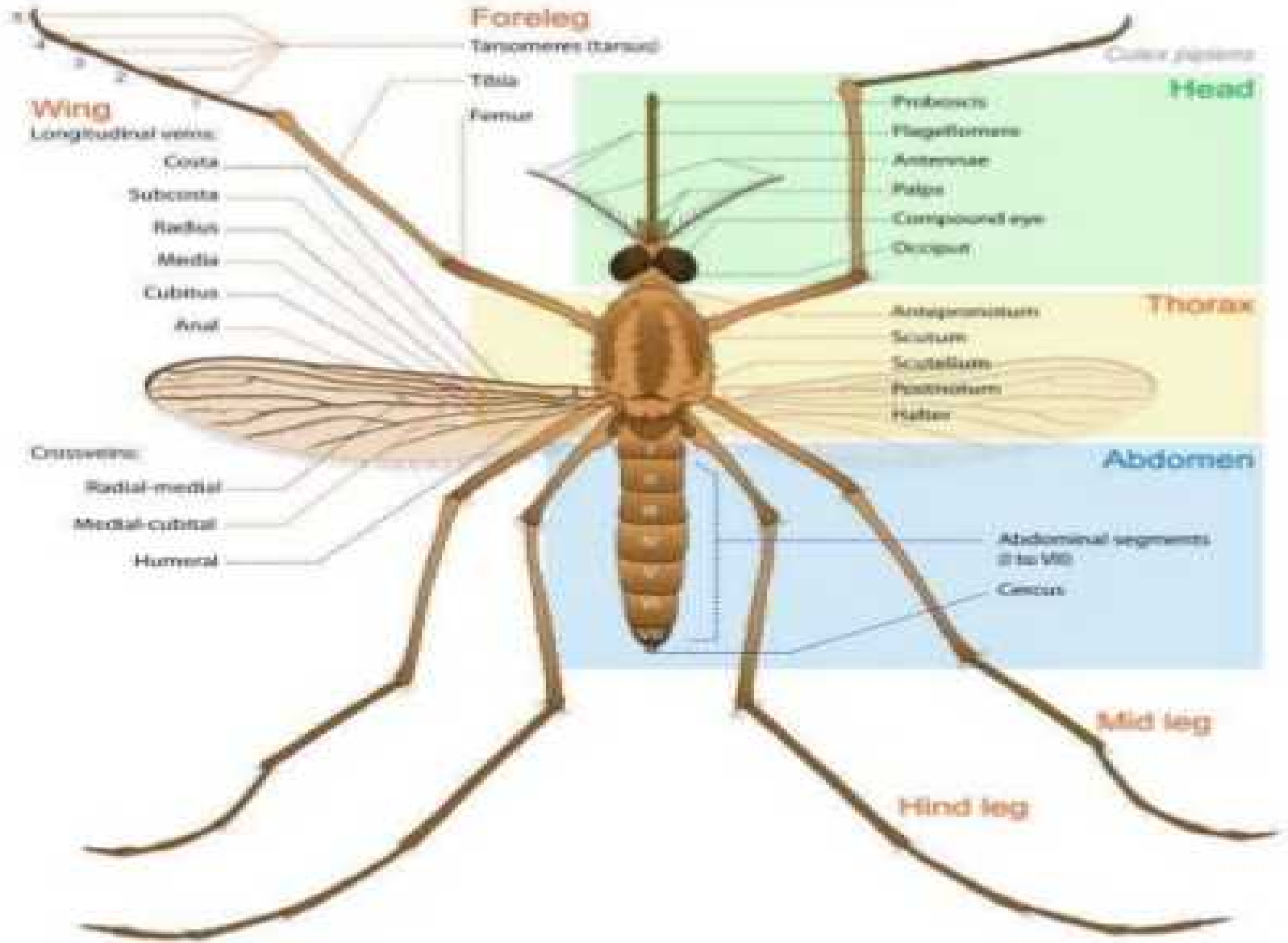
Mosquito Morphology

- **Body**: small, fragile, 3-6mm long
- **Distinguishing of sexes**:

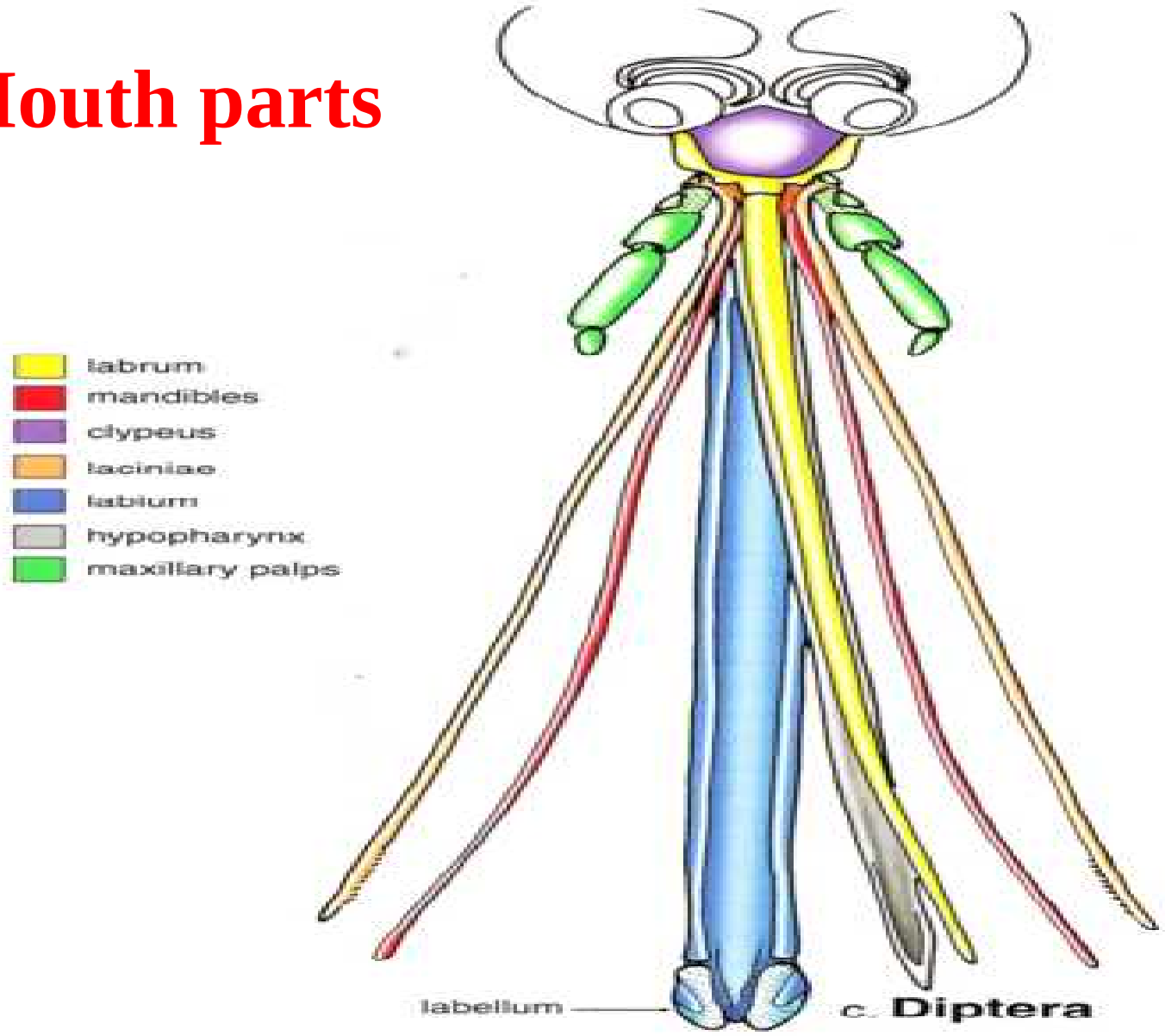
  1) **Antenna**: plumose in male, pilose in female

  2) **Palp:** long in male

  3) External genitalia
- **Mouthparts**, piercing and sucking type.
- **Proboscis** and 6 needles.


Foreleg
Tarsomeres (tarsus)
Tibia
Femur
Wing
Longitudinal veins:
Costa
Subcosta
Radius
Media
Cubitus
Anal
Crossveins:
Radial-medial
Medial-cubital
Humeral
Head
Proboscis
Flagellomere
Antennae
Palps
Compound eye
Occiput
Thorax
Scutum
Scutellum
Halter
Abdomen
Abdominal segments
Cercus
Mid leg
Hind leg

Mouth parts


labrum
mandibles
clypeus
laciniae
labium
hypopharynx
maxillary palps
labellium
c. Diptera

Blood feeding and gonotrophic cycle

- Mosquitoes mate shortly after emergence from the pupae.
- Sperm passed by the male into the sperma-thecal of the female, usually serve to fertilize all eggs laid during her lifetime.
- Female must bite a host and take blood meal to obtain the necessary nutrients for the development of the eggs in ovaries

Blood feeding and gonotrophic cycle

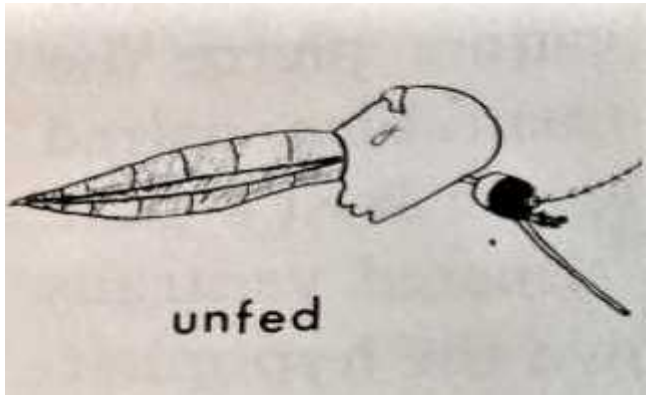
- A few species can develop the first patch of eggs without a blood meal (**autogenous development**).
- The speed of digestion of the blood meal depends on temperature, in tropical areas it takes **2-3** days, and in temperate areas **7-14** days.

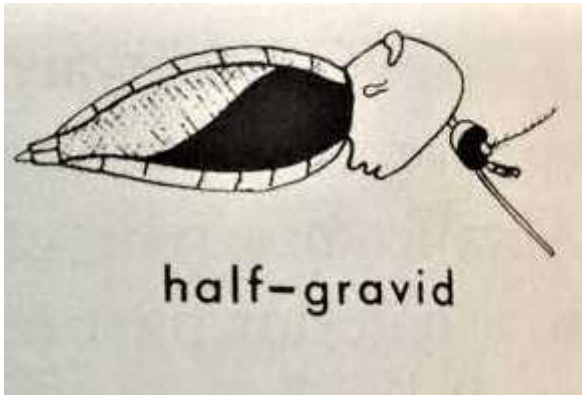
Blood feeding and gonotrophic cycle

- After blood meal the mosquito's abdomen is dilated and bright red in color.
- Some hours later the abdomen becomes a much darker red.
- As the blood is digested and the eggs are enlarged, the abdomen becomes whitish posteriorly and dark reddish anteriorly.
- This condition represents a mid point in blood digestion and ovarian development and mosquitoes referred to be as **half gravid**

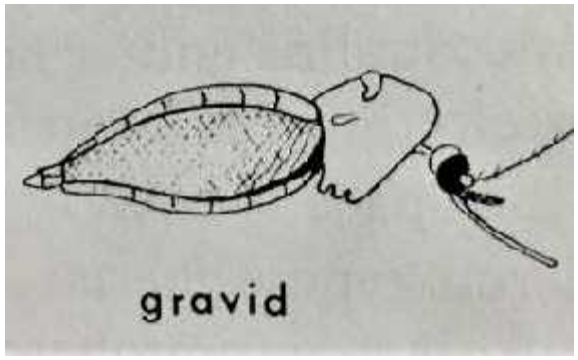
Blood feeding and gonotrophic cycle

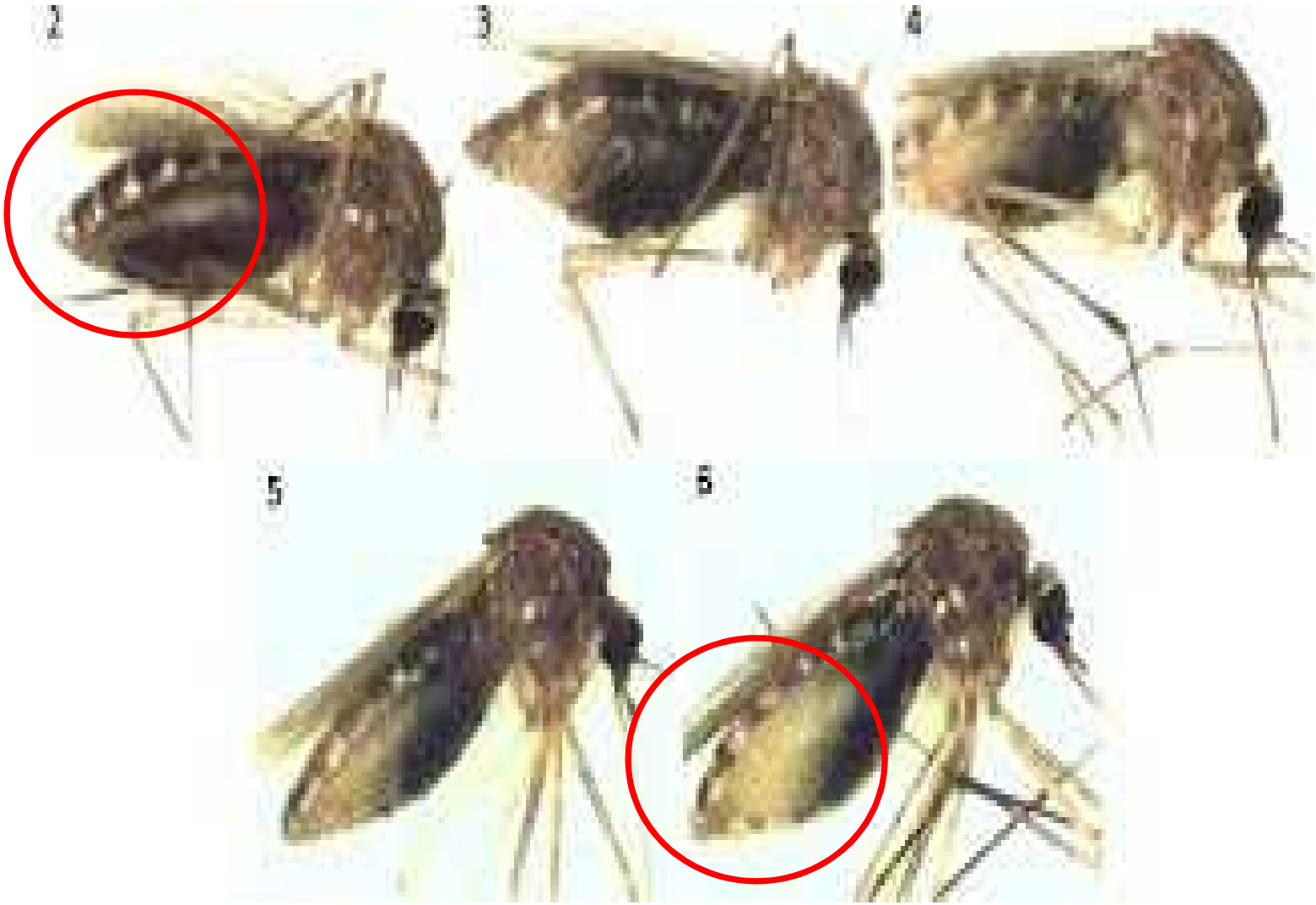
- Eventually all blood is digested and the abdomen becomes dilated and whitish due to the formation of fully developed eggs.
- The female said to be **gravid**.





Gonotrophic cycle





Gonotrophic cycle

Life Cycle of a Mosquito

- Mosquitoes of different species lay their eggs in a variety of water sources that range from small containers to vast expanses of marshland.
- Holometabola
- Egg — 1-4 days-> larva (4 stages)—7 days -> pupa – 2-3 days → adult 10-14 days

Life Cycle of a Mosquito

- The larval stage is always aquatic and shuttles from the subsurface where it filter feeds on micro-organisms to the surface to obtain oxygen through a snorkel-like breathing apparatus.
- The pupal stage **does not feed** but unlike most Insect pupae is extremely active.
- The adult emerges from the pupal case using air pressure.

Mosquito Life Cycle

Eggs

Larva

Pupa

Adult

Dr. Amr Badawy

Life cycle of a Mosquito

Life cycle

Life span:

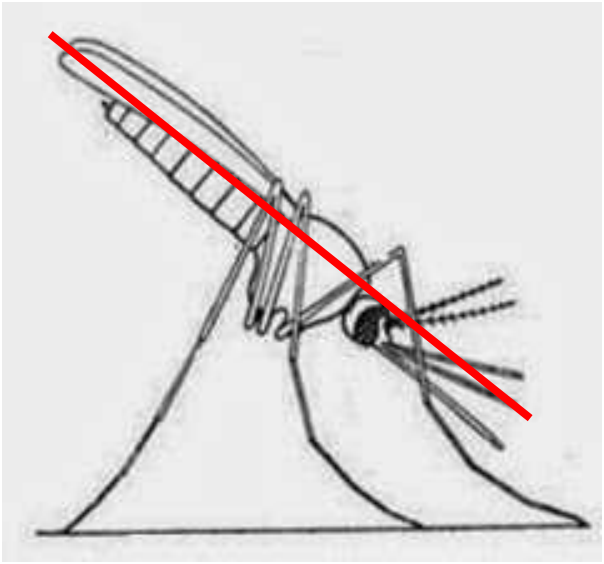
- Males, 1-3 weeks. Females, much longer.
- Hibernating females may live as long as 5 months or more.

Range of flight:

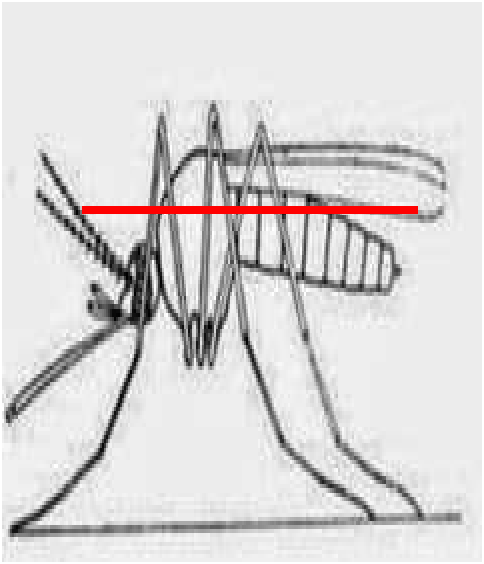
500 meters long and 300 meters high.

Differences of mosquitoes species

1- Resting posture



Anopheles

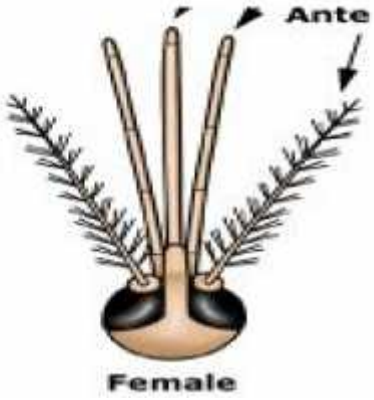


Culex

Differences of mosquitoes species

2- Palps

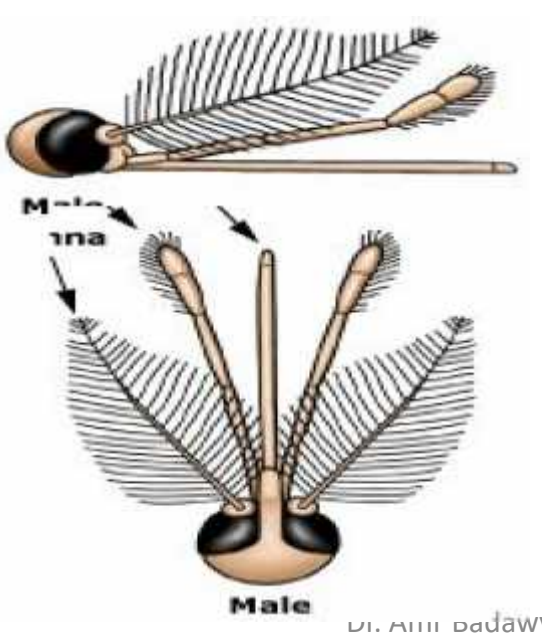
	Anopheles	*Culex*
Palps of female	**as long as proboscis**	**shorter than proboscis**

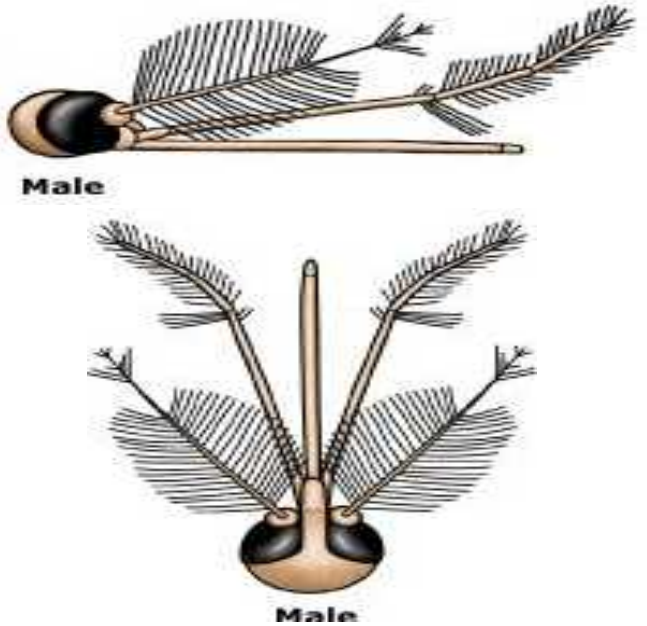


Differences of mosquitoes species

2- Palps

	Anopheles	*Culex*
Palps of male	**as long as proboscis**	**longer than proboscis**





Differences of mosquitoes species

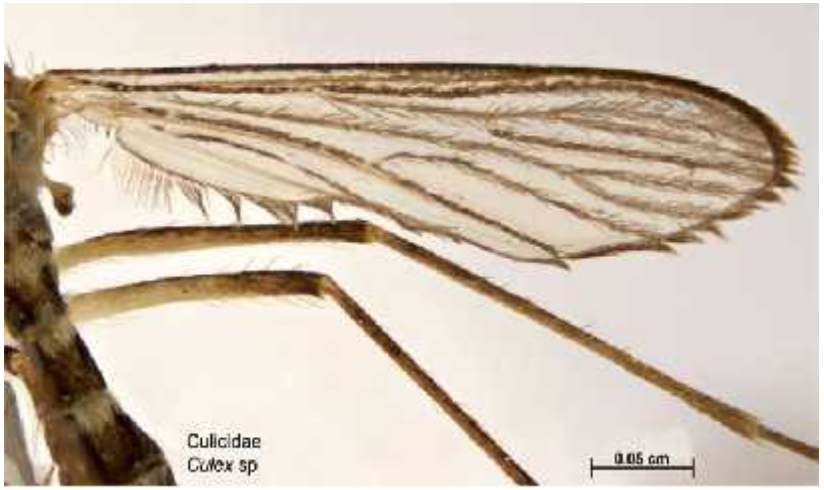
3- Wings

Anopheles

Wings have dark spots

Culex

Wings are unspotted

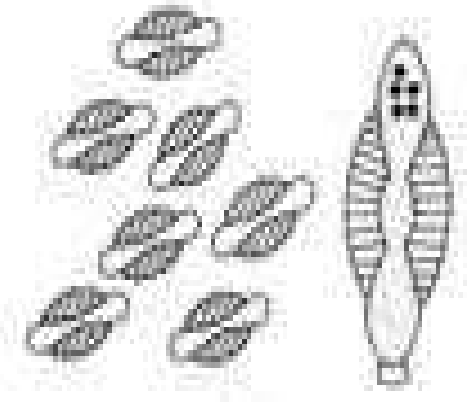


Differences of mosquitoes species

4- Eggs

Anopheles

- **Eggs laid singly**
- **and have air float**



Culex

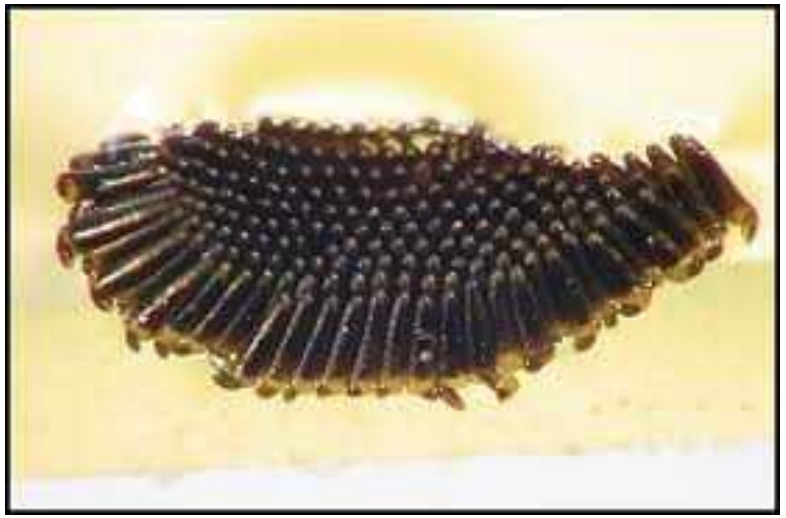
- **Eggs are laid in a cluster called egg raft.**
- **Eggs have no air float**

Eggs

- Depending on the species, female lay about 30- 300 eggs.
- Eggs are brown or blackish.
- Eggs are ovoid in shape, 0.5 mm in size
- Some species laid eggs directly on the water surface and others laid eggs stuck together in egg rafts.
- Eggs can’t survive desiccation.
- Eggs hatched within 2-14 days depending on temperature.

Anopheline

Culicine

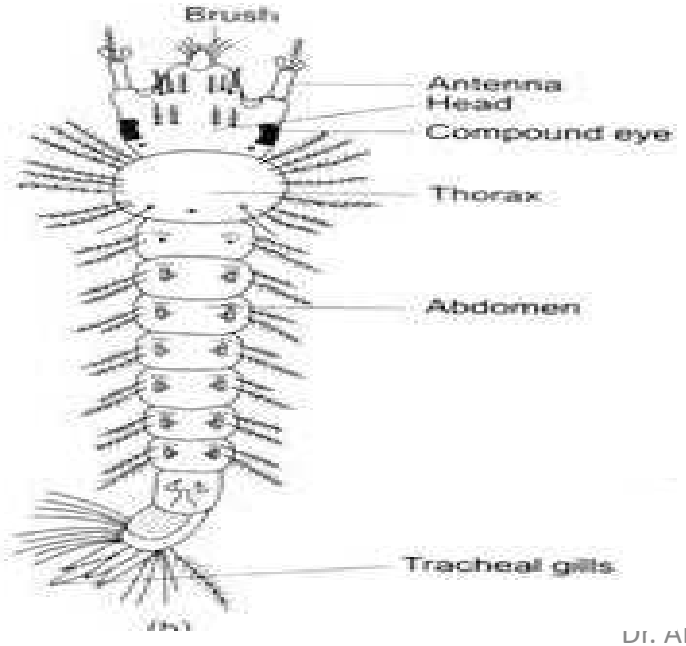


Differences of mosquitoes species

5- larvae

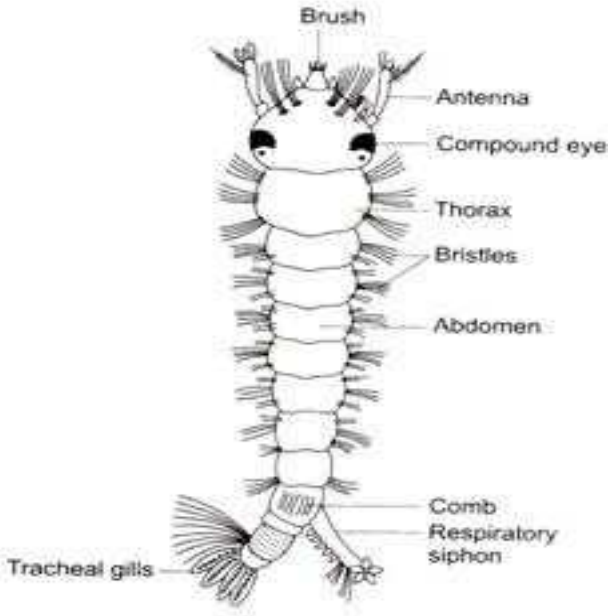
Anopheles

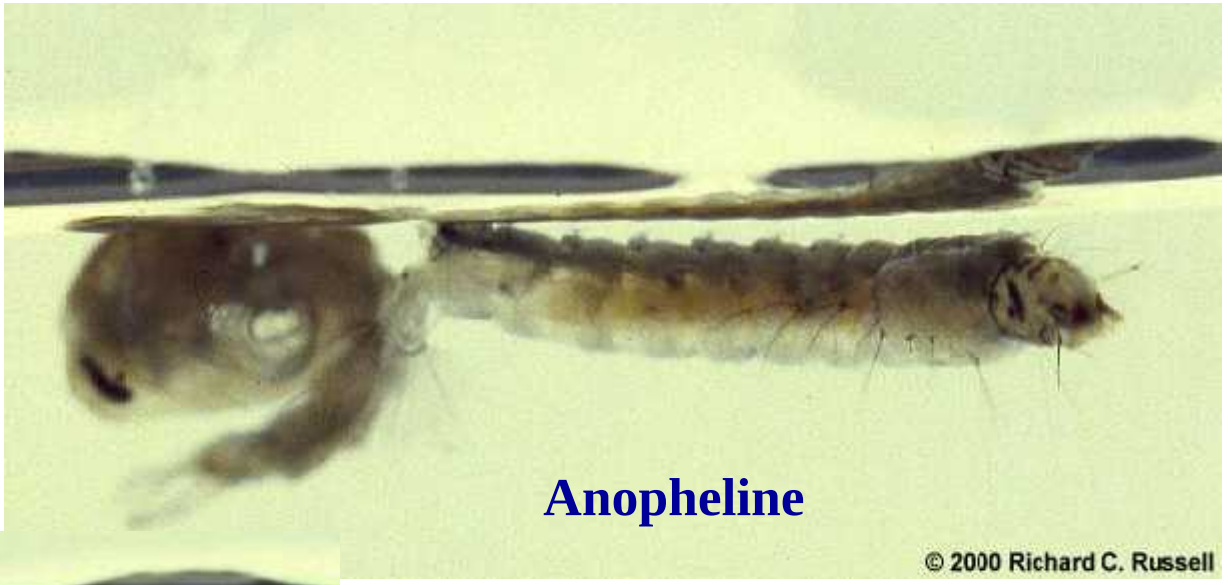
- Head is longer than broad
- Feeds on water surface.
- No siphon tube.

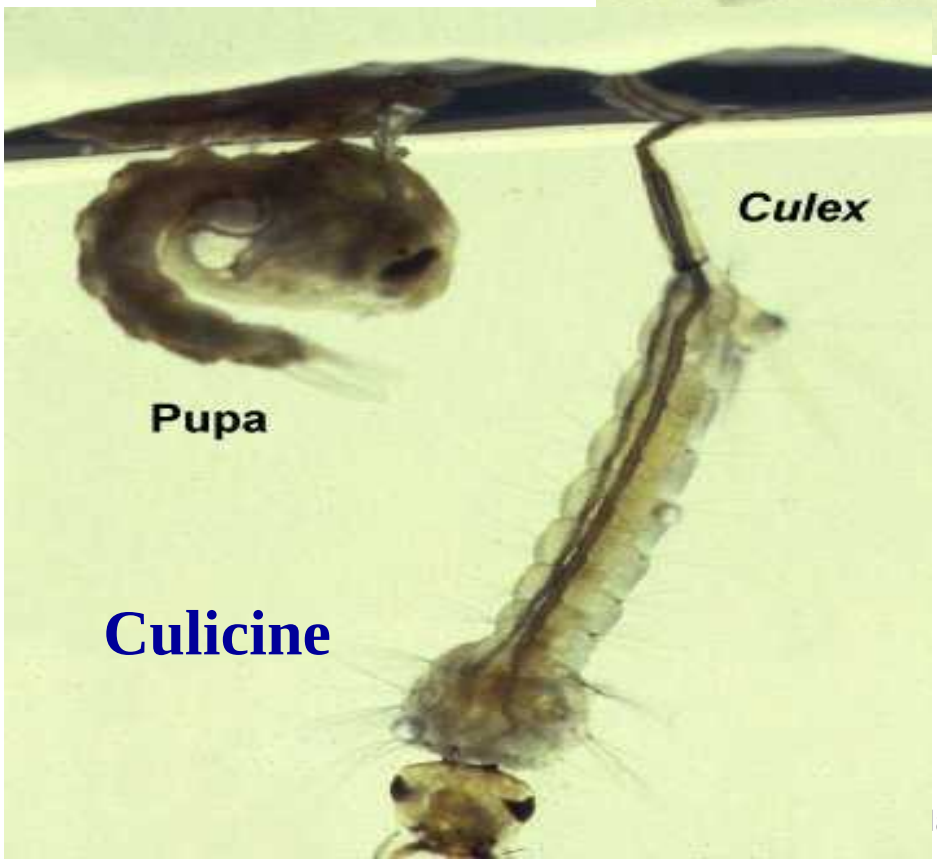


Culex

- Head is rounded
- Feeds **below** water surface.
- Possess siphon tube.




Anopheline
© 2000 Richard C. Russell

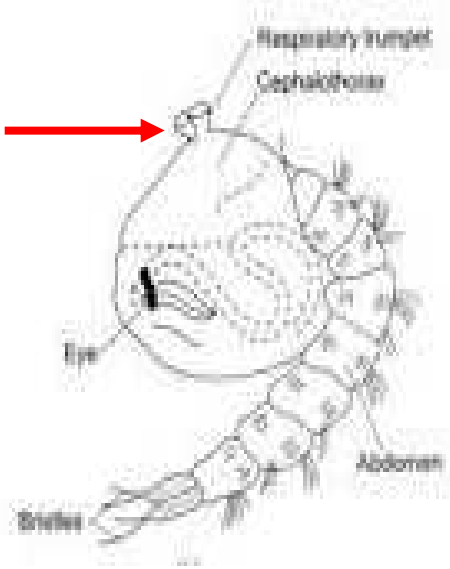

Culex
Pupa
Culicine

Differences of mosquitoes species

6- Pupa

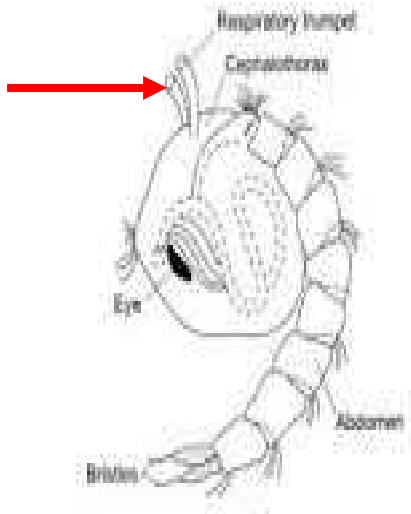
Anopheles

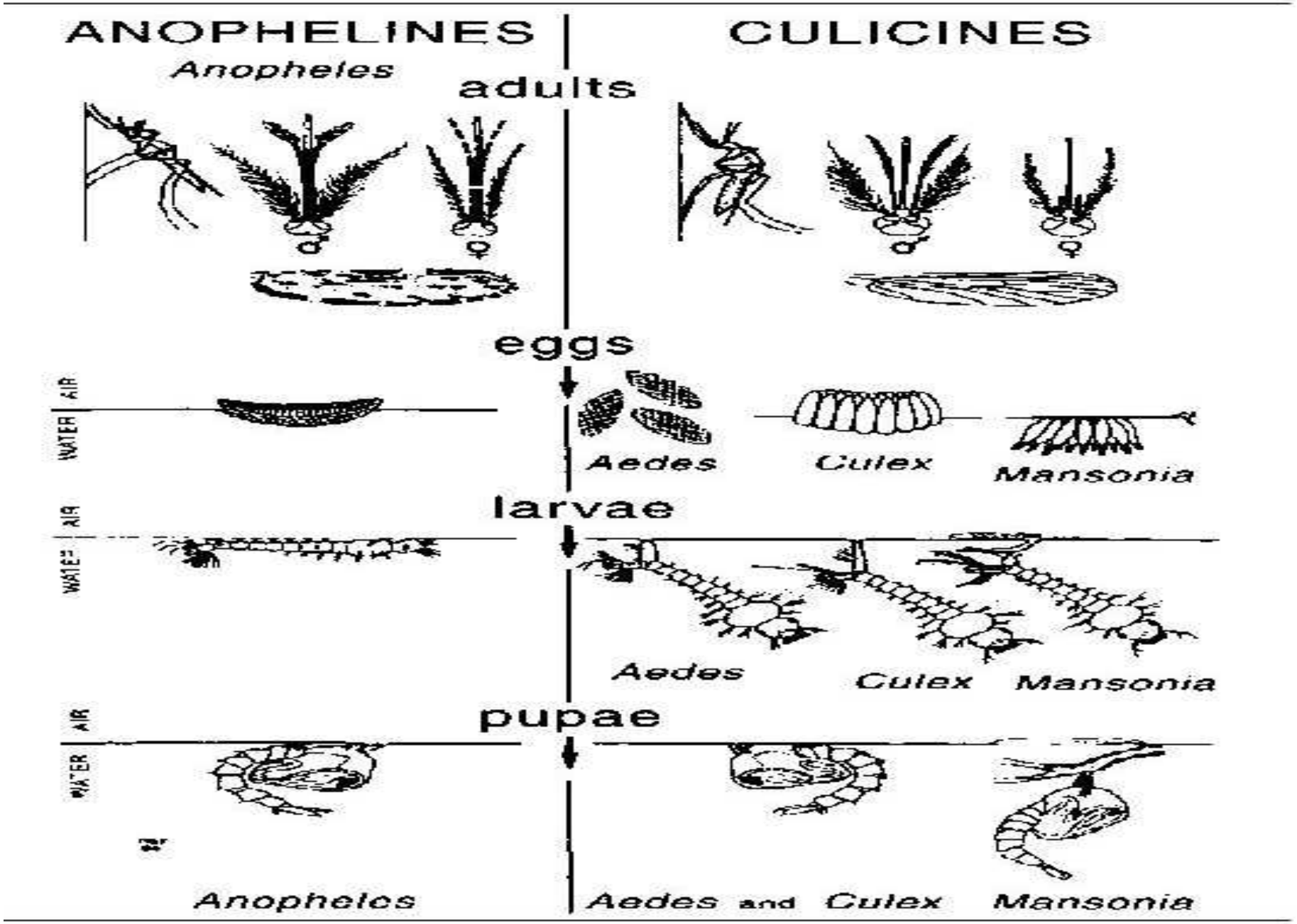
- Respiratory trumpets are **short and broad**



Culex

- Respiratory trumpets are **long and narrow**




ANOPHELINES
CULICINES
Anopheles
adults
♂
♀
eggs
AIR
WATER
Aedes
Culex
Mansonia
larvae
AIR
WATER
Aedes
Culex
Mansonia
pupae
AIR
WATER
Anopheles
Aedes and Culex
Mansonia

Larval Habitats of Mosquitoes

- Mosquito larvae can be found in numerous habitats.
- Each habitat produces specific mosquito species.
- **Habitats can be generally grouped into four types: Running Water, Transient Water, Permanent Water,** or **Container.**

Transient Water

- Transient water sources, such as flooded areas, snow pools, and ditches.
- Used as breeding grounds for mosquito species whose eggs can withstand desiccation, such as ***Aedes sp.***

Permanent water

- These waters (also known as Semi-permanent).
- Present for extended periods of time and support characteristic aquatic vegetation.
- Genera associated with permanent water are ***Anopheles, Culex***.

Containers

- Container water habitat can be found in both natural settings, such as water **held by plants**
- Artificial settings, such as water found in **tires**.
- **Tree hole sites** generally have enriched water which is characteristically clear, with rotting wood at the bottom.
- Many treehole species now also use artificial sites, such as tires since they provide insulation against the weather and are more numerous.

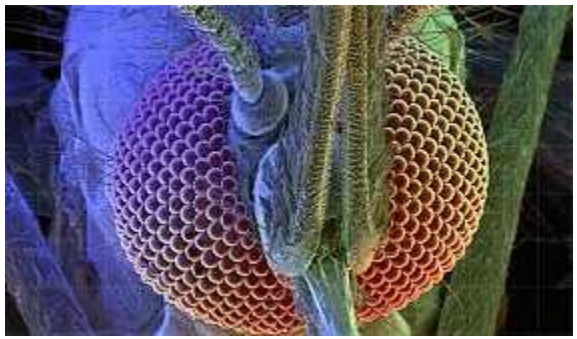
Containers

Artificial containers are a convenient mode of transporting a species of mosquito outside of it's natural range.

Adult Feeding

Finding host

1-By sight (movement)



2- Detecting infrared radiation

3- Chemical signals: CO2, lactic acid.

Why are some people more attractive to mosquitoes than others?

- Scientists are still investigating the complexities involved with mosquito host acceptance and rejection.
- Some people are highly attractive to mosquitoes and others are rarely bothered.
- Mosquitoes have specific requirements to satisfy and process many different factors before they feed.

Why are some people more attractive to mosquitoes than others?

- Many of the mosquito's physiological demands are **poorly understood** and many of the processes they use to evaluate potential blood meal hosts remain a mystery.
- Female mosquitoes use the **CO2** we exhale as their primary cue to our location.
- A host seeking mosquito is guided to our skin by following the slip stream of CO2 that exudes from our breath.

Why are some people more attractive to mosquitoes than others?

- Once they have landed, they rely on a number of short range attractants to determine if we are an acceptable blood meal host.
- **Folic acid** is one chemical that appears to be particularly important.
- Fragrances from hair sprays, perfumes, deodorants and soap can cover these chemical cues.

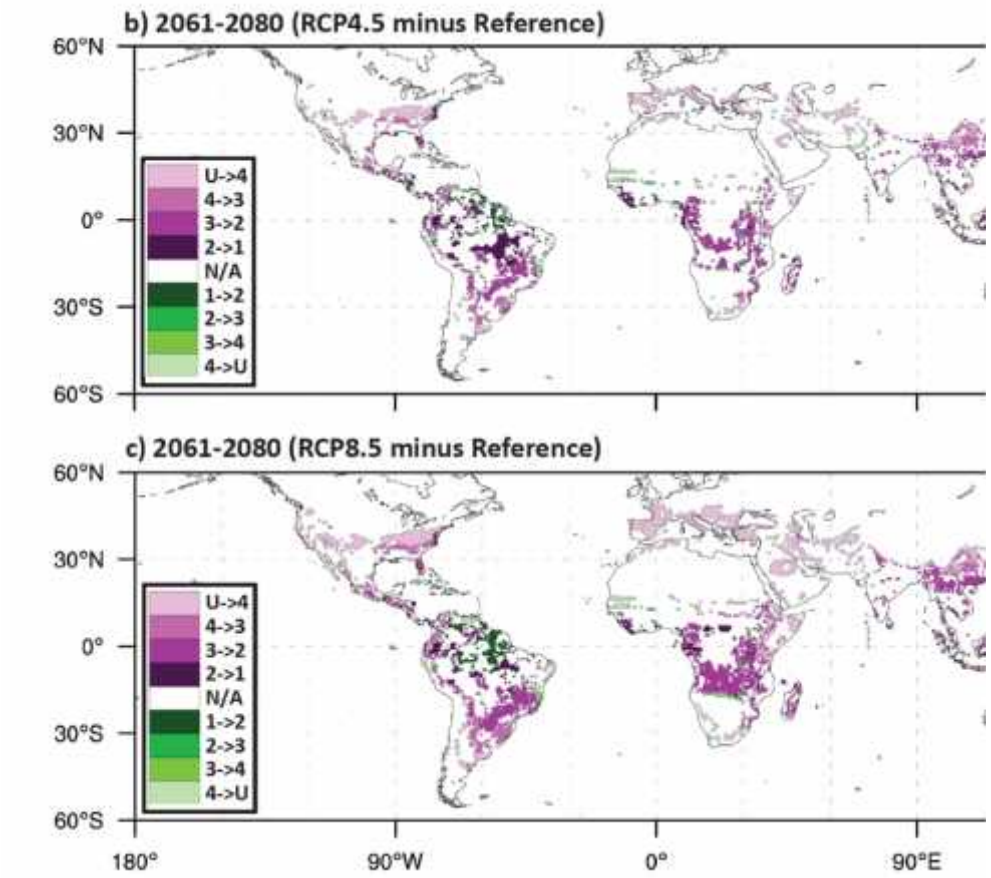
Why are some people more attractive to mosquitoes than others?

- Dark colors capture heat and make most people more attractive to mosquitoes.
- Light colors refract heat and are generally less attractive.

In most cases, only the mosquito knows why one person is more attractive than another???.

Seasonal Distribution

- **Above 10º C** mosquitoes will move from their hiding places and become active.
- they are prevalent from **May to October.**



Hibernation

- Mosquitoes, like all insects, are **cold blooded creatures**.
- As a result, they are **incapable of regulating body heat** and their temperature is essentially the same as their surroundings.
- **In tropical areas**, mosquitoes are active year round.
- **In temperate climates**, adult mosquitoes become inactive with the onset of cool weather and enter hibernation to live through the winter.

Hibernation

- Some kinds of mosquitoes have winter hardy eggs and hibernate as embryos in eggs laid by the last generation of females in late summer.

- The eggs are usually submerged under ice and hatch in spring when water temperatures rise.

- Other kinds of mosquitoes overwinter as adult females that mate in the fall, enter hibernation in animal burrows, hollow logs or basements and pass the winter in a state of torpor.

Hibernation

- In spring, the females emerge from hibernation, blood feed and lay the eggs that produce the next generation of adults.

- A limited number of mosquitoes overwinter in the larval stage, often buried in the mud of freshwater swamps.

- When temperatures rise in spring, these mosquitoes begin feeding, complete their immature growth and eventually emerge as adults to continue their kind.

HABITAT









photo by Tim Deschamps

Mosquitoes and diseases

1- Annoyance pest

- A mosquito bite may induce local dermatitis or even systematic reaction in sensitive persons.
- Can produce a severe allergic reaction.

Mosquitoes and diseases

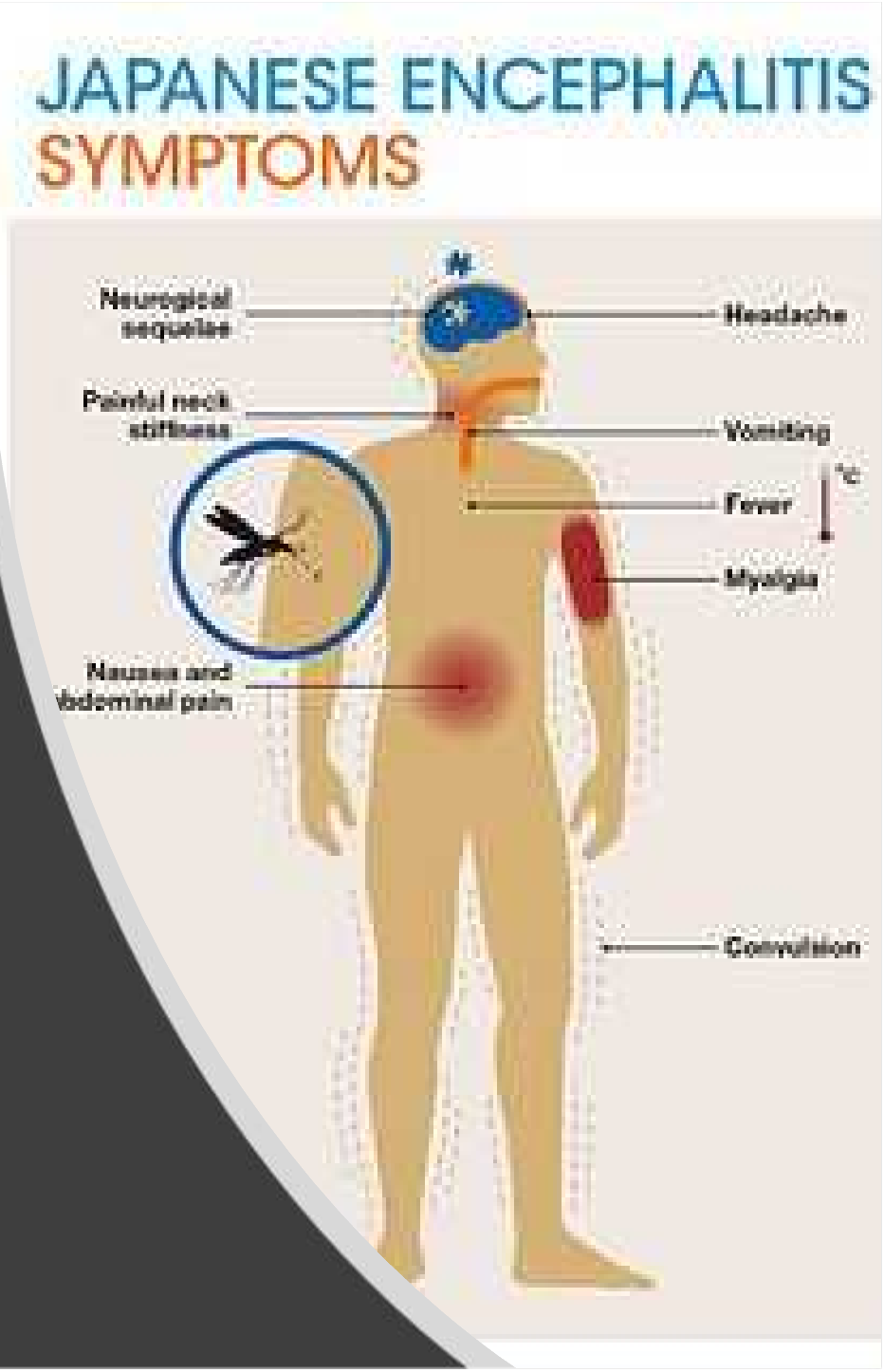
2- Parasitic diseases:

Malaria and filariasis.

Mosquitoes and diseases

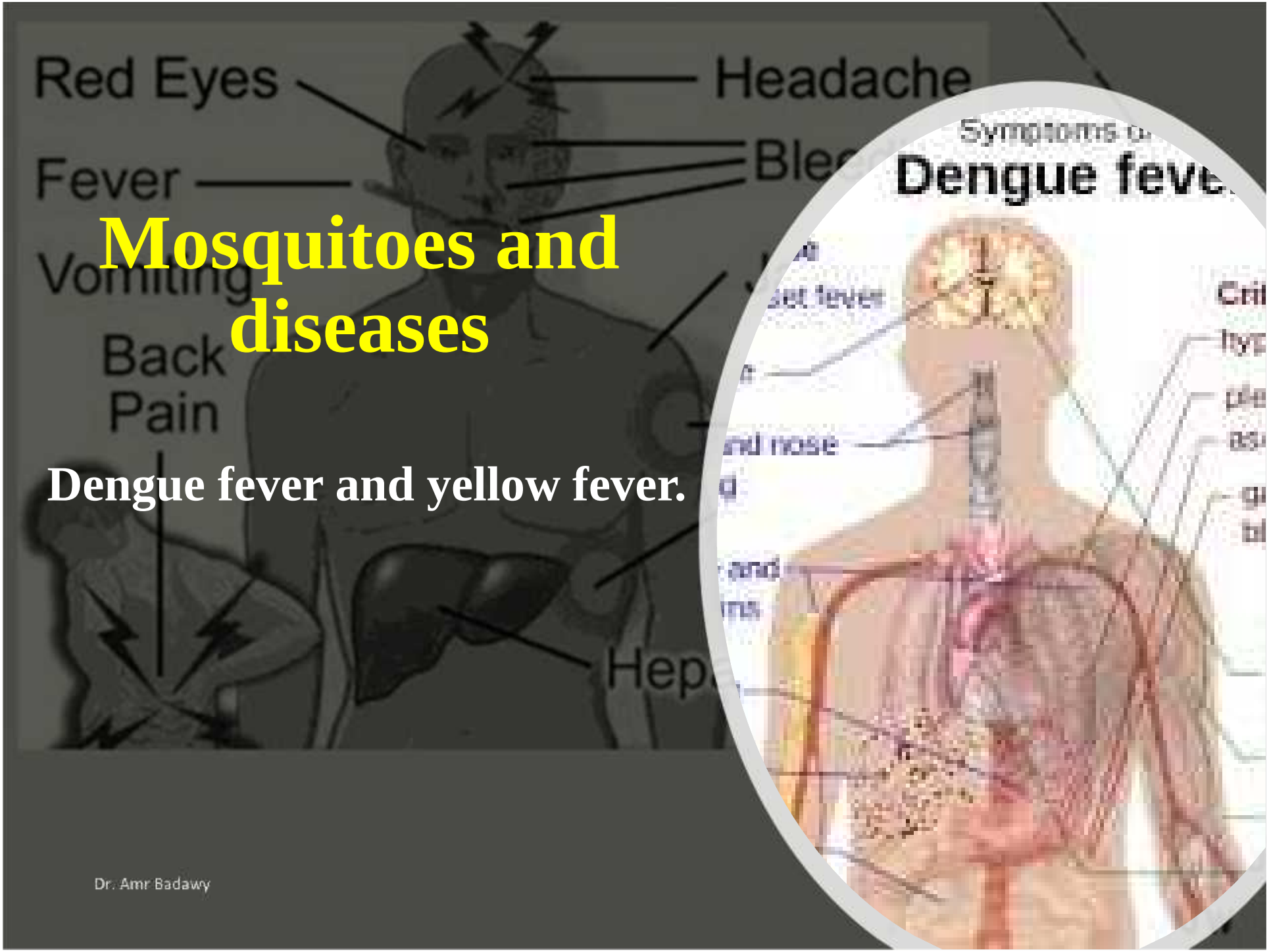
3- Virus diseases

Japanese encephalitis B, mainly by *Aedes* and *Culex*.



Mosquitoes and diseases

Dengue fever and yellow fever.



Mosquitoes and diseases

4- Mechanical transmitter

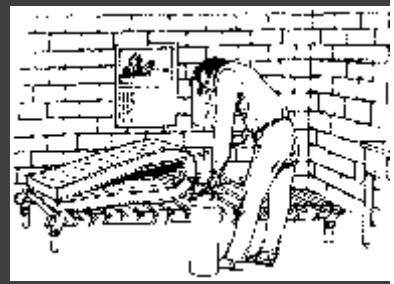
Some mosquitoes may carry fly eggs to humans, inducing myiasis.

Control
Directed at the Immature Stages

- **Biological Control**
  - Predators
  - Pathogens and Parasites
  - Genetic Control
- **Mechanical (Environmental) Control**
  - Source Reduction
  - Environmental Manipulation
- **Chemical Control**
  - Oils
  - Paris Green
  - Insecticides
  - Insect Growth Regulators

Control Directed at the Adult Stages

- Aerosols, Mists and Fogs
- Residual house-spraying



Flies

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Flies

True flies are insects of the order **Diptera**.

Two pairs of **membranous wings**.

Flies have a **mobile head**, with a pair of large **compound eyes**.

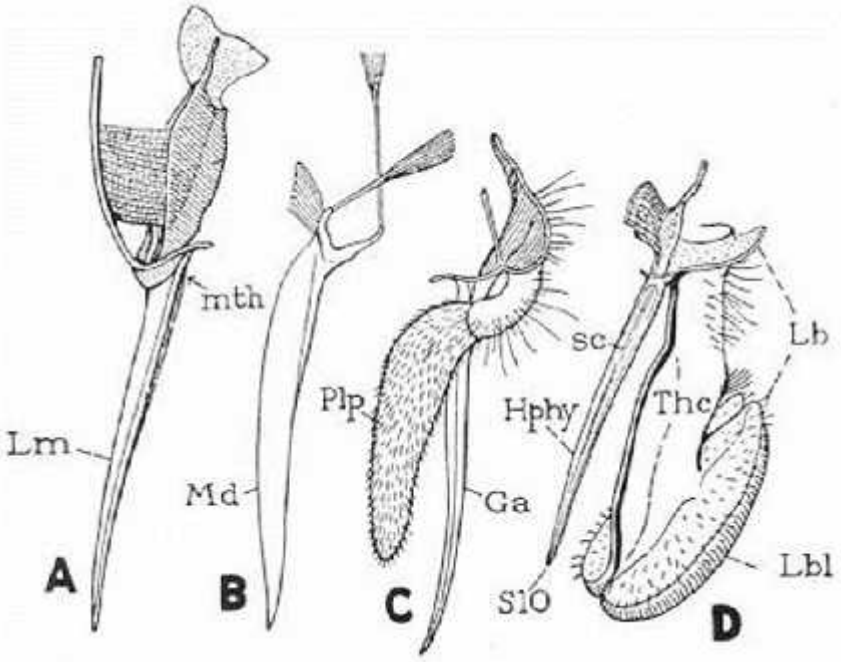
mouthparts designed for **piercing and sucking** or for **lapping and sucking**.

Their wing arrangement gives them great **maneuverability in flight**.

claws and pads on their feet enable them to cling to smooth surfaces.

Adult fly

Claws and pads



Mouth parts

Flies

Flies undergo **complete metamorphosis**.

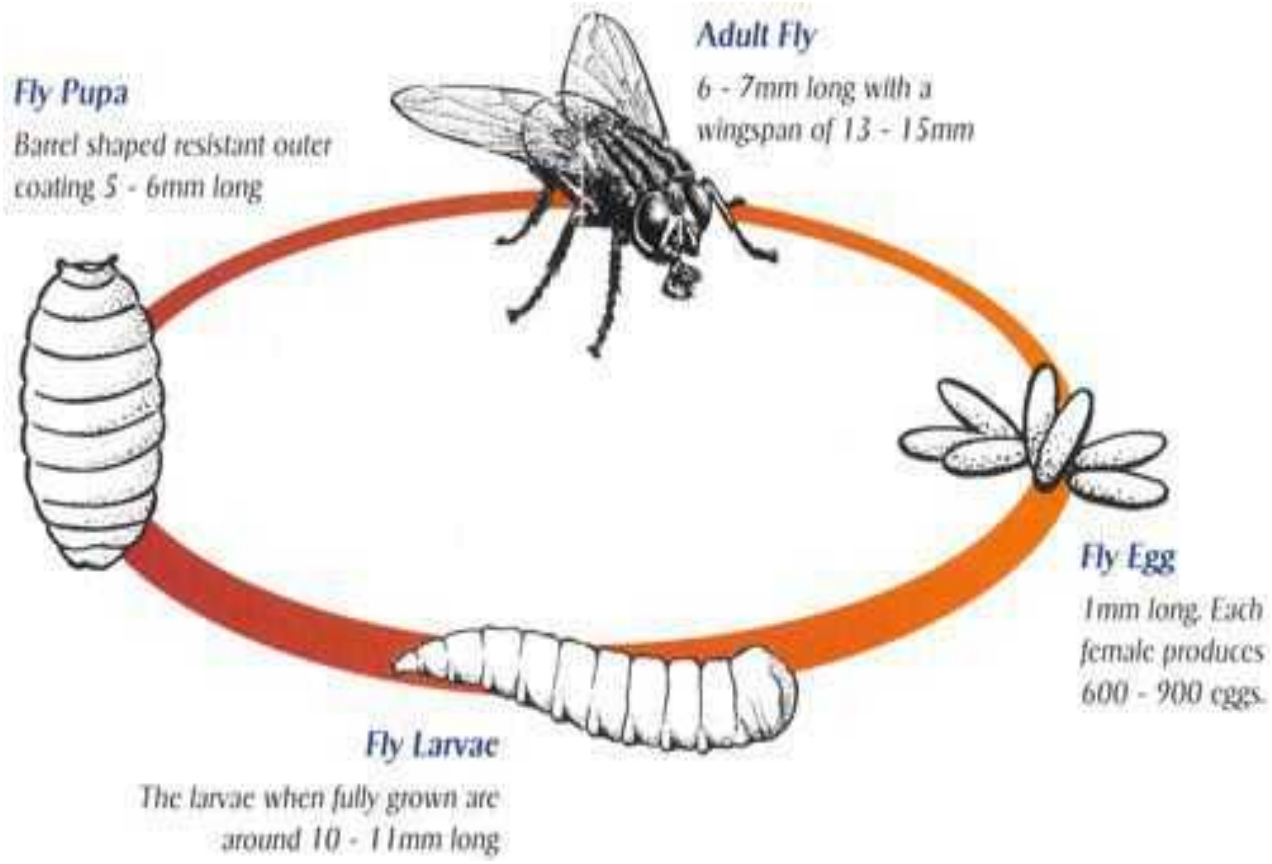
the eggs are laid on the **larval food-source**.

the larvae, which **lack true limbs**, develop in a protected environment, often inside their source of their food.

The pupa is a **tough capsule** from which the adult emerges when ready to do so.

flies mostly have short lives as adults.

Flies life cycle



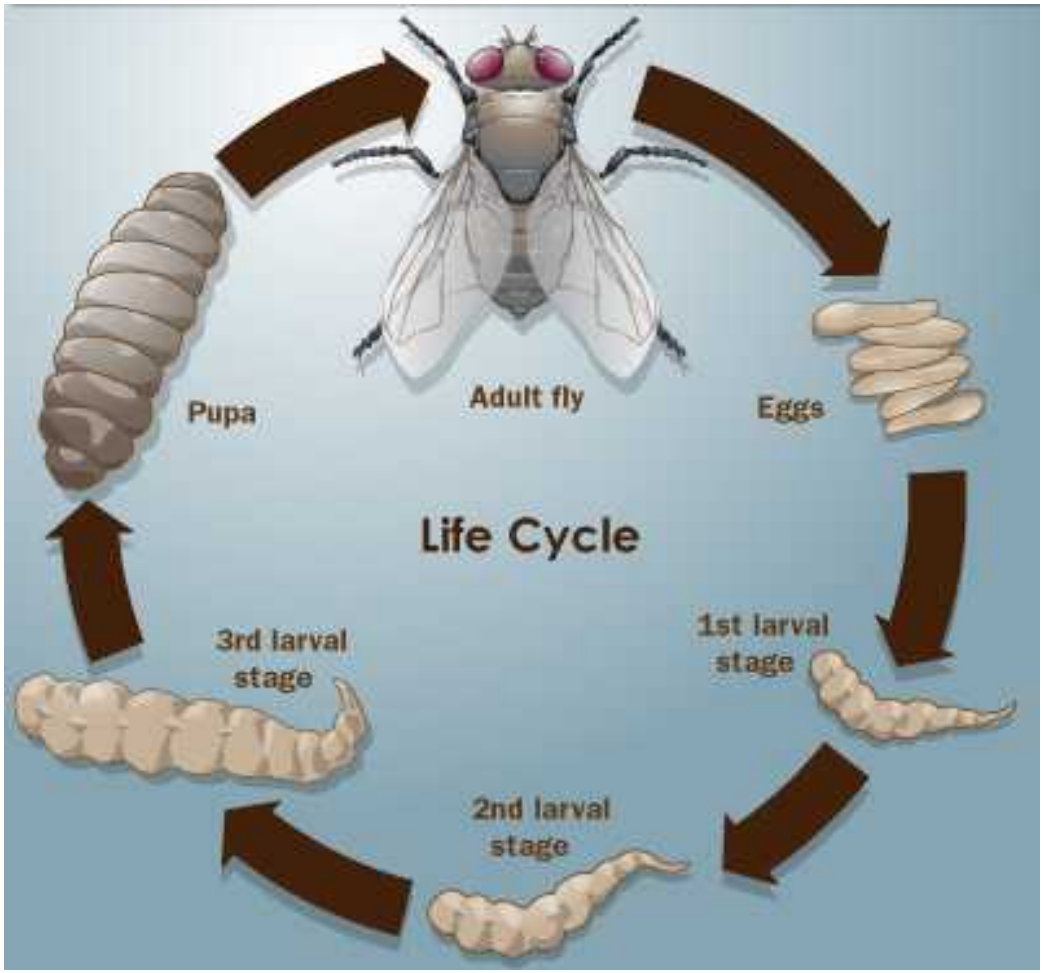
House fly taxonomy

- Order : Diptera
- Family : Muscidae
- Subfamily: Muscinae
- Tribe : Muscini
- E.g. : *Musca domestica*

House fly

One of the most familiar and widely distributed of all insects.

Scientists have calculated that a pair of flies beginning reproduction in **April** may be progenitors, under optimal conditions and if all were to live, of **191,010,000 ,000,000,000,000** flies by **August**.


Adult fly
Eggs
1st larval stage
2nd larval stage
3rd larval stage
Pupa
Life Cycle

Dr. Amr Badawy

House fly life cycle

white eggs, about 1.2 mm in length,

laid singly.

Each female fly can lay up to 500 eggs in several batches of about 75 to 150 eggs

The number of eggs produced is a function of female size, which is principally a result of larval nutrition.

Dr. Amr Badawy

Dr. Amr Badawy

Larvae

- The mature larva is 3 to 9 mm long, typical creamy whitish in color, cylindrical but **tapering toward the head**
- The head contains **one pair of dark hooks**
- **Legless**
- The posterior spiracles are slightly raised and the spiracular openings are sinuous slits which are completely surrounded by an oval black border.

Larvae

- feed on and develop in organic material where the eggs were laid.
- The larvae go through **three instars**
- When the maggots are full-grown, they crawl up to 50 feet to a dried, cool place near breeding material and transform to the pupal stage.


2 mm

Pupae

- The pupae are dark brown and 8 mm long.
- The pupal stage is passed in a pupal case formed from the last larval skin which varies in color from **yellow, red, brown, to black** as the pupa ages

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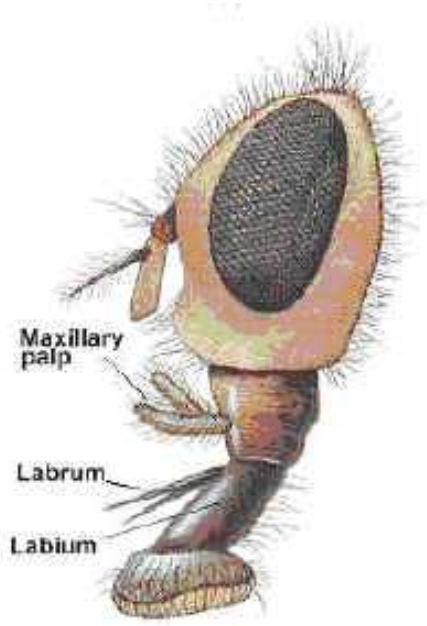
Adult

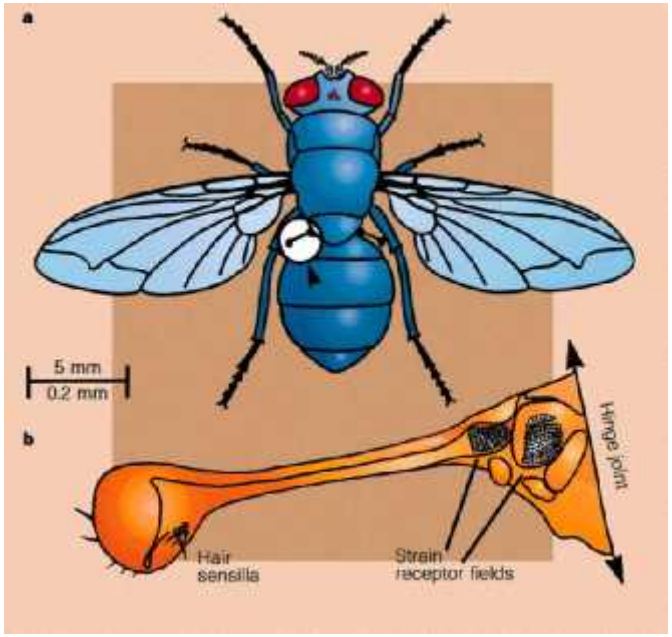
- Adult house fly is **6 to 7 mm long.**
- The **eyes are reddish**.
- It has an **aristate** antenna.
- A house fly has a **sponging mouthpart.**
- The sponging mouthpart is modified into a flattened, rounded structure used for sapping and sponging liquid and semi-liquid food.
- Thorax is **gray, with four dark longitudinal dark lines on the back.**



House Fly

Adult

- There are **three pairs of walking up-side down legs**.
- Their whole body is **covered with hair.**
- houseflies have only one pair of wings; the hind pair is reduced to small **halteres** that aid in flight stability.

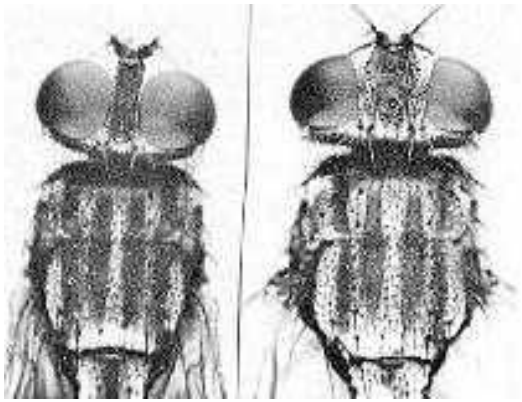

a
5 mm
0.2 mm
b
Hinge joint
Hair
sensilla
Strain
receptor fields

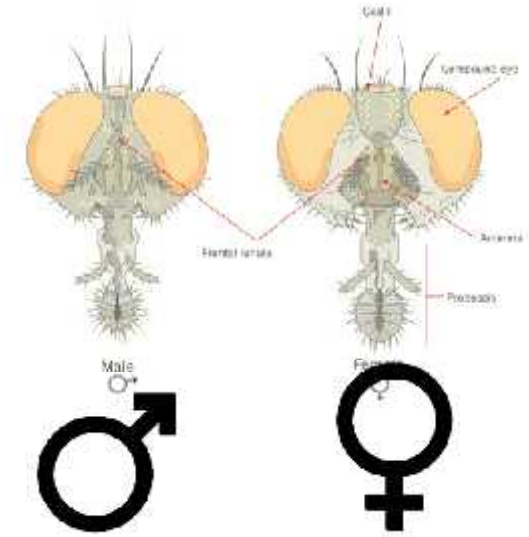

© Alex Wild

The difference between male & female house fly

- The females are slightly larger than the males.

- Females have a much larger space between their red compound eyes.





Medical importance

- transmission of pathogens (viruses, bacteria, fungi, protozoa, and nematodes)
- They are capable of carrying over 100 pathogens, such as typhoid, cholera, Salmonella, bacillary dysentery and parasitic worms.

House flies control

- Source Reduction for Larval Control.
- Biological Control via predators, parasites.
- Chemical Control (Insecticides).

Source Reduction for Larval Control

- Reducing standing water
- Reducing fecal material, rotting vegetable material
- General sanitation

Stable fly breeding ground

Draining standing water in California

Fly swarms in Cambodia garbage

Biological Control via predators, parasites

- Some are commercially available (e.g. *Muscidi furax raptor* for house fly control).
- Major emphasis of mosquito management in rice lands
- Some cases of entomopathogens managed for larval control

***Muscidifurax* parasitizing fly pupae (left) and empty pupal cases after paratization**

Fly maggot infested with parasitic nematodes that are killing the maggot.

Chemical Control (Insecticides)

- Applied to larval habitat
- Non-parasitic larvae: General environmental application for typical insecticides
- Parasitic Larvae: Oral/Dermal/Suppository/ Parenteral application of avermectins

Adult Fly Management

- Personal Protection
- Exclusion (buildings, small areas)
- Insecticides
  - Residual
  - Non-residual
- Other
  - Trapping in sensitive areas
  - Mating Disruption

Personal Protection

- Stay indoors at dusk & during evening hours
- Long shirts and pants
- Repellants
  - Deet:
    - N,N-diethyl-metatoluamide
    - 30%
  - Non-deet:
    - Eucalyptus oil
    - Avon Skin-So-Soft
    - Citronella oil

Mechanical Exclusion

- Shut them out
- Netting and Screening
  - 16-18 mesh

Tse Tse Flies

Tse Tse Flies

- Family Glossinidae
- One genus, Glossina, with 23 spp.
- All in subsaharan Africa
- Vector of African trypanosomiasis, "**Sleeping Sickness**"

Tse Tse Fly biology

- Both sexes **blood feed**
- Strong host preferences by species
  - **Humans are not preferred hosts of any species**
- Female usually only **mates one time.**
- Populations are often scattered at low densities over wide areas.
- Flies **congregate** near hosts as a way of mate location

Medical importance

- Trypanosmiasis.
- West African Sleeping Sickness.
- East African Sleeping Sickness.

Control

- the larvae and pupae are well protected in the soil, all controlling processes is aimed at the adults.
- Distribution of the tse tse flies is largely determined by types of vegetation and microclimate.
- Using of insecticides,(DDT, Dieldrin)

Sandflies

Dr. Amr Badawy

Sandflies

- Order: Diptera
- Family: Psychodidae
- *e.g.* : *Lutzomyia* spp.

Lutzomyia sp.

Dr. Amr Badawy

Sandflies Morphology

- Adults - small (less than 5 mm long),
- slender with **piercing mouthparts**
- long antennae
- wing veins are parallel to each other

Sandflies Life cycle

- Eggs are laid in dark humid animal burrows, cracks or crevices, or under dead leaves
- There are **4 larval instars**, the larval stage lasting a total of 4-6 weeks
- The pupa requires 10 days for development
- Life cycle requires 40-50 days
- Only adult females suck blood
- Adult life span 2-3 weeks, 30-50 eggs/female.

Life cycle

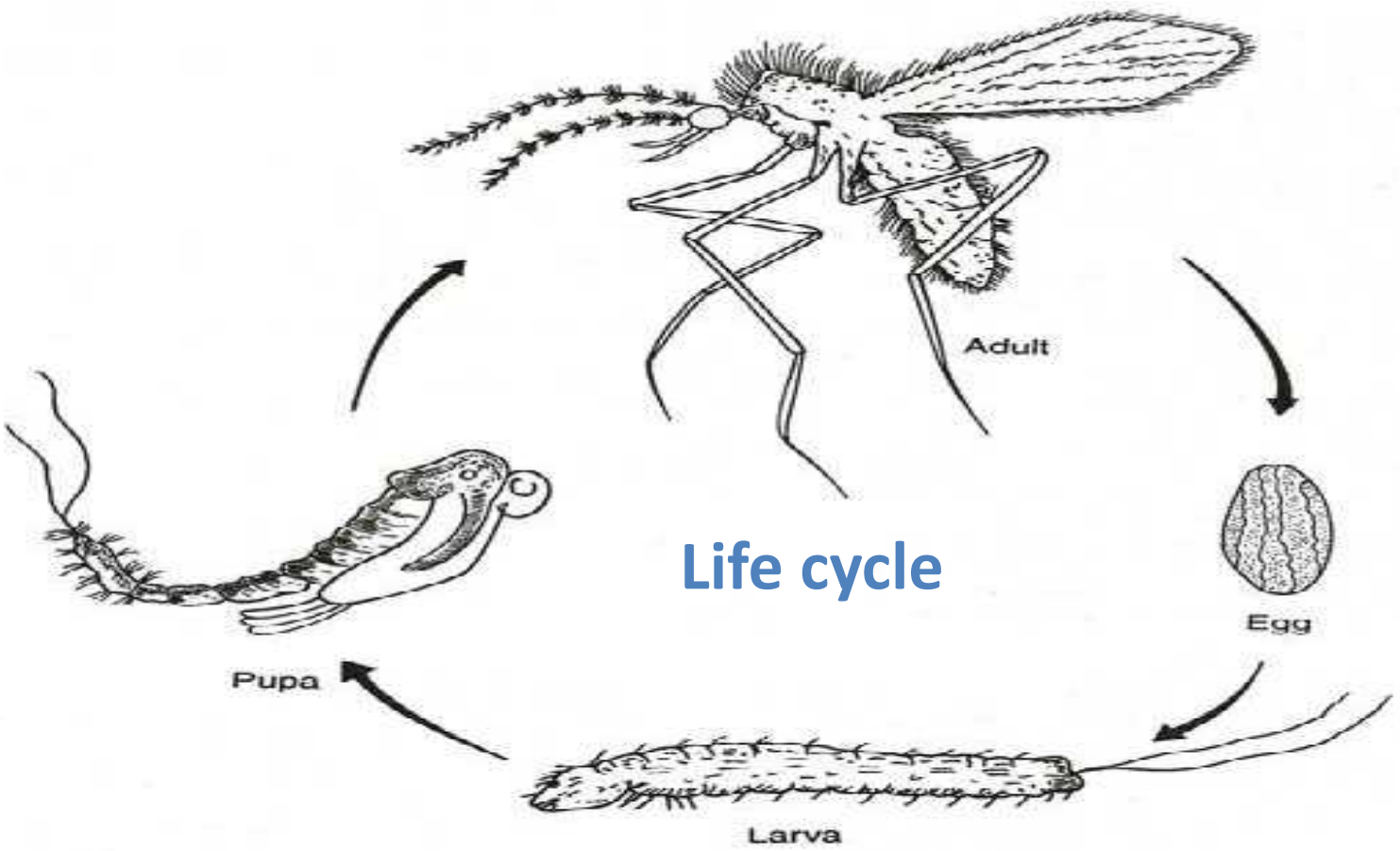


Fig. 169. Life cycle of sandfly.

Sandflies Habits

- Only female sandflies are blood sucker and they are nocturnal feeders.
- They are poor flier not over 200 m.
- Prevalent from May to September.
- Larvae survive through the winter.

Sandflies medical importants

- Transmit *Leishmania* spp. of humans and dogs,
- Carrion's disease (*Bartonella bacilliformis*),
- Viruses, sandfly fever

Sandflies control

- 1. Elimination of breeding grounds
- 2. Application of insecticides.
- 3. Personal protection.

HORSE FLY

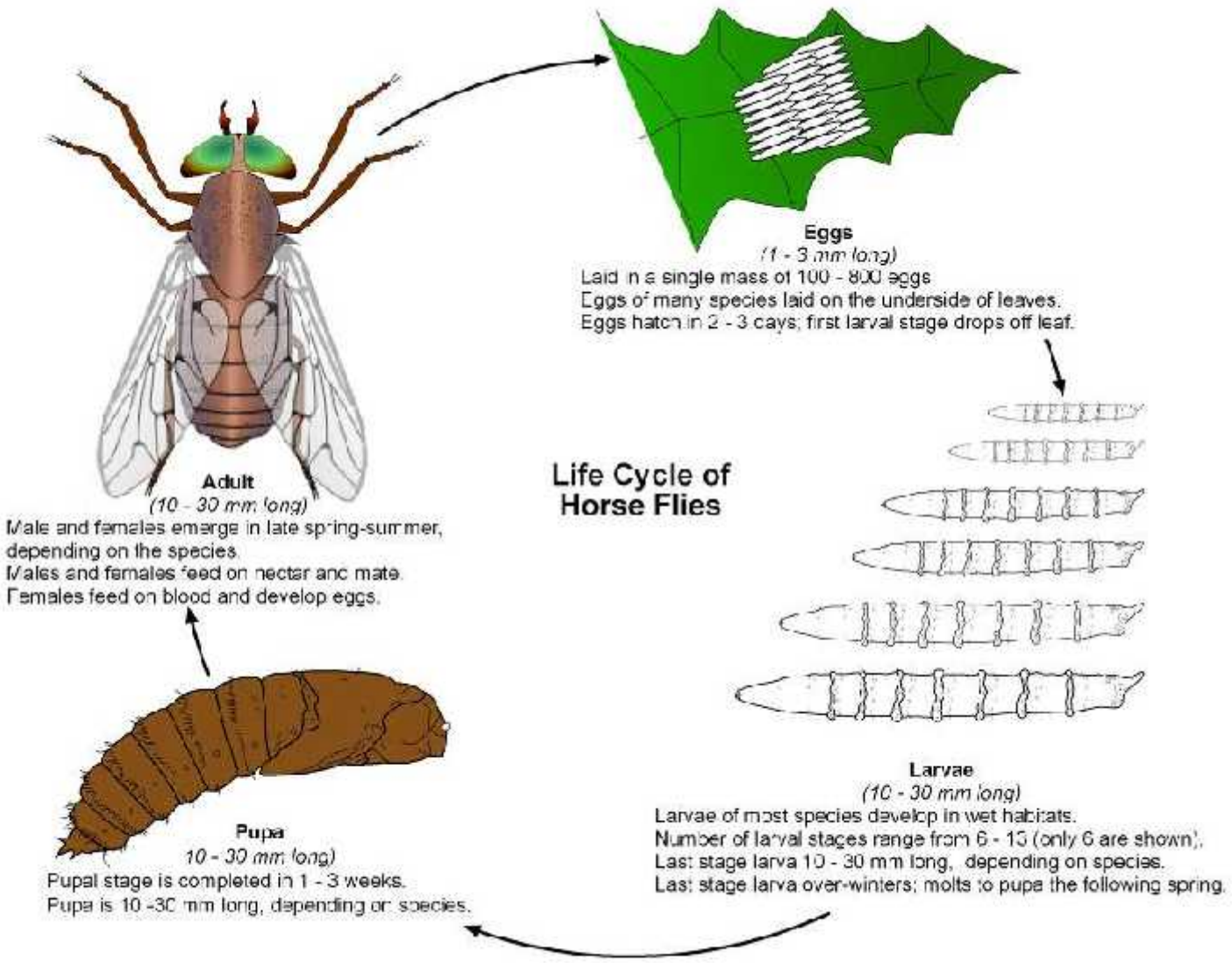
Dr. Amr Badawy

HORSE FLY

- Order :Diptera
- Suborder:Brachycera
- Family :Tabanidae
- E.g : ***Tabanus sp.***

HORSE FLY

- broad categories of biting, bloodsucking Tabanidae are variously known as breeze flies, clegs, klegs,
- habitually attack humans
- livestock are widely regarded as pests because of the bites that females of most species inflict, and the diseases and parasites that some species transmit.

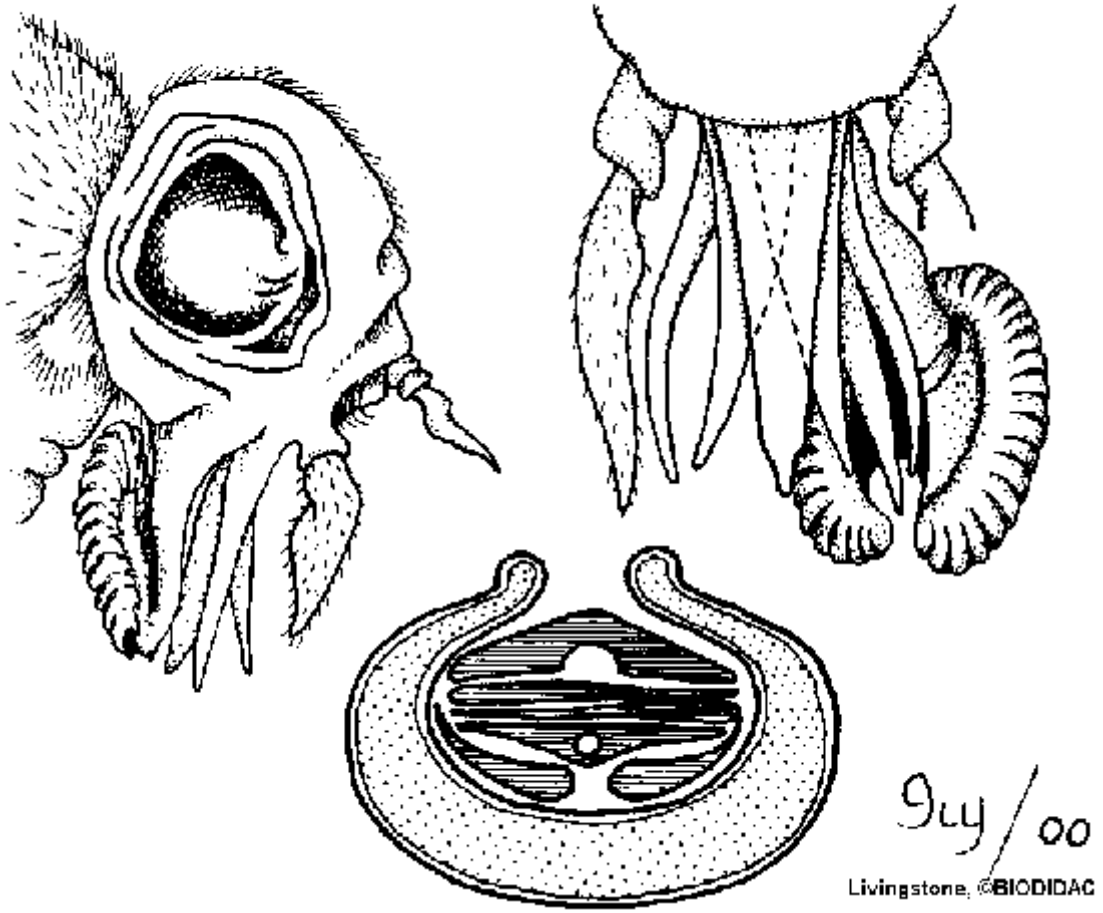

Life Cycle of
Horse Flies
Eggs
(1 - 3 mm long)
Laid in a single mass of 100 - 800 eggs
Eggs of many species laid on the underside of leaves.
Eggs hatch in 2 - 3 days; first larval stage drops off leaf.
Larvae
(10 - 30 mm long)
Larvae of most species develop in wet habitats.
Number of larval stages range from 6 - 15 (only 6 are shown).
Last stage larva 10 - 30 mm long, depending on species.
Last stage larva over-winters; molts to pupa the following spring.
Pupa
10 - 30 mm long)
Pupal stage is completed in 1 - 3 weeks.
Pupa is 10 -30 mm long, depending on species.
Adult
(10 - 30 mm long)
Male and females emerge in late spring-summer, depending on the species.
Males and females feed on nectar and mate.
Females feed on blood and develop eggs.

HORSE FLY

- Only females take blood.
- Anautogenous species usually need a single large blood meal
- Attracted to host by a variety of visual, chemical, and thermal cues

HORSE FLY

- Mouthparts use a scissor action to cut skin
- Saliva produces anticoagulant & vasodialator
- Lap up the pool of blood
- Wound often continues to bleed after the fly has fed (attracting other insects)
- Painful bite means that the flies are often selective on the body part that they target.



Mouthparts use a scissor action to cut skin

HORSE FLY Medical impotence

- Nuisance
- Allergy from saliva
- Secondary Infections
- Transmit a variety of pathogens to livestock and deer
  - Most of the serious problems are in the tropics of Africa and S. America
- Two significant human diseases.

1. Tularemia (caused by the bacterium *Francisella tularensis*.)
2. Loiasis (filarial nematodes)

Tularemia

Loiasis

HORSE FLY control

Trapping:

- black and shiny balls sticky traps.

- Malaise traps.

HORSE FLY control

Chemical management:

- Granular insecticides were applied to the water.
- Individual protection from adults can be obtained by using a repellent on exposed skin and clothing prior to exposure.

Fleas

Dr. Amr Badawy

Flea Biology and Ecology

Order: Siphonaptera

- Hind legs are adapted for jumping
- Adults are exclusively blood suckers (most are mobile, but some are attached)
- The “attached” species are like the ticks, they put their mouthparts in host and stays there for a while.
- Unfed adults live a long time, but they can’t really leave the area where they are so they just hang out waiting for a blood meal, and they are very active when looking.
- Somewhat host specific (not as host specific as lice), and it varies with species.

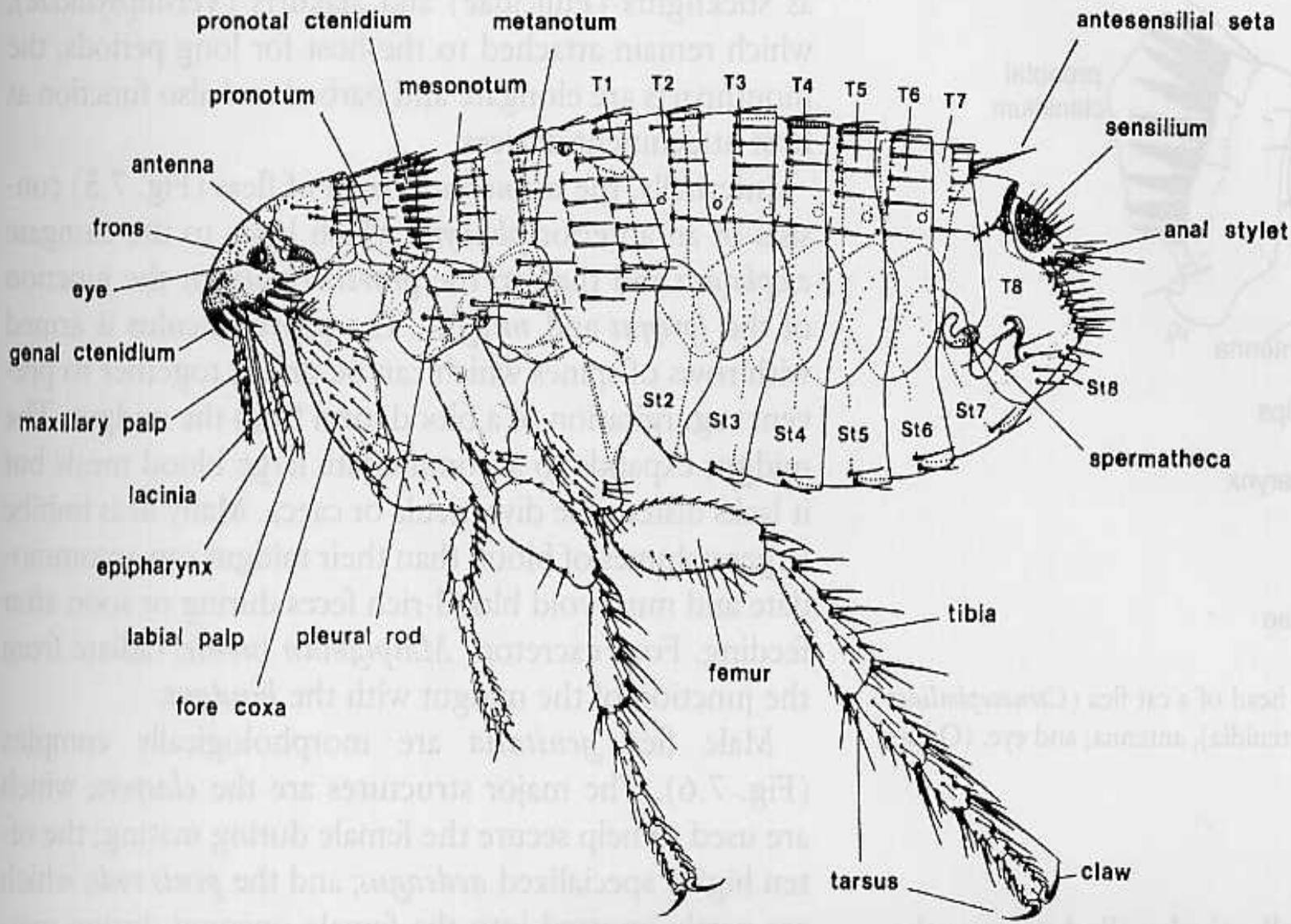
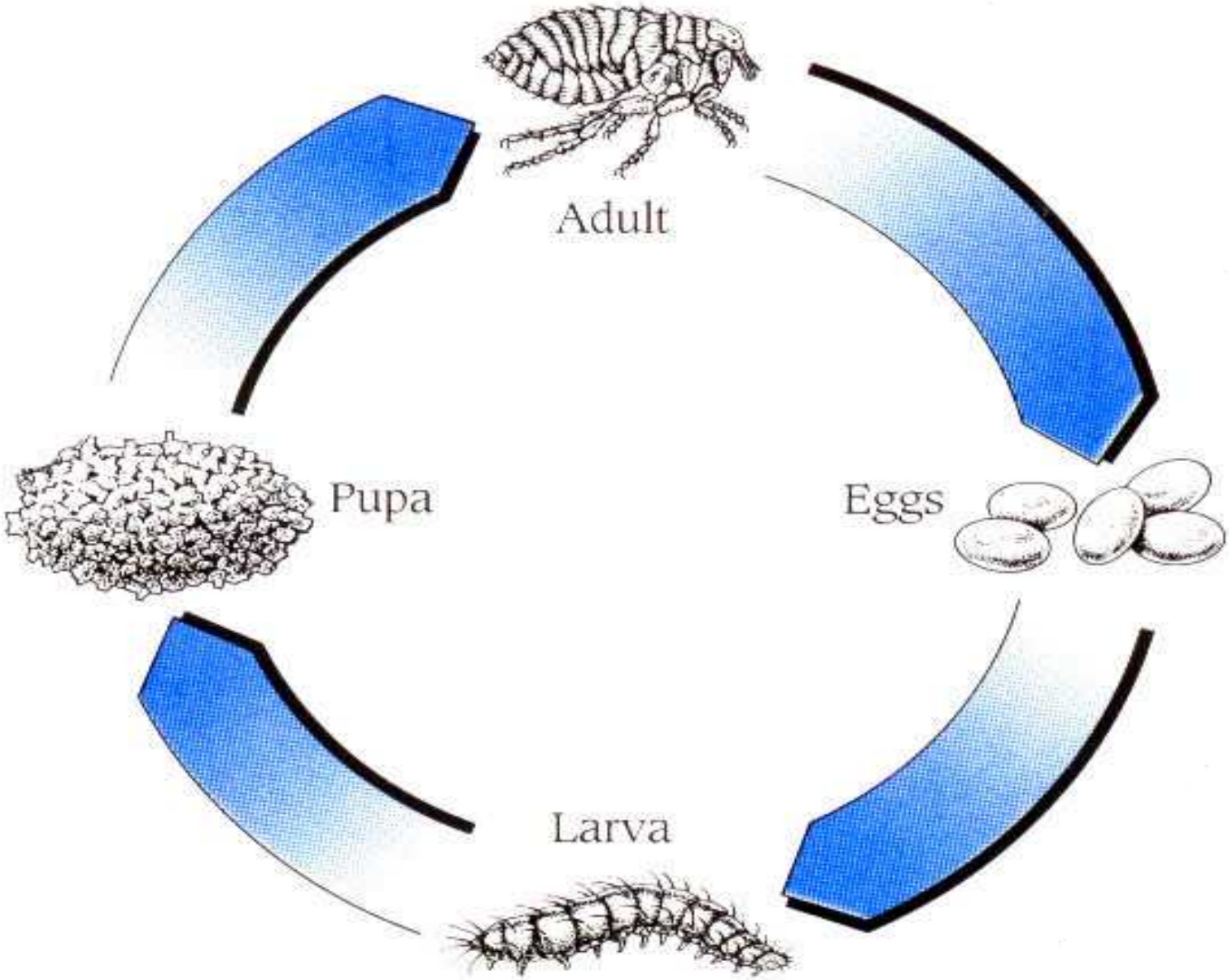


FIGURE 7.1 Morphology of generalized adult flea, female. T, abdominal tergites; St, abdominal sternites. (From Lewis, 1993b.)

Life Cycle

- Holometabolous
- Egg → Larvae → Pupa → Adult
  - 18 days to 20 months
- Eggs (3-18 at one time in several batches)
- Larvae need high humidity
  - 9-15 days optimal (up to 200 days)
- Pupa
  - 7 days to 1 year
- Adult
  - Live up to 4 years.



Flea Life Cycle

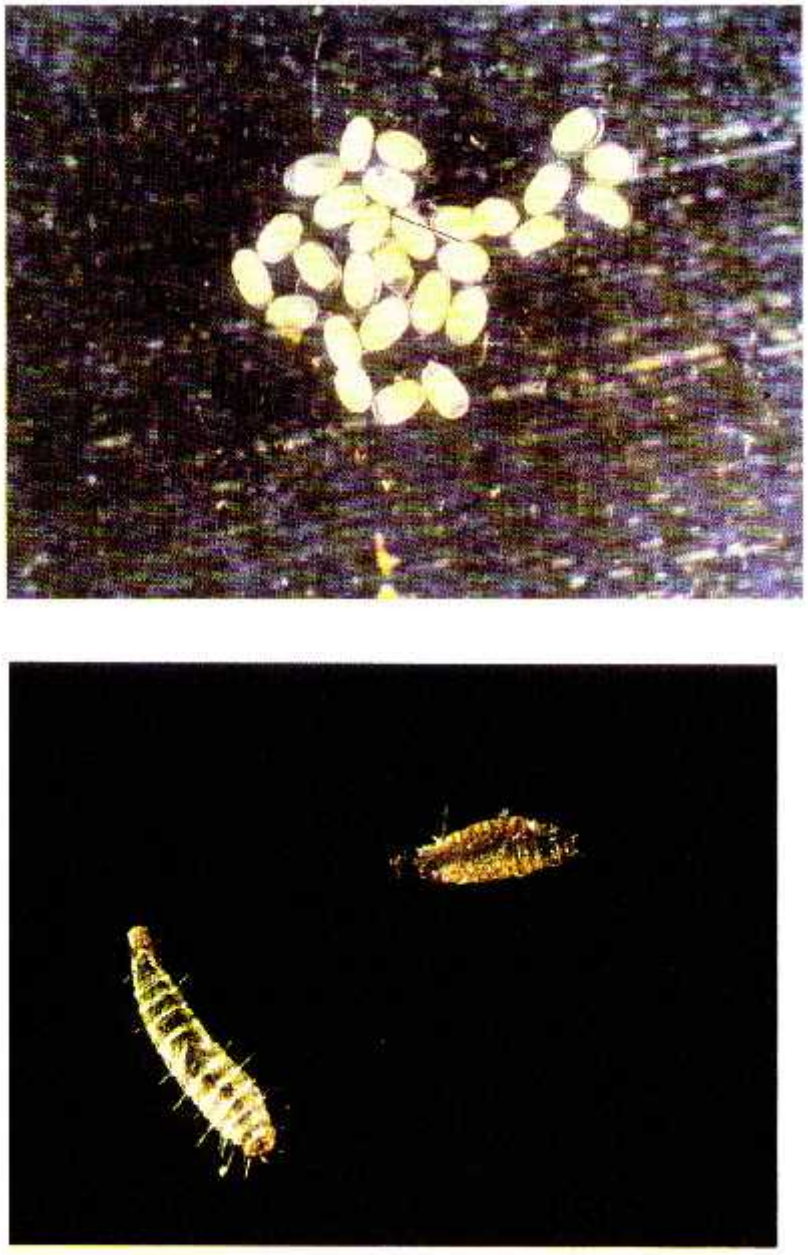
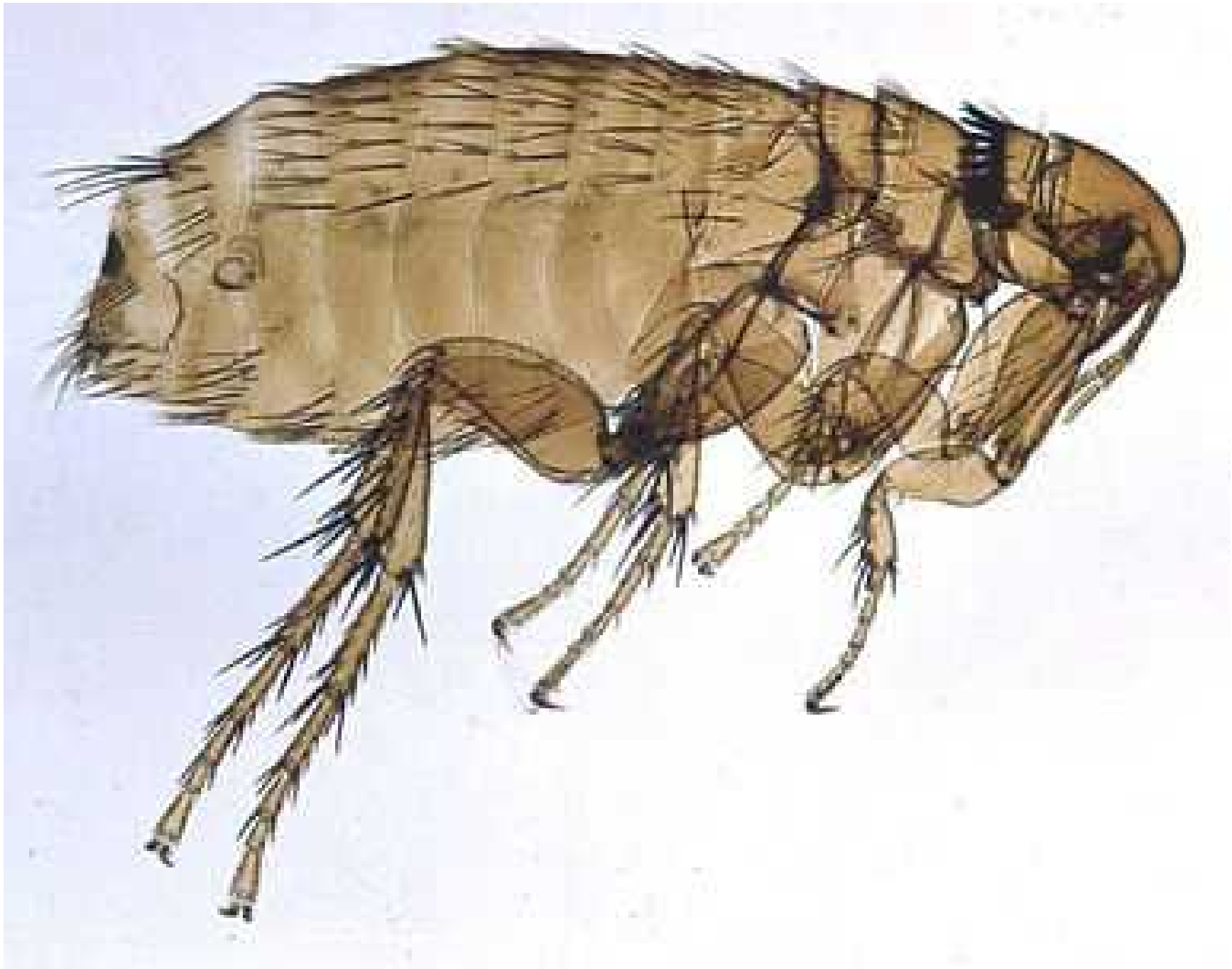


Fig. 9.10 Flea larvae. Long body hairs and anal struts can be seen.

(a)

(b)

Fig. 9.13 Flea cocoon. (a) Intact cocoon. (b) Flea from cocoon.



Important Flea Species

Xenopsylla cheopis (Oriental Rat flea) - primary urban plague vector [also *X. brasiliensis* in Africa, India and S. America - more rural]

Pulex irritans (Human flea) - occasional epidemic plague vector

Nosopsyllus fasciatus (Northern Rat flea - epidemic plague, murine typhus

Diamanus montanus (Common Ground Squirrel flea) - endemic plague vector in Western US

Primary pest species - ***Ctenocephalides felis, C. canis, P. irritans***

Medical Importance

(1) Irritation and Discomfort

(1) Dipylidium caninum (double-paired dog tapeworm)

(2) Tunga Penetrans

(3) Annoyance from bites

(2) Vectors of Disease

- Murine Typhus
- Bubonic Plague

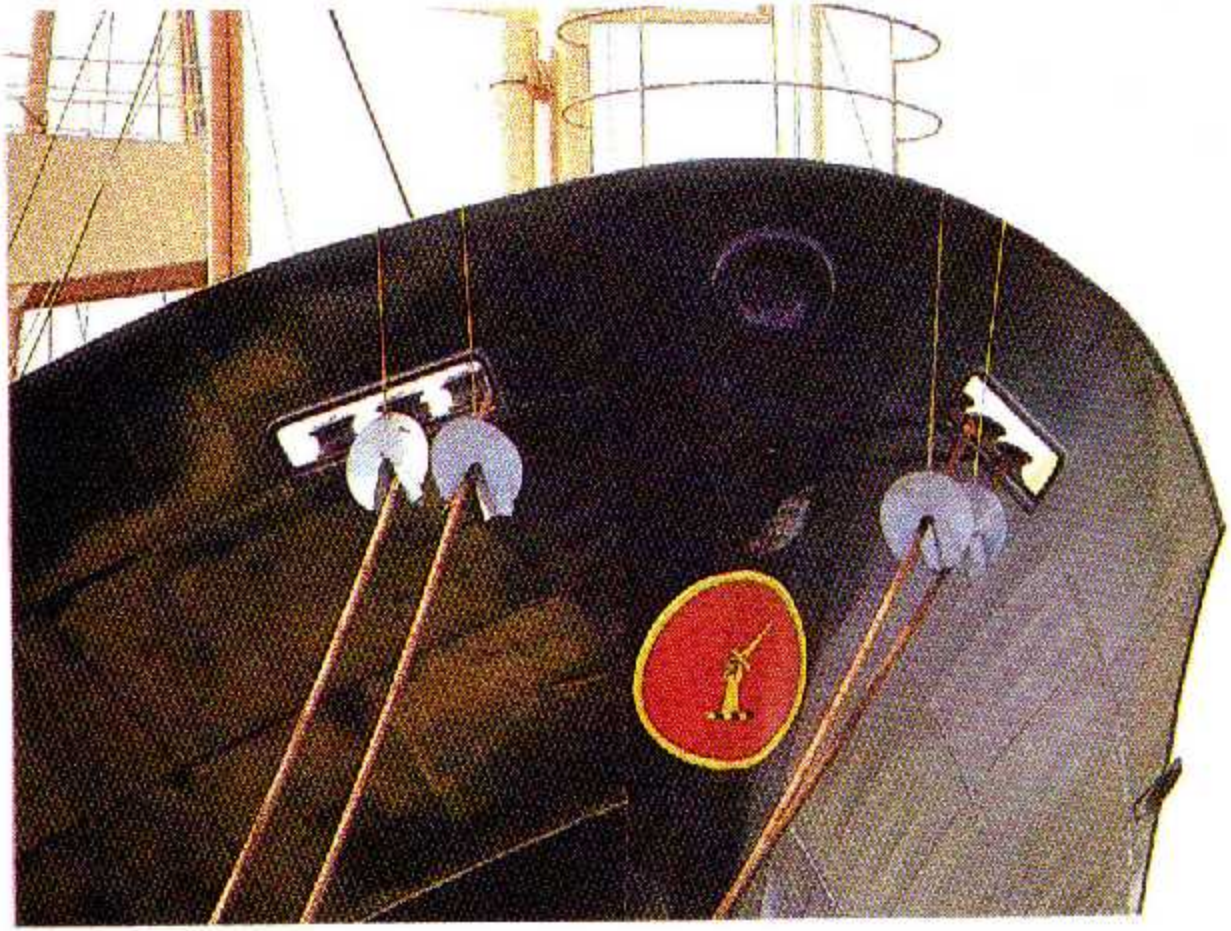
(3) Primary pest of an animal that has a home.

Flea Control

Sanitation – environmental clean up is important to destroying harborage for eggs, larvae, pupae and adults

Chemical Insecticides – apply to cats and dogs, spray rodent infested environments; flea collars often not very effective (incomplete coverage); topical application of insecticides absorbed through the skin

Insect Growth Regulators (IGRs) – topical application on animals; fumigation of affected rooms, etc.; ovicidal as well as insecticidal



45 Metal guards preventing access of rats along ships' hawsers Plague control demands strictly enforced rodent control measures and international quarantine regulations, particularly for shipping.

Tunga Penetrans

- Chigoe flea, jigger flea
- Does not transmit any disease.
- Small size, and very compressed.
- Females burrow into skin.

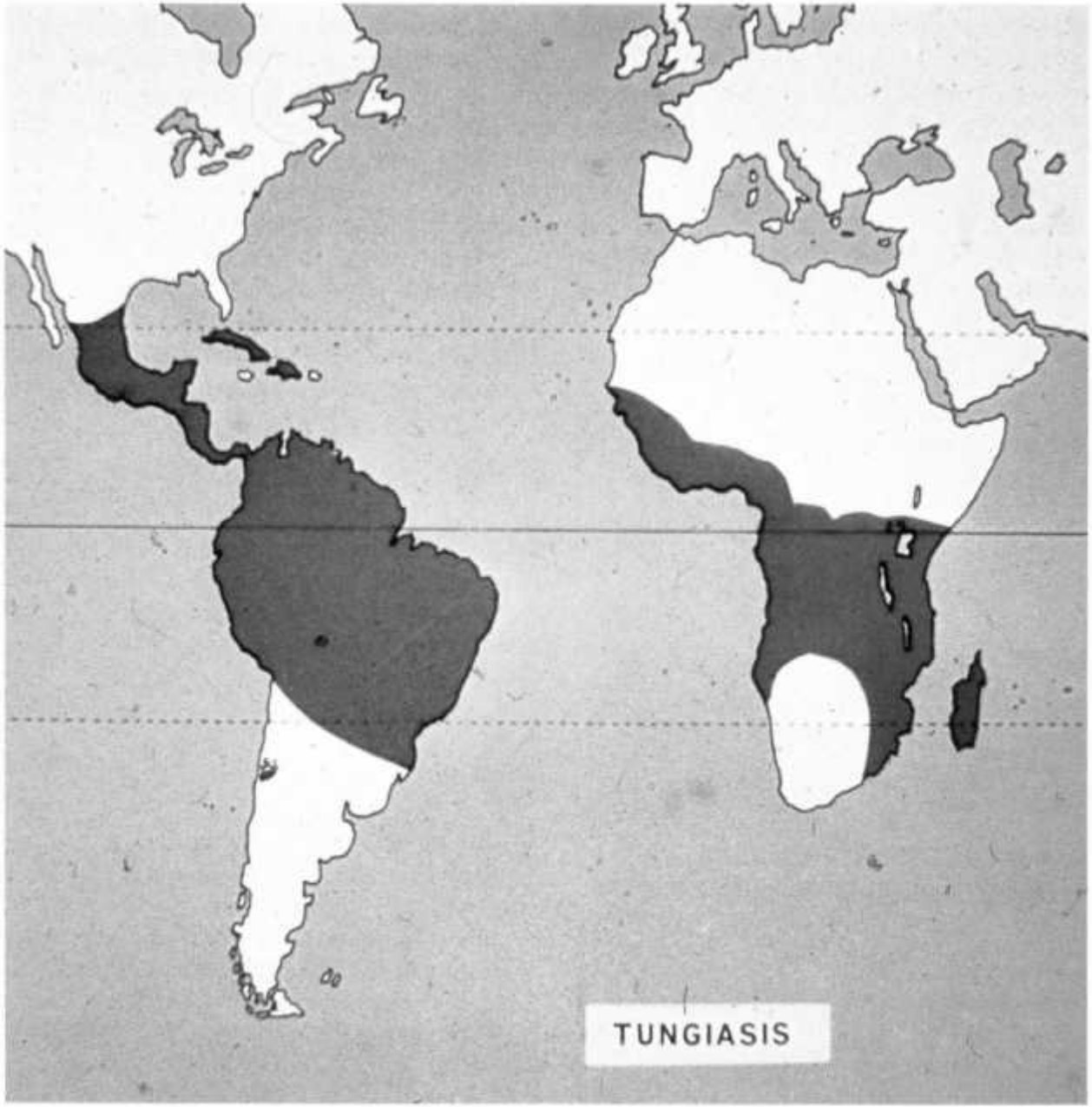


Fig. 9.21 Distribution of tungiasis.

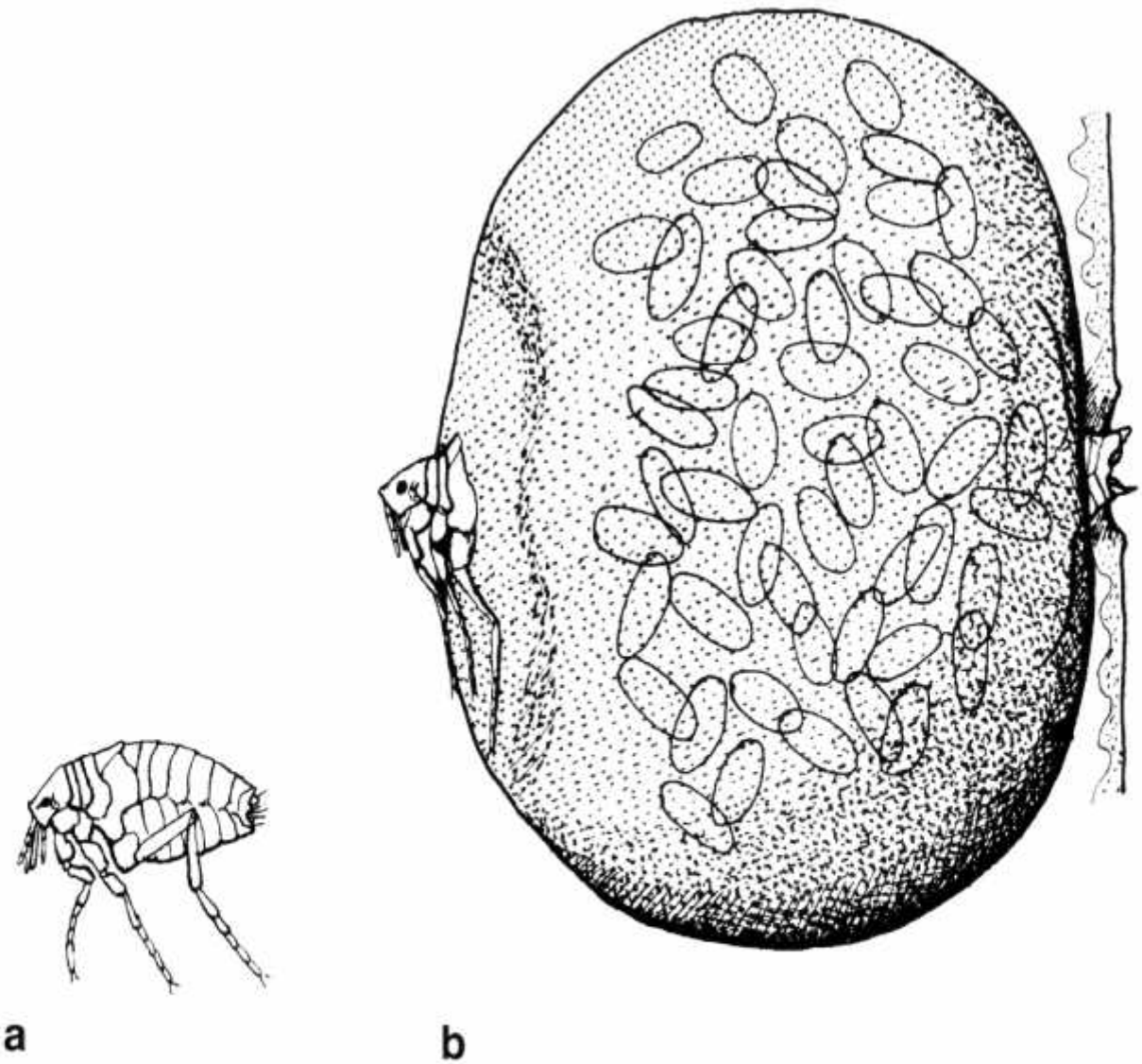


Figure 11.5 Adults of *Tunga penetrans*. (a) Non-gravid (immature) female flea; (b) gravid female and enormously swollen abdomen full of eggs, embedded in skin of host. The tip of the abdomen projects from host's skin to the exterior.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louse flies

Family:Hippoboscidae

- obligate parasites of mammals and birds.
- piercing mouthparts
- Genera occur in both winged and wingless forms.
- there are winged species which can fly at least reasonably well, as well as others with vestigial or no wings which are flightless.
- Both adult males and females feed on the blood of their host.

louse flies

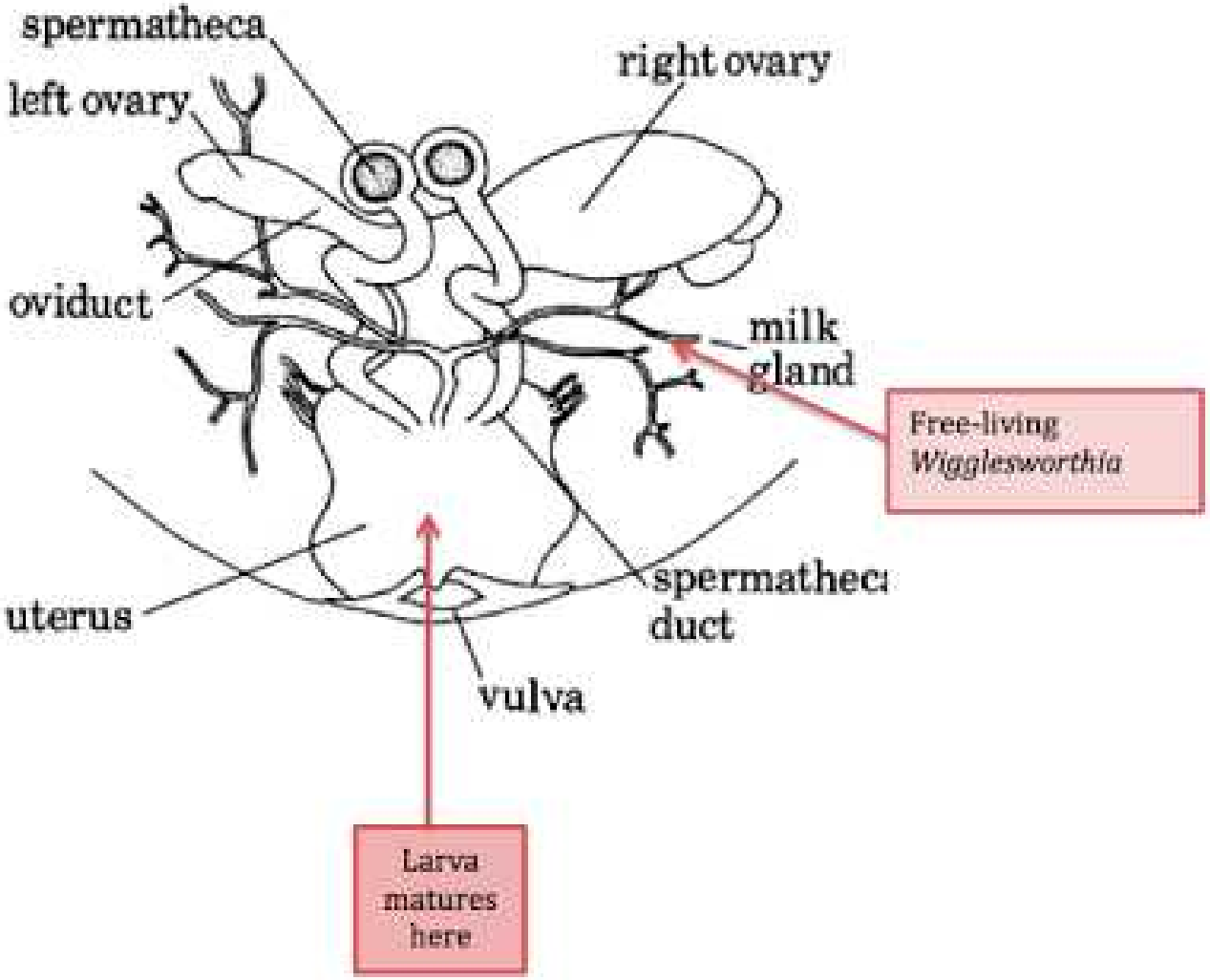
- Most winged ones are dark brownish and smaller than house flies. Flat shape and leathery appearance.
- They are adapted for clinging to and moving through the plumage and pelage of their hosts.
- Strongly specialized claws help them cling to the hair or feathers of their particular host species.


NATURFOTO


NATURFOTO

louse flies
life cycle

- Females rear one offspring at a time.
- the larva feeding *in utero* from special "milk" glands.
- The mature larva is "born alive" and immediately pupates in the soil (or on the host in some cases).


spermatheca
left ovary
right ovary
oviduct
milk gland
Free-living Wigglesworthia
uterus
spermatheca duct
vulva
Larva matures here

louse flies
medical importance

- Hippoboscid flies move about quickly on their avian hosts and bite and suck blood from parts that are not well feathered.
- They may serve as intermediate hosts for many avian blood protozoans of the genus *Haemoproteus*.
- Pigeon flies readily attack people who handle adult birds; the bite is said to be as painful as a bee sting, and its effects may persist for ≥5 days.

louse flies control

- Any flies on the birds can be killed by spraying the birds with permethrin.
- Thorough cleaning of the premises and destruction of the debris are essential for control.
- Spraying the loft with permethrin, when coupled with cleaning, will alleviate the infestation.