



# Parasitology

3<sup>rd</sup> Stage

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## Medical Entomology

Study of an arthropod that serves as a vector of a various infections or as a disease agent themselves.

**Arthropod:** Phylum arthropod = 1000000 spp. (80% of animal kingdom).

### Characters

1. Segmented invertebrates.
2. Have exoskeleton (made of chitin)
3. Have internal hemocoel (body cavity) filled with hemolymph which bathes internal organs and reach all appendages.
4. Have paired jointed appendages.

### Digestive organs

1. Foregut.
2. Stomach (midgut).
3. Hindgut.

1 & 3 lined with chitin

### Circulatory system

Heart, aorta, paired vessels, open in hemocoel.

## Life cycle

Arthropod develop through process called metamorphosis.

1. Eggs → nymph (resemble adult) → adult (lice, cockroaches, spiders) (without metamorphosis).
  2. Eggs → larvae (different from adult) → pupa (non feeding stage) → adult (complete metamorphosis e.g.: flies, fleas).
- ❖ Growth accompanied by periodic molting (shedding) of entire exoskeleton and chitinous lining of foregut, hindgut, and tracheae, then these are replaced by secretion of new and larger components.
  - ❖ Growth occur in period of molts before hardening of the last one, no growth occur in adult stage.
  - ❖ Molting divides the life cycle into stages or instars

## Arthropod of medical importance are in the following classes

- ✓ Class Insecta: Flies, Fleas, Lice (venomous, urticating, biologic and mechanical vectors, intermediate hosts, parasitic)
- ✓ Class Arachnida: Ticks, Mites, Scorpions (venomous, biological vectors, parasitic)
- ✓ Class Crustacea: Cyclops, Crabs, Crayfish and pentastomids (intermediate hosts, parasitic).
- ✓ Chilopoda: centipedes (venomous).
- ✓ Diplopoda: millipedes (vesicating).

**Arthropod as a vector:** (transmitter of a disease agents)

### 1. Mechanical transmission

The vector is not a part of the life cycle of the disease agent (micro-organism does not undergo any development or appreciable multiplication within the arthropod. Simply, the transport of organisms from one place to

another). e.g.: Filth Flies and enteric pathogens like *Salmonella*, *Shigella*, *E.histolytica*.

## 2. Biological transmission

The vector is an integral part of the life cycle of micro-organism (m.o) . The m.o. must spend a predetermined amount of time (extrinsic incubation period) within the vector, during which it either undergoes a series of developmental stages or reproduces, or does both.

- a. **Propagative**: increase in number of microorganism only (multiplication) e.g.: bacteria, viruses.
- b. **Cyclopropagative**: multiplication & development of micro-organism (e.g.: Malaria & Anopheles).
- c. **Cyclodevelopmental**: developmental of m.o. only. e.g.: Mosquito & Filarial nematodes.

## Arthropod as a disease agent

Arthropod can cause some degree of pathology by the following means:

1. **Vesication**: body fluid of arthropod discharge on the skin & mucous memb. → Blisters.
2. **Urtication**: when poison hairs of certain arthropods contact with the skin or mucous memb.
3. **Sensitization**: salivary secretion of arthropod enter into the body → evoke immunological reaction.
4. **Envenomation**: poisonous fluid injected into the body.
5. **Tissue invasion**: by larvae and adult stage of arthropod.
6. **Psychological disturbance**: fear (entomophobia), restlessness (due to crawling, biting, buzzing of arthropod).
7. **Transmission of pathogens** (vector of disease agents).

## Insects

70% of animal spp.

Most important group in animal kingdom.

### Adult morphology

Body consist of

#### **1. Head (six fused segments)**

- a. Contain antennae
- b. Mouth parts: consist of
  - Anterior lip
  - Pair of mandibles
  - Pair of maxillae
  - Posterior lip

The mouth parts adapted for:

- a. Chewing ( cockroach, beetle)
- b. Sucking (sucking lice, bugs, butterflies, flies, fleas.)

#### **2. Thorax: Three segments.**

- 3 pairs of walking legs.
- 1 or 2 pairs of wings or wingless.

#### **3. Abdomen: 12 segments.**

## Beetles

1. Vesication agents (blister beetles) → blistering of skin after contact with adult body fluid → burning pain.
2. Act as intermediate host (grain beetles for *H. nana*, *H. diminuta*, and *D. caninum*)
3. Mechanical vector of pathogen.

### Vesicating beetles (Family: *Meloidae*):

- + Adult produce cantharidin (e.g.:Spanish fly).
- + When accidentally crushed on the skin, an epidermal blister develops in which histamine-like substances can be demonstrated. The blisters are intensely painful.
- + **Treatment:** Calamine lotion and topical anesthetic locally.

### Moths and butter fly larvae (caterpillars)

- ☒ These larvae contain urticating spines or hairs which may cause reaction when handled or inhaled due to release of poisonous fluid from broken hairs.
- ☒ This reaction cause local burning and stinging sensation, the area becomes erythematous then elevated and whitish with reddish border (2.5 cm.) and peripheral reddish macular zone 2 cm. beyond without ulceration.
- ☒ The reaction subsides in a few hours
- ☒ **Treatment:** Locally, calamine lotion or corticosteroid oint.

### Bees, Wasps and Ants (Hymenoptera): (Envenomation)

- ❖ Have sting apparatus and potent venom that cause painful sting and potential anaphylaxis and trauma

- ❖ Two pairs of membranous wings.
- ❖ Mouth parts adapted to sucking or lapping (bees) or for lancing and chewing (ants).
- ❖ Complete metamorphosis.

### **Pathogenesis And symptomatology of Bees and Wasps envenomation**

- ✓ The puncture is made by the sting shaft, and then the poison secretion is injected into the wound. All species of hornets and wasps, most bees and some ants have an efficient sting mechanism and potent venom.
- ✓ The workers of the honey bee and of some wasps leave the posterior tip of their abdomen including the entire sting mechanism at the site of penetration in the victim's skin.
- ✓ Muscle attachments continue to contract for some time, forcing the sting shaft more deeply into the wound and releasing additional venom.
- ✓ Bumble bees and many wasps retain their sting.
- ✓ The active venom fraction resembles viperine snake venom.
- ✓ The venomous substances are complex mixtures of enzymes, polypeptides, histamine, 5-hydroxytryptamine and hyaluronidase.
- ✓ The victim shows:  
Local and painful swelling → subside in few hours Or entire member becomes swollen with systemic reaction.
- ✓ Such individual require desensitization since subsequent envenomation may be fatal due to anaphylactic reaction .

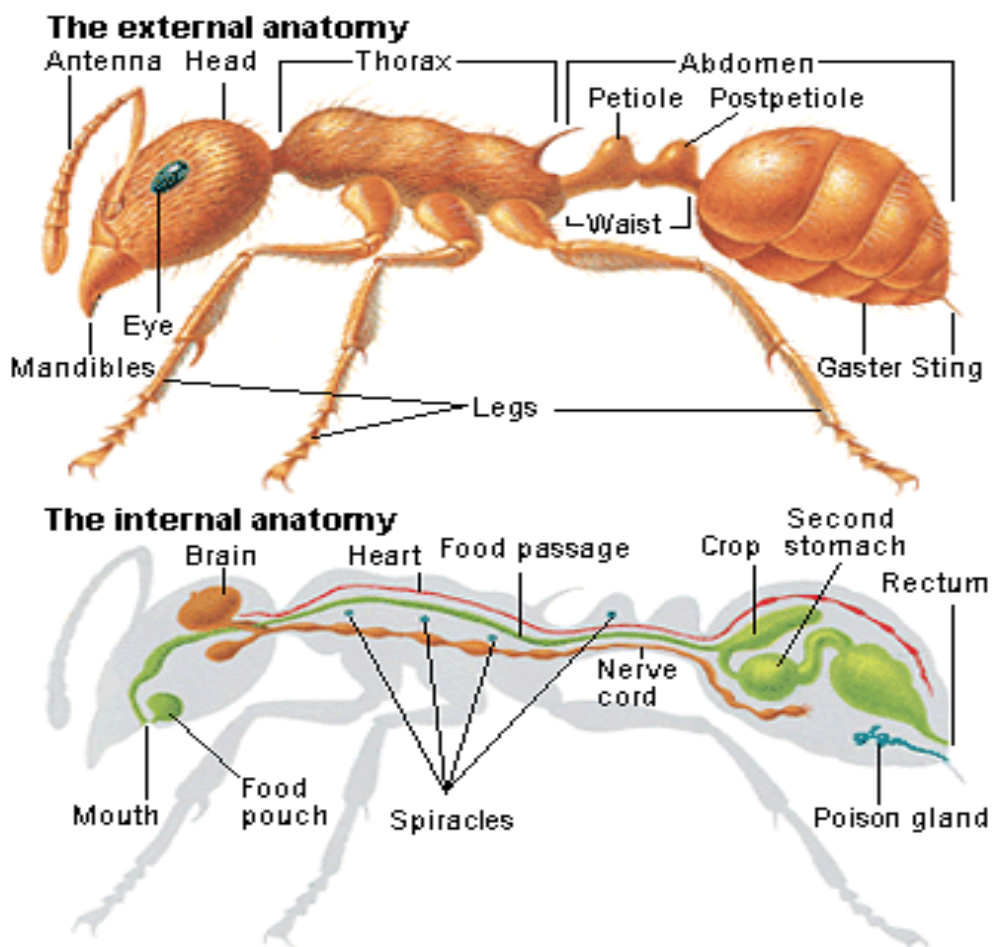
### **Treatment**

1. Extraction of sting (honey bee) by sharp needle or knife blade.
2. local injection of antihistamine.
3. in anaphylactic reaction injection of ethylnorepinephrine hypodermically as soon as possible.

In case of bumble bee, wasps and hornet envenomation:

Ice packs and palliative lotions topically to reduce the swelling and relieving the pain.

## Ants



- ✚ Cause painful bites.
- ✚ The secretions introduced into the skin by sharp, strong mandibles.
- ✚ Contain formic acid and cause local pain.
- ✚ Large ants have also stinging mechanism that may cause death victims.

- ✚ Multiple stings are common by large numbers of ants.
- ✚ The venom is strongly hemolytic and produce a vesicle or pustule at the site of skin puncture or cause systemic reaction of an allergic type and required desensitization.

### **Control**

Control of Bees, Wasps and Hornets by wearing protective clothing, gloves and nets for face and neck. Hypersensitive individuals should receive desensitizing treatment carried out with specific venom extract.

Domestic wasps and ants may be controlled through the use of insecticides

### Sucking lice (Ectoparasite)

- ☒ Small, wingless flattened dorsoventrally with three pairs of legs that ending in a sharp, curved claw for attachment to hairs or fibers. Have 3-5 jointed short antennae.
- ☒ Both nymph and adult are hematophagous (blood sucking). Lice are host specific ectoparasites.
- ☒ Mouthparts adapted for piercing and sucking.

### **Types of lice infested man**

1. Head louse: *Pediculus humanus capitis*.
2. Body louse: *Pediculus humanus humnaus*.
3. Pubic or crab louse: *Pthirus pubis*.

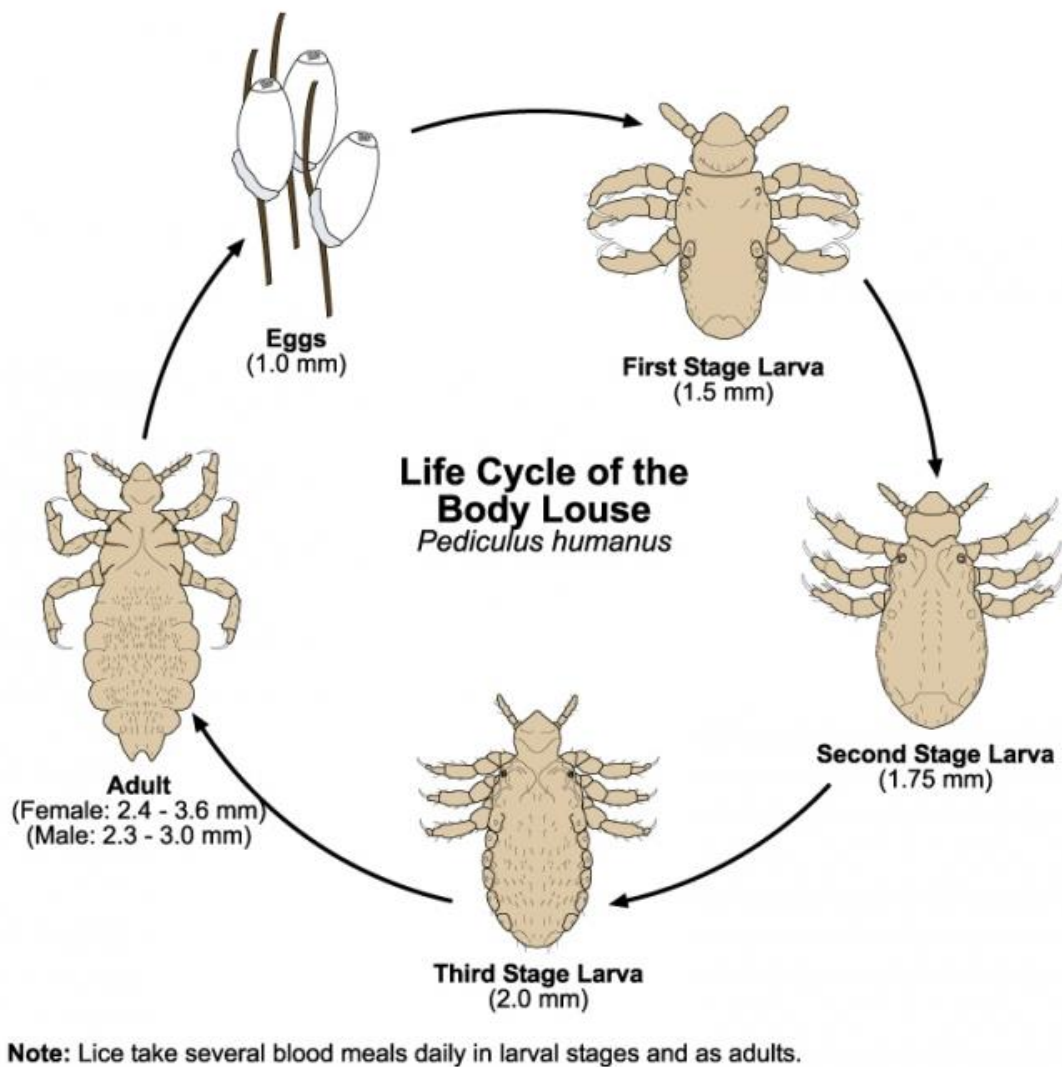


## **Life cycle**

- ❖ Egg (Nits) → nymph (molts three times) → adult.
- ❖ The entire life cycle (egg to adult) require 12 to 28 days.
- ❖ Head louse deposit and cement their eggs onto the hair of head or back of neck (habitat).
- ❖ Pubic louse deposit and cement their eggs onto the hair of pubic region, chest, axilla, eyebrows and eyelashes (Habitats).

## **Body louse**

Deposit and cement their eggs on fine threads of clothes (in the seams).



## Pediculosis

- ✓ Infestation with lice
- ✓ Cutaneous lesion at site of feeding due to introduction of salivary secretion → roseate elevated papule → intense pruritis → scratching → eczematous dermatitis, and at times induration and bronzing of the area.

- ✓ May become secondarily infected by bacteria.

## Diagnosis

Adult and eggs on hair shaft.

## Treatment

- ✚ 1% lindane shampoo or lotions. (head and pubic lice).
- ✚ Body louse: dusting powder (1% malathion) (body and clothing).
- ✚ Bedding can be fumigated with ethylformate or by using hot water.
- ✚ Remaining nits can be removed with fine-toothed comb.
- ✚ Topical application of soothing lotions relieves the pruritis and allows the lesion to heal
- ✚ N.B: Mass treatment is preferred, all group should be treated at once.
- ✚ Lice are readily transmitted from person to person especially in overcrowding and poor personal and family hygiene.
- ✚ Head louse most commonly found on individuals with long hair.

## Control

1. treatment of ind. And
2. mass treatment
3. personal hygiene (never using the same comb, shaving the head, regular washing, combing)
4. bedding + clothing fumigated with ethylformate.

Pubic louse usually acquired through sexual contact (The most common mode of transmission) and fomites.

## **Disease transmission**

body louse

1. epidemic typhus (Rickettsia)
2. epidemic relapsing fever (spirochete)
3. trench fever.

## **Flies (Diptera)**

- ☒ Adult has one pair of wing, complete metamorphosis. There are 3 or more larval instars (stages).
- ☒ Pupal stage is a non feeding transitional stage.
- ☒ Mouthparts adapted for piercing as in hematophagous mosquitoes or lapping as with house flies.

## **Hematophagous diptera are of two basic types**

1. **Capillary feeders:** mouth parts are inserted into the skin and blood is withdrawn directly (mosquitoes) (solenophages).
2. **Pool feeders:** mouthparts short and are used to lacerate the skin then the blood flow and ingested by the fly (temophages).

## **Bite of flies: (sensitization)**

- ❖ Hematophagous flies puncture the skin to suck the blood.
- ❖ During feeding, they introduce salivary secretions which contain a digestive enzyme anticoagulants and other substances.

- ❖ This will evoke immunological reactions (sensitization) which usually cause local pruritus and erythema that last from a few hours to a few days depend on the amount of saliva introduced and spp. of the fly and degree of hypersensitivity of the host.
- ❖ In some people, intense systemic allergic reaction may result.
- ❖ **Treatment:** Local palliative.

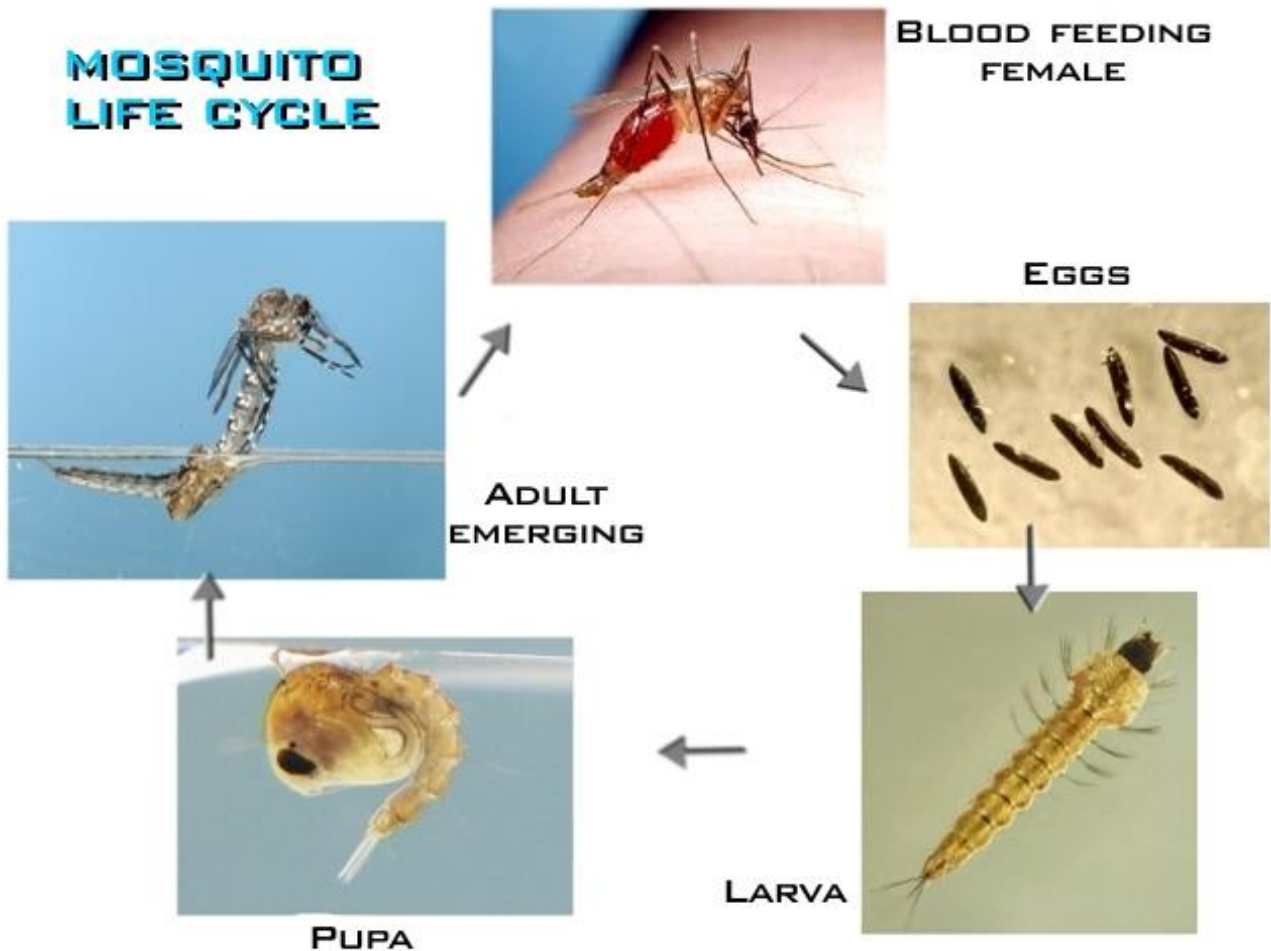
## Mosquitoes

- ✓ Slender, delicate insect with long legs and minute scales on the body and appendages and has aquatic larval and pupal stage.
- ✓ The eggs laid in water after blood meal
- ✓ There are about 3000 spp, of mosquitoes.

### Adult morphology

- ✚ The antennae are long, segmented with hair at the nodes.
- ✚ Male have very bushy antennae.
- ✚ In female, antennal hairs are sparse.
- ✚ Mouthparts are assembled into a long proboscis.
- ✚ Only female capable of piercing the skin.
- ✚ Male feed on plant juices.
- ✚ There are two maxillary palps and three pairs of legs and two wings.

### Life cycle



- ☒ Eggs laying after blood meal. Female oviposit on water surface or moist areas near water.
- ☒ Eggs hatch to larvae (feed on plankton), after 10 -14 days and 4 instars molt to pupa (active in water but not feed), few days, adult emerges.
- ☒ Longevity of adult usually few weeks.

### Subgroups of medical importance

1. Anopheline (e.g: Anopheles).
2. Culicine (Culex, Aedes, Mansonia)

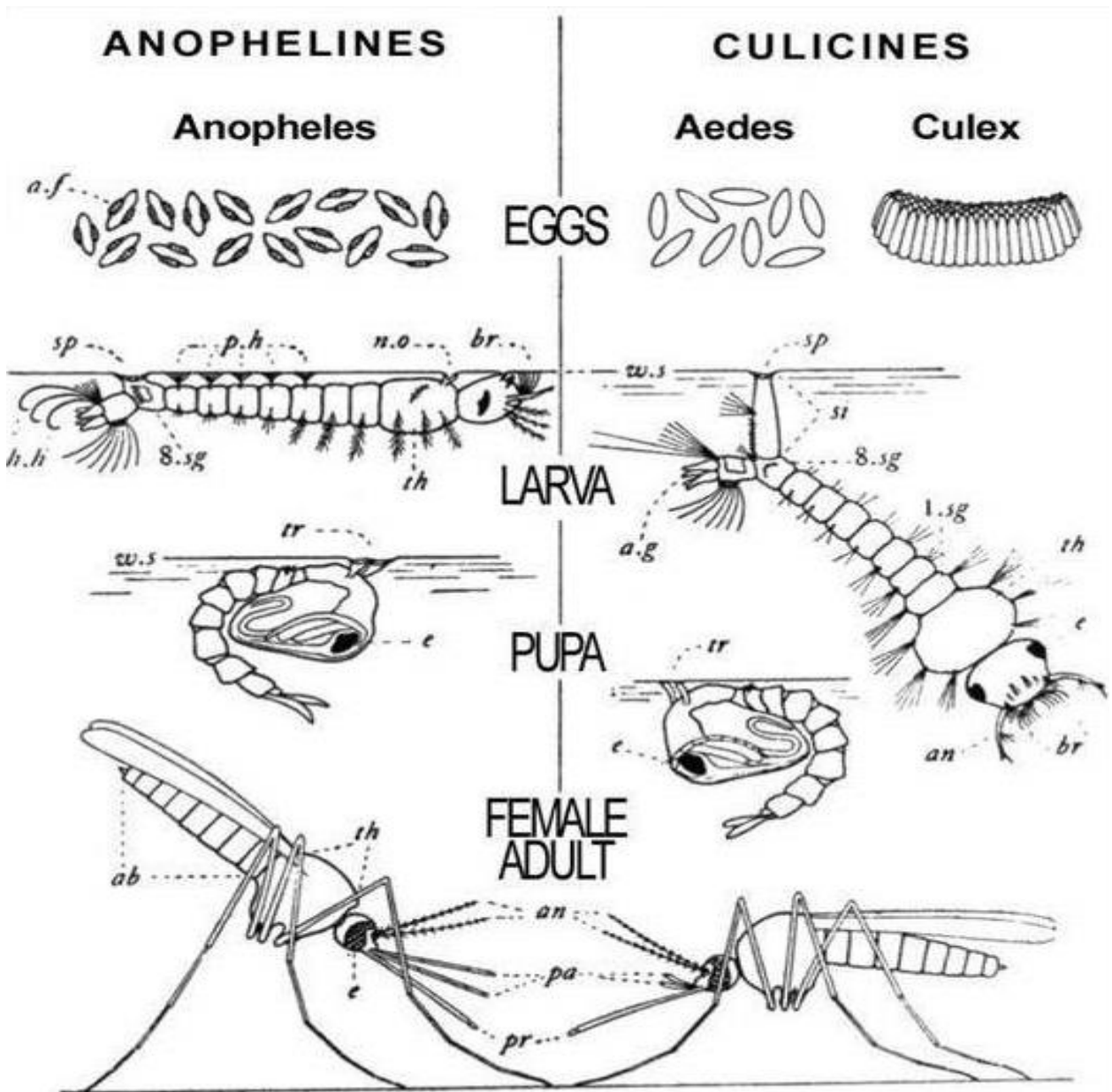
❖ Only females are hematophagous.

- ❖ Flight range 1-2—10km ; life span 6-8 weeks in 25 C.
- ❖ Stay in winter in dark place without activity.
- ❖ Anthropophilic: feed on human blood.
- ❖ Zoophilic: feed on animal blood.

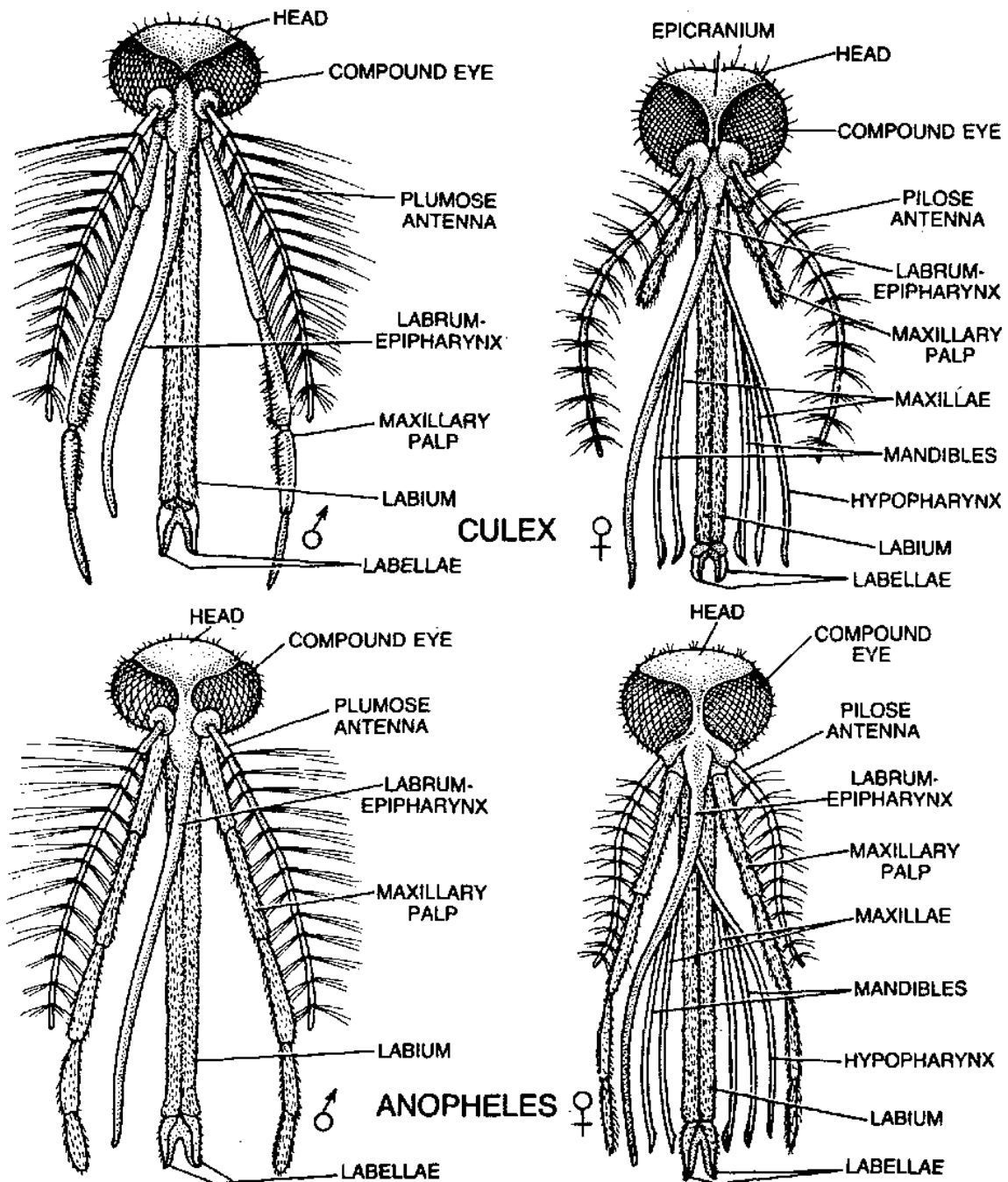
Difference between anopheline and culicine mosquitoes:

<i>Anopheles</i>	<i>Culicine (Culex, Aedes)</i>
During life, it stands on surface, it's body making an angle of 45 degree.	They stand with their body rather parallel to the surface.
male has plumose antennae (i.e..densely haired). Female has pilose antennae (lightly or scanty haired).	Similar (i.e..antennae plumose in males and pilose in females).
Maxillary palps in the male are as long as the proboscis, but the tip has swollen end.	Maxillary palps in the male are as long as the proboscis, but not club ended.
Maxillary palps in female are nearly as long as the proboscis.	Maxillary palps in female are short (hardly visible).
Wing are spotted.	Not spotted.
Larvae: lie parallel to the surface of water.	hang down ward with siphon.
No respiratory siphon on 8 segment of abdomen.	Siphon present on the 8 segment.
Disease transmission: <ol style="list-style-type: none"> <li>1. Malaria (<i>plasmodium</i>)</li> <li>2. Filariasis (<i>Wuchereria bancrofti</i>)</li> </ol>	<i>Aedes</i> <ol style="list-style-type: none"> <li>1. Filariasis (<i>W.bancrofti</i>)</li> <li>2. Yellow fever(virus)</li> <li>3. Dengue(virus)</li> </ol>

	<p><i>Culex</i></p> <ol style="list-style-type: none"> <li>1. Filariasis (<i>W.bancrofti</i>)</li> <li>2. Encephalitis(virus)</li> </ol>
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**Fig. 17.46 Comparison of mouthparts of male and female *Culex* and *Anopheles***

To be effective vectors for malaria, Mosquitoes must be:

1. Feed frequently on human (Anthropophilic)

2. Susceptible to the malarial gametocyte.
3. Live long enough for parasite to complete life cycle.
4. Present in sufficient number to maintain transmission of parasite.

So only 20 out of 300 spp. Of anopheles act as vector of malaria.

## Sand fly

- ✓ Small (5 mm long) with conspicuous black eyes and long narrowly obovate wings that form a V-shaped out line above thorax. There are fine hairs on body, wings and legs.
- ✓ Female feed on blood at night. Sand flies are pool feeder (telmophages) which suck blood from a small wound they make in the skin. Their bite is therefore relatively painful.
- ✓ Sand flies do not produce a buzzing or whining noise before biting which again reduces the perceived nuisance to man.
- ✓ Color of sand flies are brownish in day light, but their bodies are densely covered in oily hairs which give them whitish appearance when illuminated.
- ✓ Egg laid on moist dark place containing organic debris (under leaves on the ground, in damp mossy place, in rank vegetation or on hallow tree trunks). Adult move in a short jerky hops.
- ✓ Life cycle with complete metamorphosis taking 30 days (short hopping flights) and ordinarily are not found more than 5 meters above the ground or far from their breeding sites.
- ✓ Egg → 4 larval instars → pupa → adult.

### Two genera of medical importance:

1. Phlebotomus (in old world)
2. Lutzomyia (new world)

### Sand fly bite

The bite is indurated, inflamed with a wheal of 1-2 cm. and accompanied by pruritus lasting for hours or weeks and sometime with systemic allergic reaction (fever, nausea, malaise swelling of the bitten member).

### **Treatment**

Topical application of phenolated camphor in mineral oil or anesthetic ointment.

### **Disease transmission**

1. Leishmaniasis (Leishmania)
2. Sand fly fever (virus)
3. Bartonellosis (Bartonella)

### **Blackflies (Simulium spp.)**

1-5 mm., have stout body and lumped back. Swarms may attack human during daytime. Only female suck blood.

Vector of onchocerciasis (*Onchocerca volvulus*).

### **Deerflies (Chrysops spp.)**

About the size of house fly. Only female suck blood and the bite site can become a painful wound that takes a long time to heal

Vector of loiasis (*Loa loa*) and tularemia (caused by bacterium *Francisella tularensis*).

## **House flies (*Tabanus*)**

Large fly (35 mm.), multicolored, have wings, mouthparts large, short and massive (lacerate the skin, producing considerable pain and trauma which may require surgical dressing of puncture). Only female hematophagous (hematophagous).

## **Tsetse flies (*Glossina* spp.)**

6-15 mm. (size of housefly), both sexes are voracious blood feeders and are limited to the African continent south of Sahara. Vector of trypanosomiasis (*Trypanosoma gambiense* and *rhodesiense*).

## **Stable flies (*Muscidae*)**

### **1. *Stomoxys***

Resemble the house fly which has led to the popular belief that house flies may occasionally bite. It is readily distinguished from house fly by the long, rigid proboscis projecting conspicuously beyond the head. Both sexes can be tremendous pests with impressive bite (stabbing pain).

### **2. House fly (*Musca domestica*): (filthflies)**

Size, 6-7.5 mm., dusky-gray color, head broad, antennae brown, more or less club shape consist of 3 segments. The maxillary palps black. The mouthparts are adapted for lapping or sponging.

## **Life cycle**

Eggs hatch in 24 hr. at usual summer temperature 4 to 8 days three larval (maggots) instars... pupa 4 to 5 days adult.

Under optimal conditions, a complete life cycle requires about two weeks.

Filthflies breed in animal manure, human feces, garbage and decaying organic matter around the house, in city dump heaps, on seashore and on farm, and in other exposed decaying or fermenting materials on which both adult and larvae feed.

### **Medical importance**

1. Mechanical vectors of enteric pathogens e.g.: *Salmonella*, *Vibrio*, *Entamoeba histolytica*, polio virus.
2. Non enteric infections: e.g. *Mycobacterium*, *Yersinia pestis*, *Bacillus anthracis*, *Brucella abortus*.
3. Accidental intestinal myiasis.

### Fleas (Siphonaptera)

Small wingless, brown insect strongly compressed from side to side, provided with long legs for jumping and propelling themselves through the hair of the host.

Male and female are hemtrophagous: Fleas are not host specific and spend most their time on the host but readily move from one host to another.

## Flea bite

- ✚ A symptomatic, or from roseate raised lesion usually in lower extremities, frequently edematous, indurated or pustular and intensely pruritic and becomes inflamed and
- ✚ scarified as a result of scratching.
- ✚ **Treatment:** Local palliative, insecticides.

## Disease transmission

1. Plague (*Yersinia pestis*)
2. Murine typhus (*Rickettsia*)
3. Intermediate host for *H. diminuta*, *D. caninum*, *H. nana*.

## Chigoe Flea

- ☒ (*Tunga penetrans*) common parasite of feet of pigs and dogs.
- ☒ Female burrows into skin (often toes, feet) → cause nodular swelling, subsequent ulceration, festering sore
- ☒ **Treatment:** weaning shoes, Flea removed aseptically with needle, wound bathed, and treated with antiseptic.

## Myiasis

Infestation of live human and vertebrate animals with dipterous larvae which feed on host's dead or living tissue, liquid body substances, or ingested food.

Larvae (Maggots or Bots) can infest any organ or tissue accessible to fly oviposition.

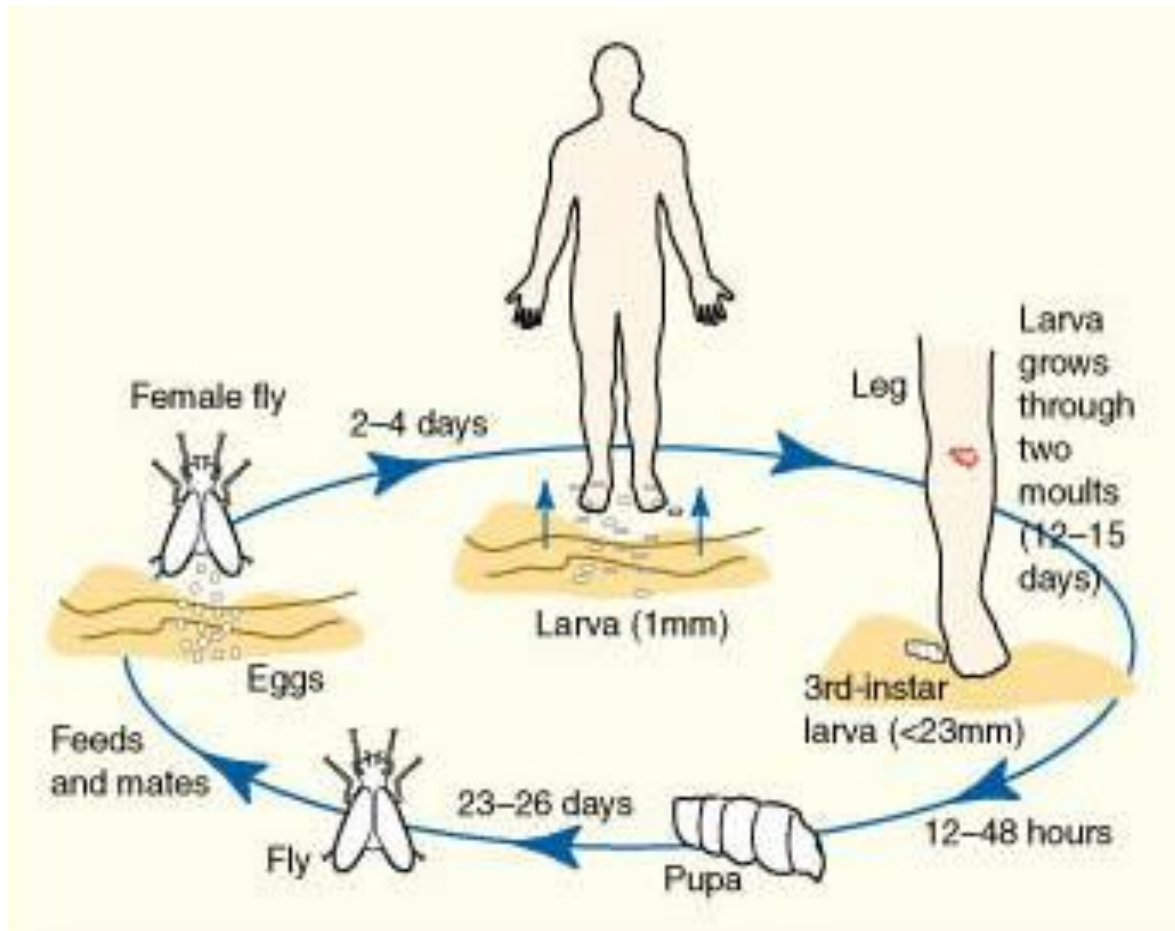
## **Morphology of the larvae**

- ❖ Have pair of sharp, curved mandibular hooks at anterior end.
- ❖ Pair of spiracles (openings to the respiratory system) at posterior ends and several body segments in between bearing bands or rows of small spines or teeth.
- ❖ Larvae with a narrow anterior and broader posterior extremity are called maggots.
- ❖ Larvae which are more robust or more nearly uniform diameter throughout and often with more pronounced spination on the body termed bots .

Several species of dipterous flies cause myiasis in man, for example:

Screwworm, Tumbu fly, Human bot fly, cattle bots fly, Sheep bots fly, Rodent bots fly, Horse bots fly.

## **Life cycle of myiasis**



## Types of myiasis

according to affected tissue:

### 1. Cut. And mucocut. Tissue, eyes, nose, and ear:

Larvae penetrate these areas with various degrees of pathology, ranging from irritating pruritis to invasion of eye, brain, nasopharynx, bone, ear canal, vagina, tongue and open wound.

Syndrome	Symptoms
Cutaneous Myiasis	Painful, slow-developing ulcers or furuncle- (boil-) like sores that can last for a prolonged period.
Nasal Myiasis	Obstruction of nasal passages and severe irritation. In



	some cases facial edema and fever can develop. Death is not uncommon.
Aural Myiasis	Crawling sensations and buzzing noises. Smelly discharge is sometimes present. If located in the middle ear, larvae may get to the brain.
Ophthalmomyiasis	Fairly common, this causes severe irritation, edema, and pain.

**Intestinal:** female may deposit eggs or larvae on food that is then eaten by human. Occasionally some eggs or larvae may survive, become temporarily lodged in the intestinal crypts and develop before being passed in stool.

### Symptoms

Severe nervous symptoms as well as intestinal irritation.

2. **Other site:** lactating breast, urinary bladder, colon, lung, penis, gum, brain, carcinoma of scalp

### Myiasis may be classified to

1. **Specific myiasis:** the larvae attack only the living tissue (cut. And subcut., nose, mouth, eyes, ears, vagina.....)
2. **Semi-specific myiasis:** larvae breed on body of dead animals or dead tissues of living one.
3. **Accidental myiasis:** accidental infestation of GIT by ingestion of food contaminated by larvae or eggs. Sometimes also skin or urinary bladder.

### Treatment

1. Simple surgical removal of larvae.  
Application of petroleum jelly to cut off air supply → larvae migrate to the surface → grasped with forceps.
2. treatment of secondary bacterial and fungal inf..
3. for intestinal myiasis, castor oil will expel the larvae.

## True Bugs (Hemiptera)

Have two pair of wings and hinged proboscis. Blood suckers.

1. Bedbugs
2. Kissing –bugs or cone – nosed bugs. (*Triatominae*).
3. Triatomine bugs (*Triatoma* spp.) serve as the vectors of *Typanosoma cruzi*.

## Cockroaches

- ✓ Mouthparts adapted for biting and chewing.
- ✓ They are runner rather than hopper.
- ✓ Feed at night on all food for human consumption, also feed on filths and feces.
- ✓ They discharge their feces and vomits on that food.
- ✓ They are a common pests because of filthy habits and bad smell production.
- ✓ They discharge nauseous secretion that give long lasting offensive cockroach smell.

### Medical importance

1. Mechanical vector of enteric pathogen.
2. Biological vector of animal cestodes.
3. Potentially important source of contactants, inhalant, injactant and ingestant allergens → which cause:  
Itching, dermatitis, local necrosis, asthma and hay fever.

### Control

1. Cleanliness and hygiene.
2. Environmental sanitation.
3. Home improvement.
4. Insecticide in resting and hiding place (e.g: Diazinon as dust or spray)

## Arachnida

Body is externally divided into : prosoma and opisthoma. No antennae, 4 pair of legs.

### Medically important are

Ticks, mites, scorpions and spiders.

### 1. Acarina (Acari)

#### Ticks & mites

1. Body is not divided (not segmented).
2. Mouthparts contained capitulum
3. Dorsoventrally flattened
4. Have four pairs of legs

Ticks	Mites
larger (several mm., macroscopic)	Smaller (less than 1 mm)
Has armed hypostome	hypostome is not armed.

Live cycle is long (Months or years)	Live cycle is short (days or weeks).
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## Ticks

Ectoparasites adapted to blood sucking (mammals, birds, and reptiles).

### 1. Hard ticks.

### 2. Soft ticks

Hard tick	Soft tick
Capitulum extend anteriorly beyond the margin of body.	Not extend beyond anterior margin.
Covered with dorsal chitinous plate (scutum).	No scutum, body is flexible and leathery.
Feeding process is very slow (several days to weeks).	Feeding process is rapid and frequent (few minutes)
Spend prolonged period of time on their host.	Spend short period of time on their host

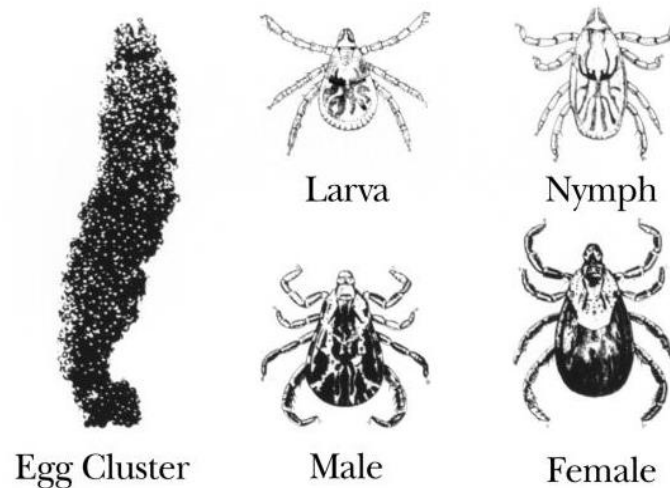
### Note

Scutum covered entire body in male larvae and nymph but only anterior portion in female.

### Life cycle

- ✚ Egg → larvae (with 6 legs) → nymphs (8 legs) → adult (8 legs).
- ✚ Larva, nymph, adult (male & female) are haematophagous.

Stages of *Dermacentor variabilis*  
the American Dog Tick



### Medical importance

#### 1. Tick bite: (hard ticks)

Salivary secretion and penetration of skin by mouth parts provokes inflammatory reaction and cause local hyperaemia, edema, pruritis and hemorrhage and thickening of stratum corium → then subside after several days or weeks after of ticks.

Sometimes, there is generalized hypersensitivity reaction.

### Treatment

Removal of ticks by the following:

Application of chloroform, lighter fluid, oil, petroleum jelly or finger nail polish so the tick relax → then the anterior portion should be grasped with forceps close to skin and pulled straight out.

### Note

Leaving the mouth parts cause severe tissue reaction and secondary infection.

## 2. Ticks paralysis

Generalized toxemia and systemic neurological reaction substance due to introduction of saliva of certain hard tick that contain some substance that cause paralysis and may be death of individual.

Removal of tick → complete remission in 1-3 days.

### Disease transmission

#### 1. By hard tick

- a. Spotted fevers (rickettsia).
- b. Colorado tick fever (virus).
- c. Babesiosis (protozoa).
- d. Encephalitis (virus).
- e. Lyme disease (spirochete).

#### 2. By soft tick

Endemic relapsing fever (spirochete)

The bites of soft ticks may be irritating and at times painful.

### Control

Insecticide as lindane or malathion dust

## Mites

**Rodent & birds mites:** when their hosts die or leave, or the nests are disturbed, mites seek blood meals elsewhere, may attack man. the bite is painful, irritating, and cause sleepless night.

**Chiggers:** (red bugs) they are larvae of *Trombiculidae* mites. they cause irritation by their bite and cause (12 – 24 hrs. after attachment) intense itching and dermatitis which lead to scratching and secondary bacterial infection.

## Disease transmission

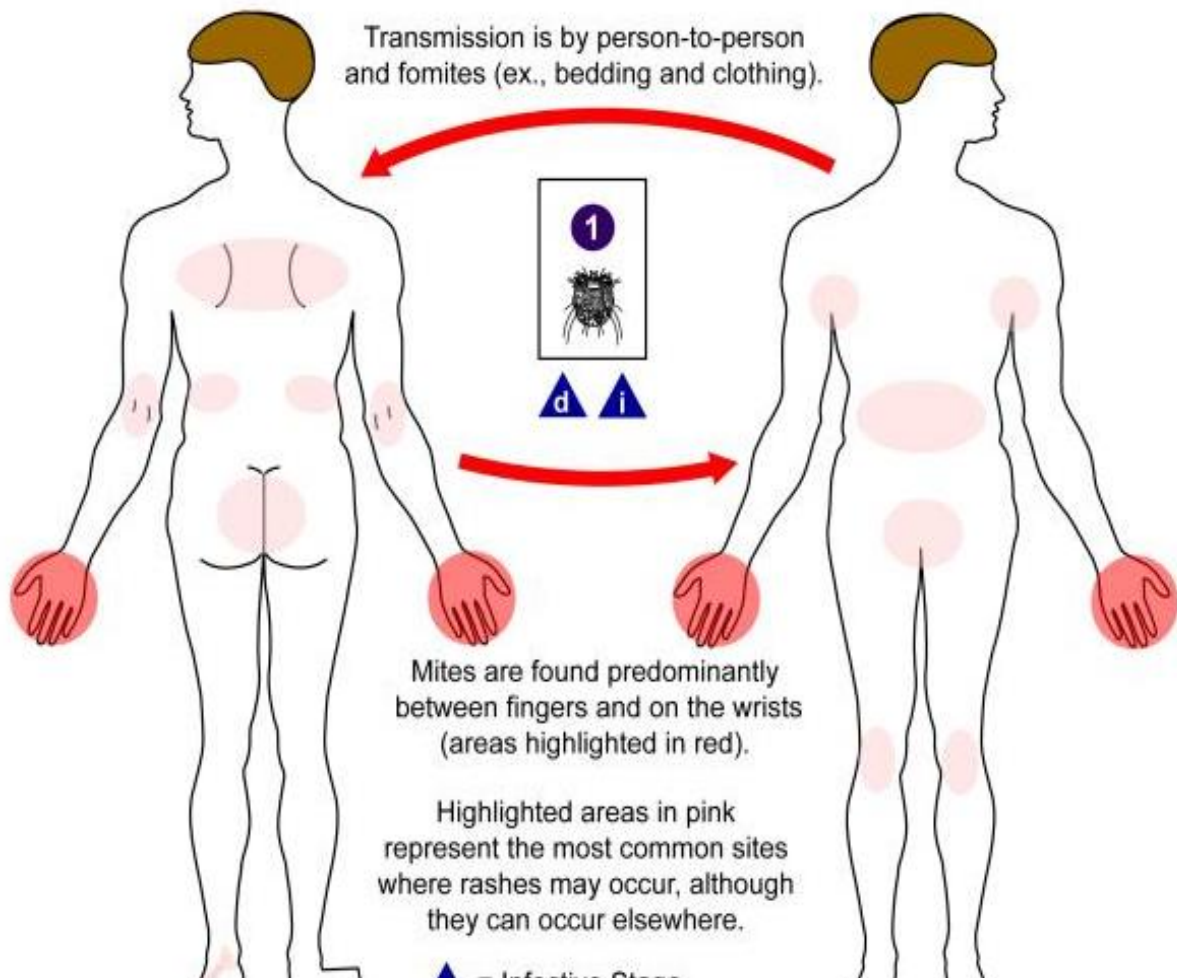
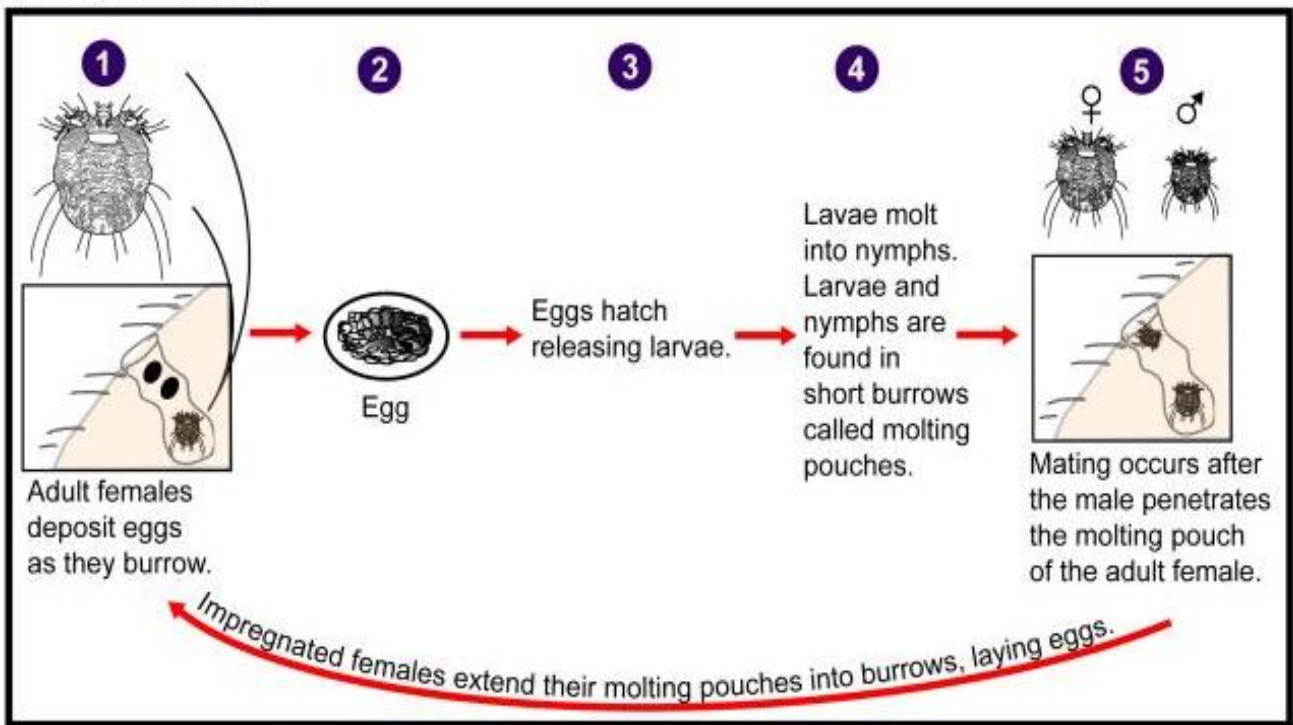
Scrub typhus (rickettsia).

## Itch mites: *Sarcoptes scabiei*

- ☒ Cause severe dermatitis known as scabies or sarcopitic mange
- ☒ *sarcoptes scabiei* is microscopic mites inhabits the epidermis (in cutaneous burrows) where the fertilized female deposit eggs. the tunnel is up to 3 cm. long.
- ☒ the live spine is 2 months.
- ☒ Have four pairs of stubby legs. The first two pairs of females (first three of males) bear a terminal stalk ending in a minute disklike sucker.
- ☒ Have four pairs of stubby legs. The first two pairs of females (first three of males) bear a terminal stalk ending in a minute disklike sucker.

# Scabies

(*Sarcoptes scabiei*)





## Scabies (Sarcopic mange)

- ❖ **site:** most commonly in epidermis of inter digital webs, back of hand, elbows, breast, scrotum.
- ❖ the lesion is short, slightly elevated, linear, reddish track followed by papule and vesicle on the surface of skin. the lesion which is due to metabolic products, eggs shells, and dead adults is intensely pruritic and lead to scratching of the area that cause weeping and bleeding and secondary bacterial infection gives rise to boils, pastules and eczema. the lesion is spread by the time
- ❖ Atypical scabies rash (urticaria) can develop in area of body not infested with mites (on shoulder) and is of an allergic reaction.
- ❖ Itching and rash appear 4 – 6 weeks after infestation but in previously infested individual, the rash develop with few days.

### **Confirmation: (diagnosis)**

1. Characteristic lesions and symptoms.
2. Scraping of affected tissue with knife → transfer to glass slide and examine under the microscope using mineral oil or KOH as clearing agent (adult, eggs)
3. Applying ink to infested skin area and then washing it off. thus revealing the burrow.

### **Treatment**

1. Ivermectin 100 – 200 mg.\kg. B.w in a single oral dose.
2. Kill the mites with insecticide:
  - a. Lindane (1 %) lotion.
  - b. Benzyl benzoate (20 - 34 %) cream or emulsion.
  - c. Permethrin 5% cream or 1% soap bar.

## Notes

1. All parts of body below neck should be treated
2. Not washed off until the next day.
3. Treatment of all family members is necessary for prevention of re-infection.
4. 2<sup>nd</sup> application within 2 – 7 days is needed in rare cases.

## Transmission

The infection is highly contagious and transmitted by direct contact and by fomites.

### Food mites

Some mites found in stored food products may act as allergic agent and produce dermatitis and asthma.

neither bite nor burrow, found in food stuffs & plant material (cheese, stored food products) and cause:

1. Temporary irritation of skin when contact with it → grocer's itch.
2. Act as allergic agents of asthmatic bronchitis.

### House dust mites (Dermatophogoides)

The dead or living parasite, fecal pellets found in house dust:

1. Act as allergen .
2. Cause Kawasaki syndrome: sever disease of preschool children  
cause fever, bilateral conjunctival infection, stomatitis, rash and cervical lymphadenopathy

## 2. Spiders (Aranae)

- ✓ Spiders are arachnids that have a cephalothorax and a saclike abdomen separated by constriction.
- ✓ Have four pairs of legs.
- ✓ The mouthparts include a pair of poison "fangs" (the chelicerae) which are comprised of basal segment and a claw like terminal segment bearing a small pore through which the poison gland opens
- ✓ Few of spiders can cause pathology in humans.
- ✓ All produce venom, few produce more than local irritation.

### Some cause tissue damage

#### 1. Systemic arachnidism (Black widow and other widow spiders)

- Have shiny black abdomen.
- Red hourglass on the ventral surface.
- Venom is neurotoxic, may cause:  
Abdominal cramps, hypertension, reduced heartbeat, convulsions, shock, delirium and death.
- Complete systemic immunity following recovery.

#### 2. Necrotic arachnidism (Violin or brown recluse spiders):

- Commonly found inside human habitation., 1-1.5 cm.long, yellowish to dark brown.
- Have a fiddle – shaped marking on the dorsal surface.
- Mild to severe pain occur immediately after the bite or within a few hours.
- Extensive tissue necrosis can occur with extended spread and severe disfiguring.
- If large dose of venom is injected, may also be systemic complications (hemolytic anemia, hemoglobinuria, hematuria, jaundice fever, with high mortality).

### 3. Scorpions

✚ Have:

- Large pedipalps end in stout claws.
- Four pairs of spindly legs.
- Abdomen with a broad anterior portion and narrow, flexible posterior portion bearing a pyriform telson end in sharp, curved spine or stinger.

✚ Feed at night or in dark places.

✚ Hide under logs and rocks and occasionally in bedrolls and boots.

#### Scorpion envenomation

- ☒ The venom is complex mixtures of neurotoxic and hemotoxic substances.
- ☒ Severity involved species of scorpion, age of victim. Children and infants being at much greater risk.
- ☒ Human contact by stepping on them or touching them in dark places.
- ☒ Some species can penetrate the soles of feet and inject venom

#### Symptoms

- ❖ May be serious particularly in children.
- ❖ Aching pain radiating from the site.
- ❖ Lymphadenitis.
- ❖ Generalized numbness.
- ❖ Throbbing and twitching
- ❖ Muscle spasms of abdomen
- ❖ Convulsions, mental disturbances, paralysis,
- ❖ Electrocardiographic changes
- ❖ Death from respiratory paralysis.

## **Treatment**

- ✓ Mild case (usually) by local application of ice.
- ✓ Profound systemic reactions,; specific antivenin should be
- ✓ Administered.

## **Control**

Insecticides.