

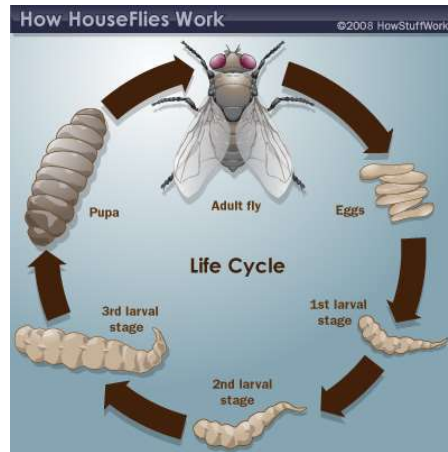
CORONAVIRUS (COVID-19)

# Pupipara

Prof. Dr. *Hanem Khater*  
*Benha University*



# DEVELOPMENT of ARTHROPODA



## Holometabala (*complete metamorphosis*)

The eggs hatch into larvae

### Larvae vs Adults:

Different *morphology*

Different *food*

Different *habitat*

**Eggs >>>> larvae >>>> pupae >>>> adults.**

# Pupipara

## Superfamily: Hippoboscoidea

- Blood-feeding obligate parasites of their hosts (males and females).
- Daytime feeders.
- F. Glossinidae
- F. Hippoboscidae
  
- In older literature, this group is often referred to as the **Pupipara**
- **Pupipara** ("pupa-bearers")
- unlike virtually all other insects, most of the larval development takes place inside the mother's body, and pupation occurs almost immediately after birth.
- **Lay L3 >> ready for pupation**

# Glossina

(Tsetse flies)

## F. Glossinidae



**important blood sucking flies confined only to tropical Africa.**

# Range of the tsetse fly

***G. morsitans*** ("savannah" species)

***G. fusca*** ("forest" species)

***G. palpalis*** ("riverine" species)

African Savannah



## Folded wings

When at rest, tsetse *fold* their wings completely one on top of the other.



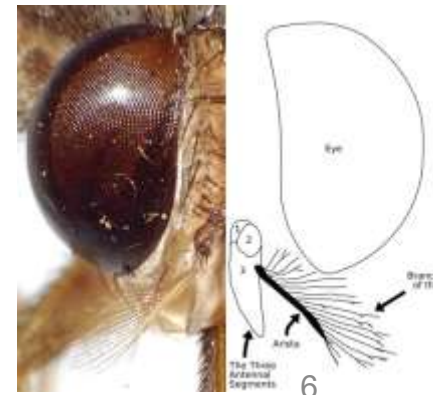
## Hatchet cell

The discal medial ("middle") cell of the wing has a characteristic *hatchet* shape resembling a meat cleaver or a hatchet.

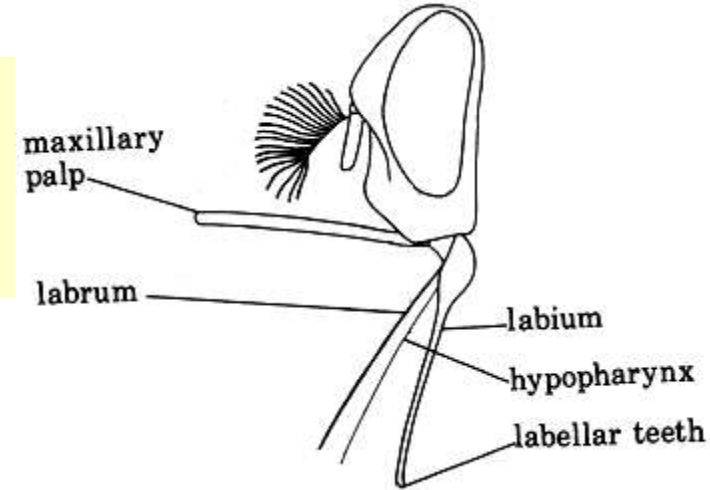


## Branched arista hairs

The antennae have arista with hairs which are themselves branched.



# Feeding habits of *Glossina* spp



Mouthparts and feeding habits >>> like stable flies.

The base of the proboscis: swollen >>> bulb.

Both sexes feed exclusively on blood.

Feed on a wide variety of animals, including humans, and are particularly attracted to pigs.

*Daytime feeders.  
Attracted to moving objects.*

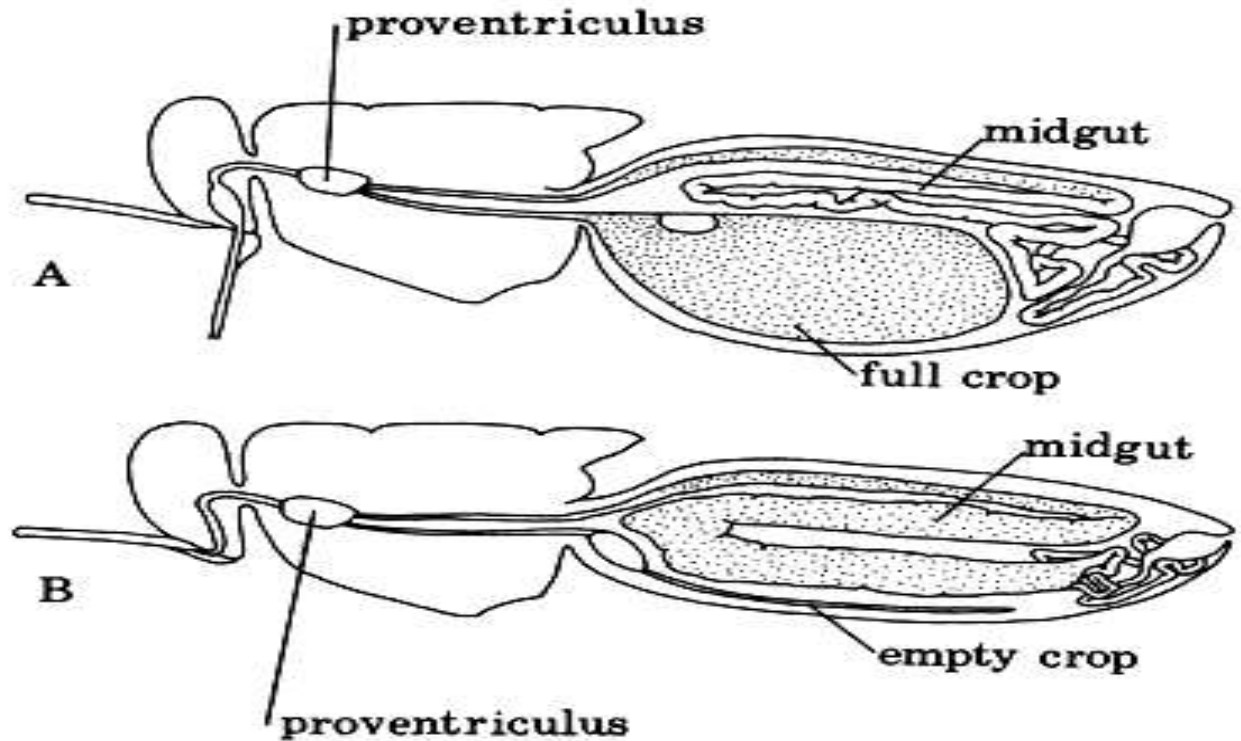


moving human.mp4





# *Glossina* spp.



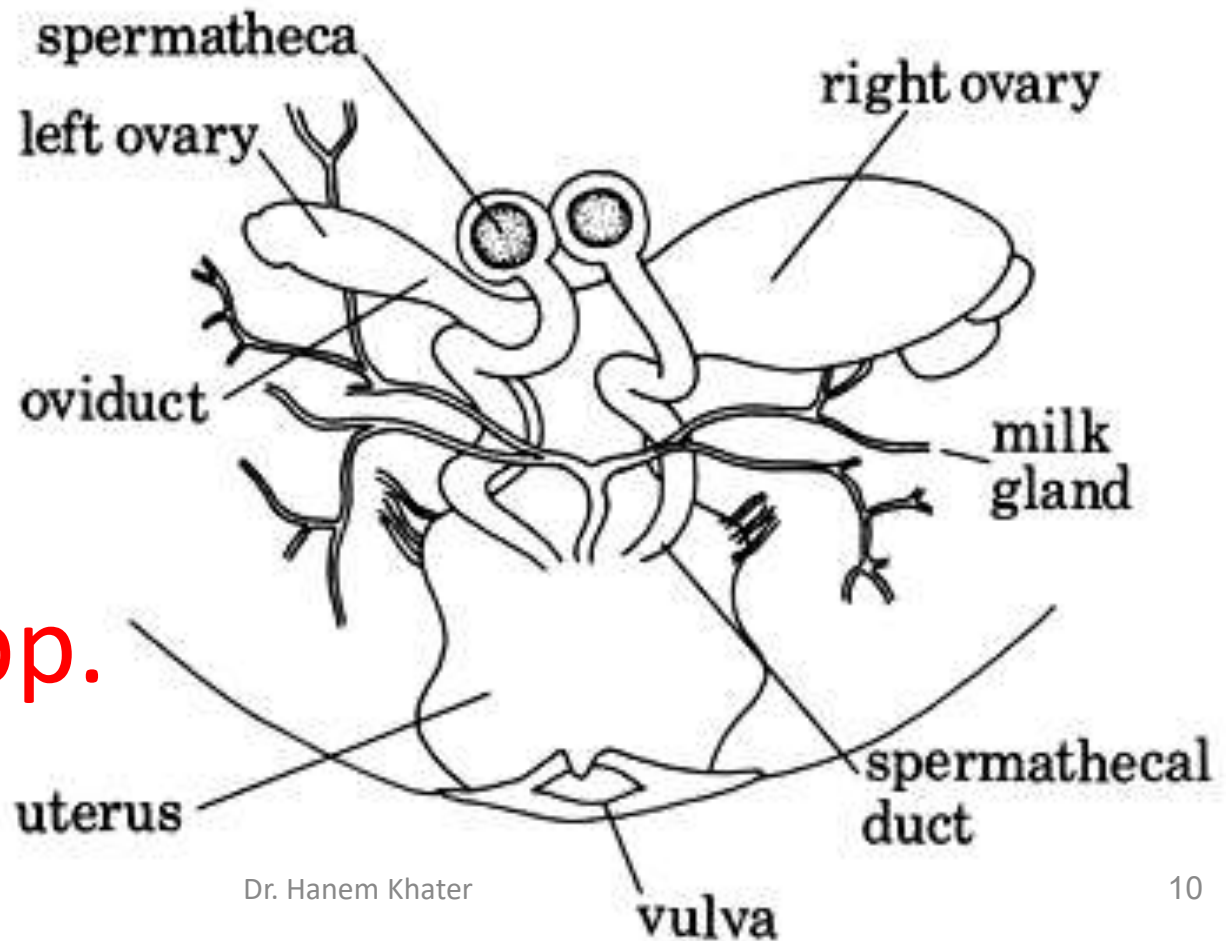
## Crop:

large enough to accommodate a huge increase in size during the blood meal

<<< as tsetse can take a blood meal weighing as much themselves.

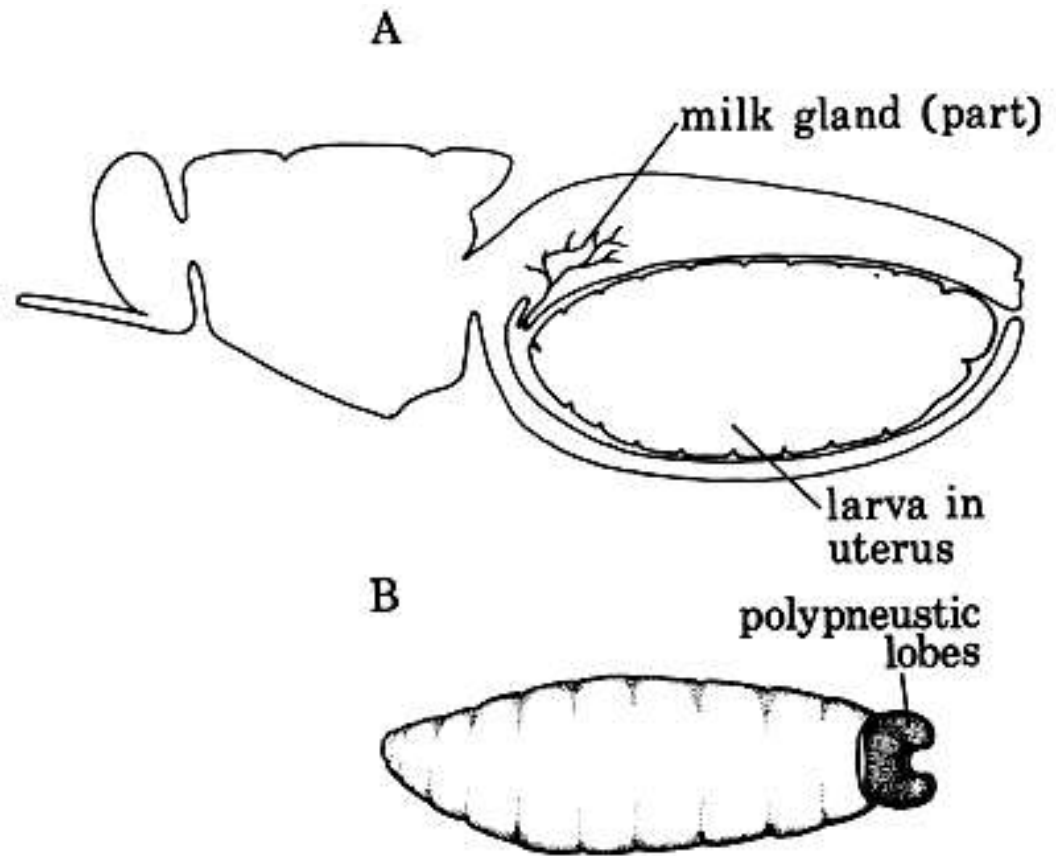
Female reproductive tract >>>

a uterus >>> large enough to hold L3  
at the end of each pregnancy.



*Glossina* spp.

# Glossina spp.



Tsetse flies are larviparous and pupiparous  
*giving birth to a single, completely developed larva at intervals,  
producing from 8 to 20 in all.*

**While in the oviduct, the larva feeds on secretions from specialized  
*milk glands.***

# Tsetse Fly (*Glossina morsitans*)

gravid female about to give birth



# *Glossina* life cycle

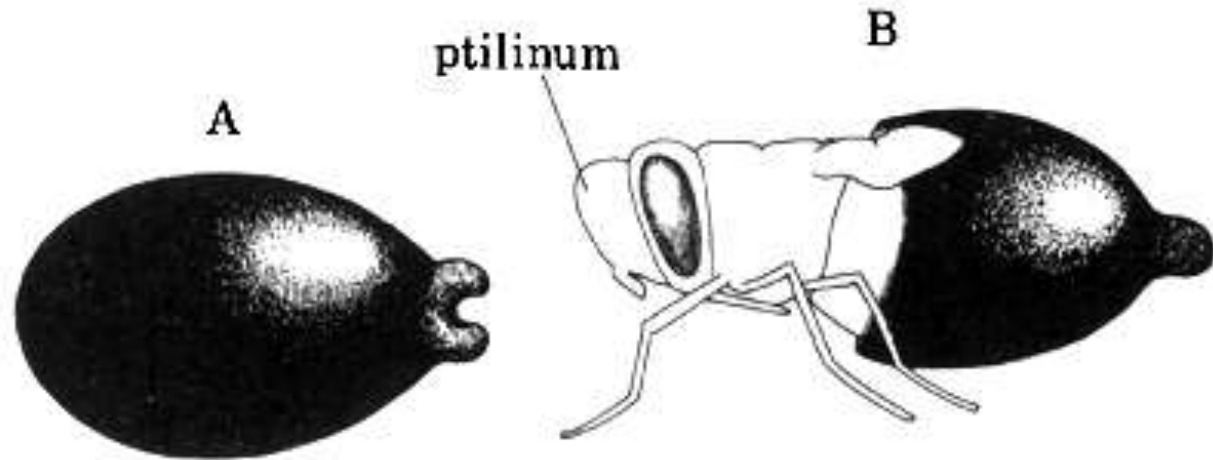


Maturation of larva takes place in 10 days.

Size of larva is 8-10 mm.

Color of larva is creamy white and segmented body and ear shaped.

# Glossina Life cycle



Pupal stage and emergence; A, pupa;  
B, young fly emerging from the pupa, with ptilinum inflated in front  
of head.

Pupa stage is 4-5 weeks.

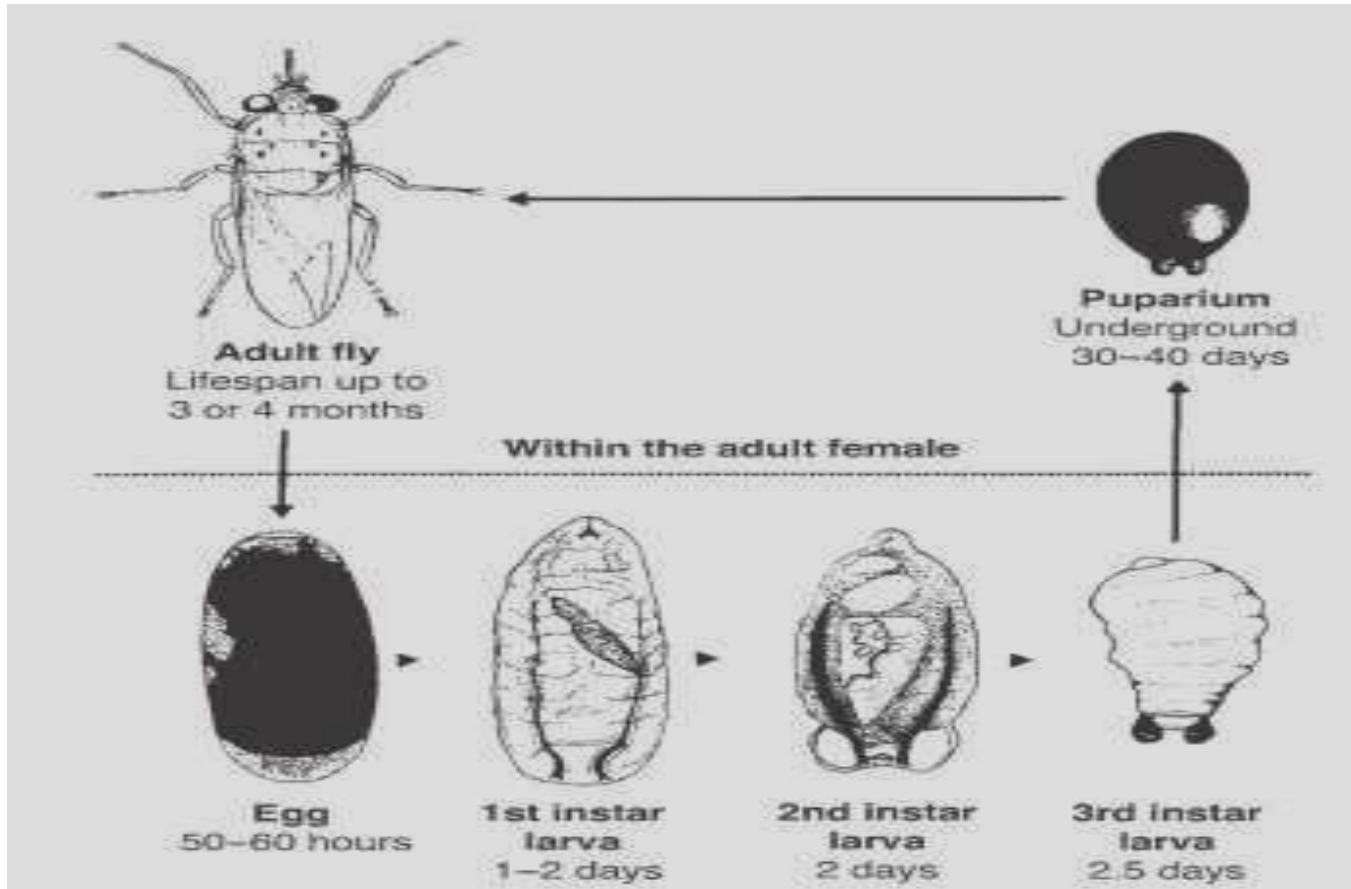
*Pupa: Barrel shaped*

*Dark brown in color.*

Adult requires several blood meals

for a period of 16-20 days before ovary matures and egg laying  
starts.

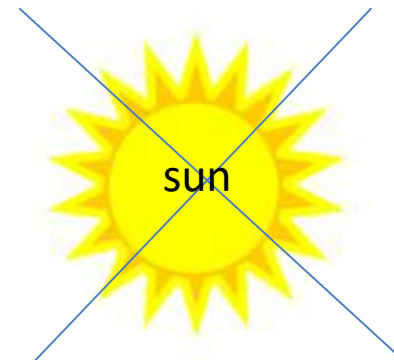
# Glossina Life cycle



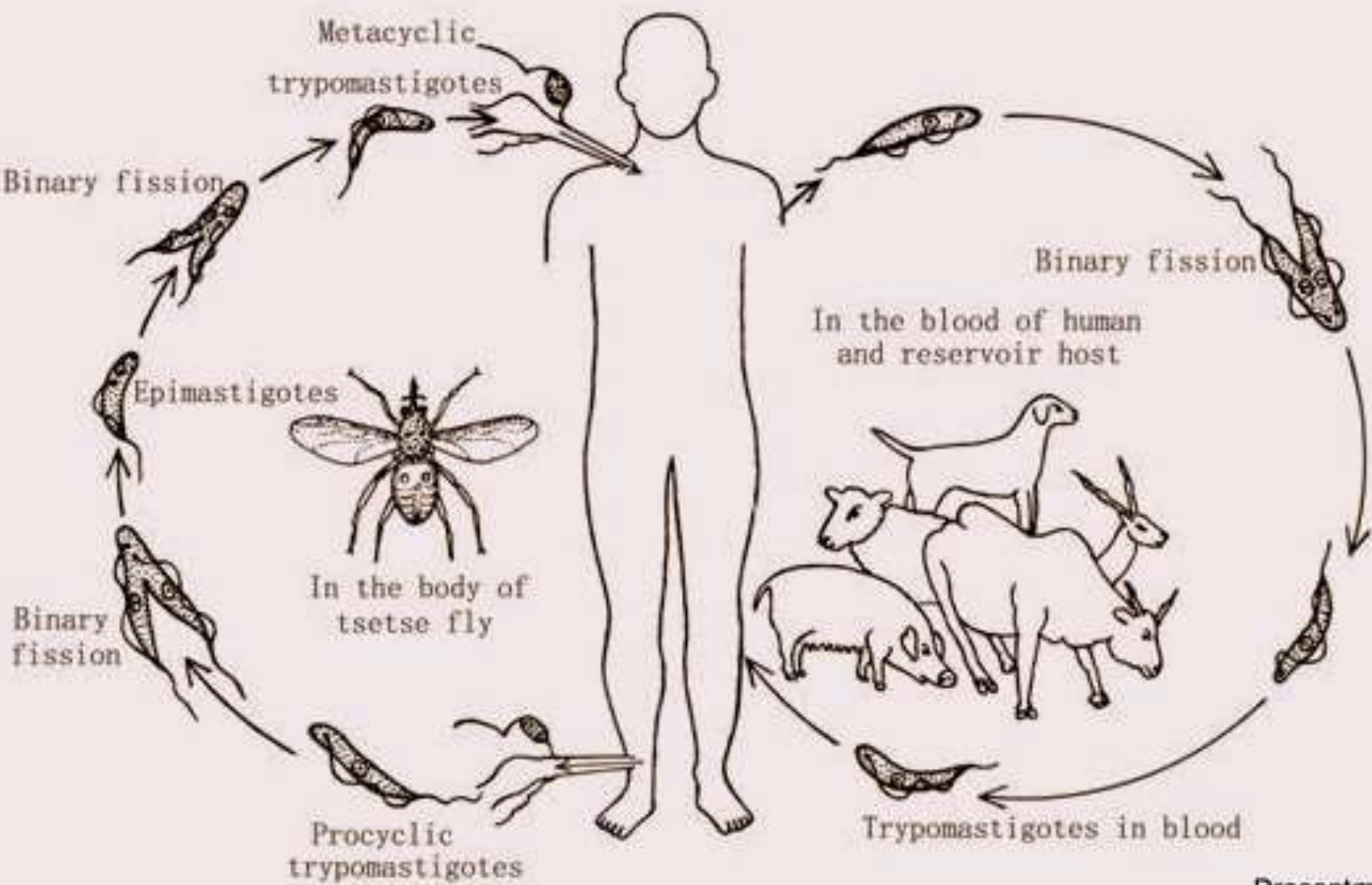
# *Glossina*

## Habite:

- Humidity of the atmosphere
- Temperature and the presence of **shade** have an important bearing on life of the fly.
- It is killed within a short live by direct sunlight and by temperature over 30°C, especially if the humidity is not high.

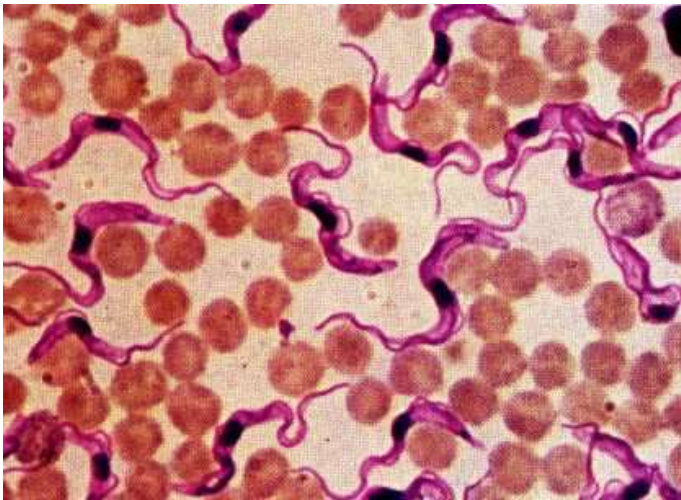






Presentmam

# Importance



Vector of trypanosomes

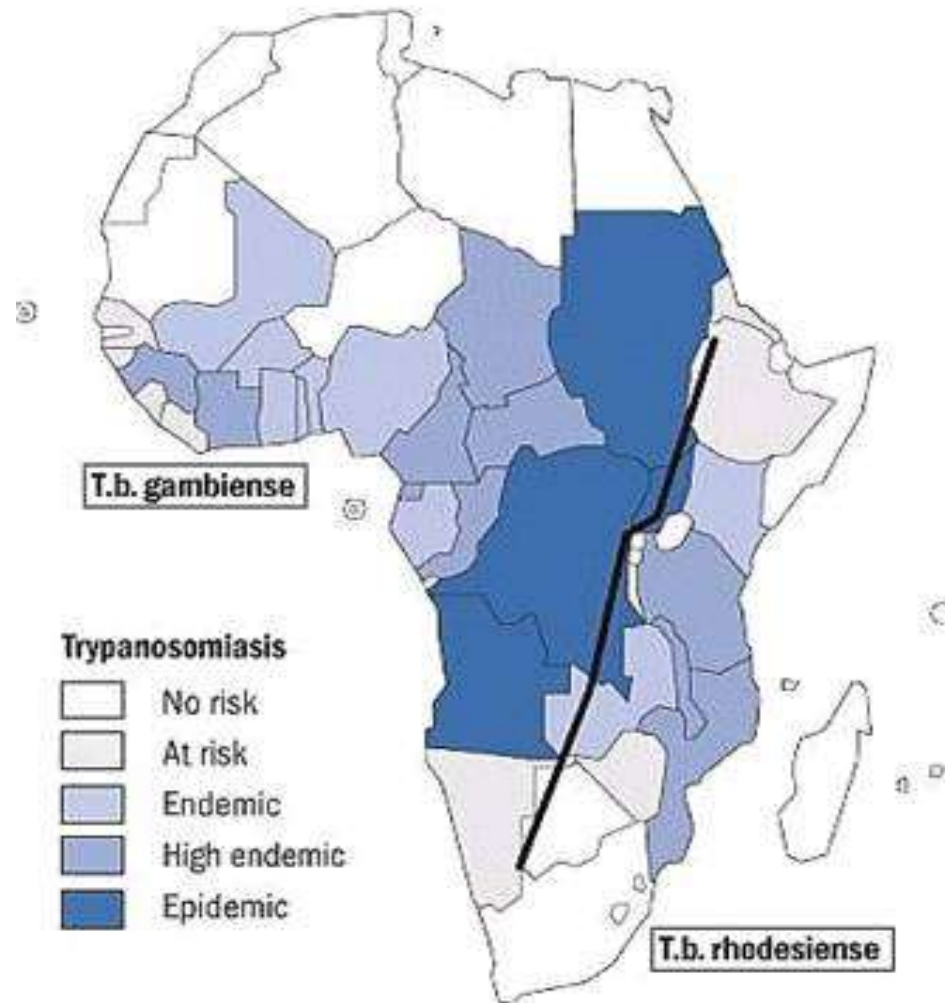
*T. congolense*,

*T. vivax*,

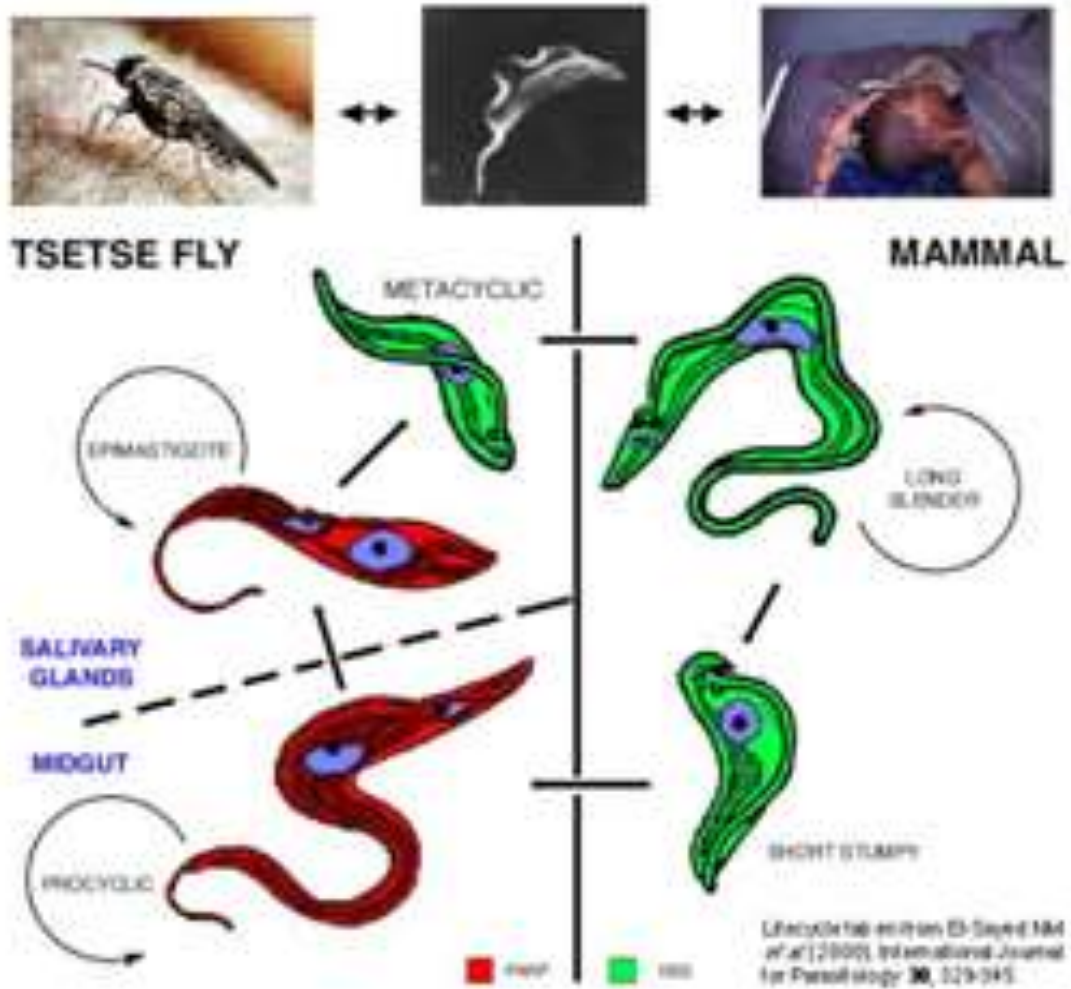
*T. gambiense*,

*T. rhodesiense*,

*T. brucei*.

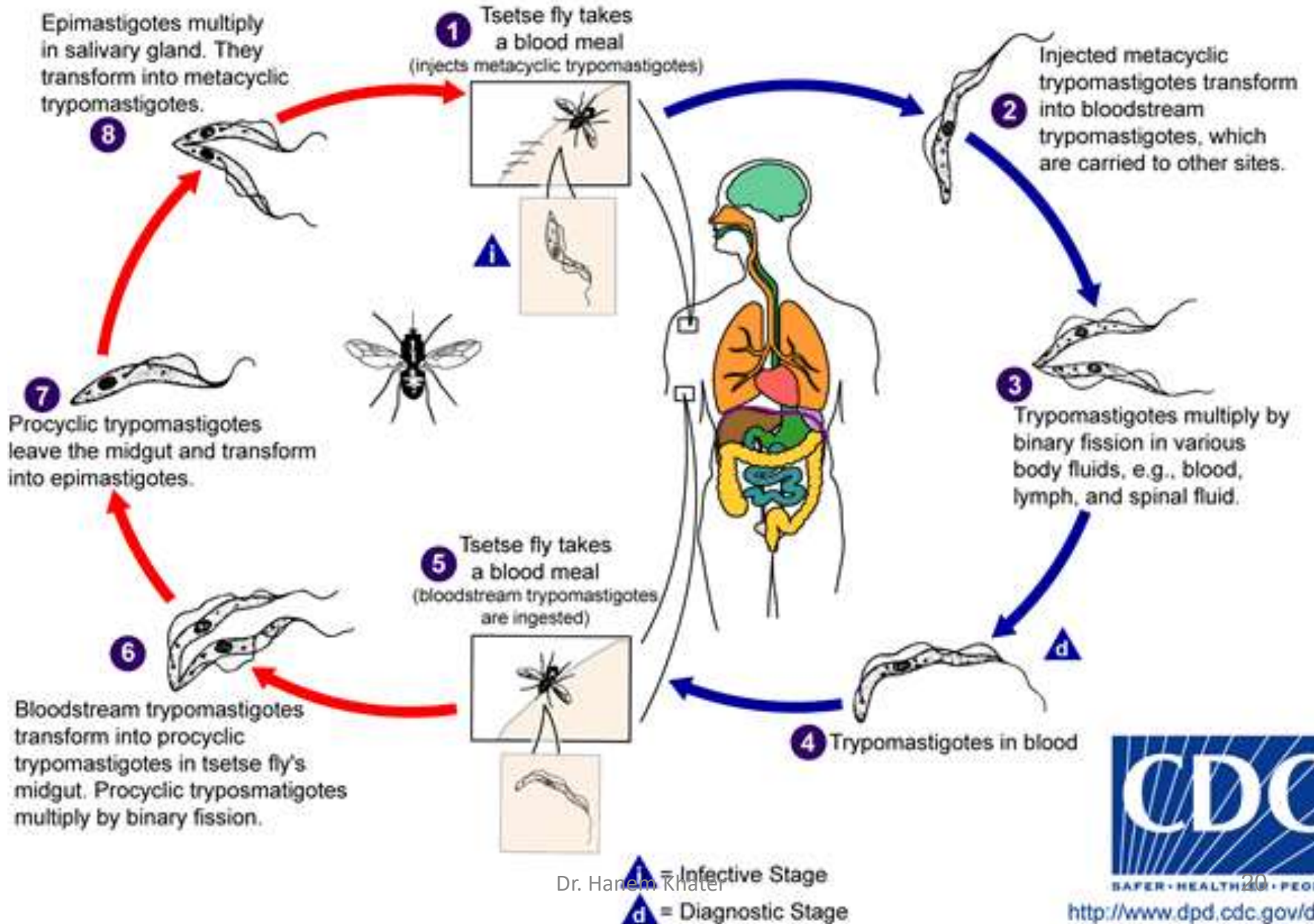


East & West African Sleeping Sickness  
(Map provided by WHO)



## Tsetse fly Stages

## Human Stages



# Control of *Glossina* spp.

Tsetse populations can be monitored

Using simple, inexpensive traps.

The sterile insect technique.



# Glossina (Trapping )



- use electric blue cloth, since this color attracts the flies.
- simple sheets or have a biconical form.
- The traps can kill by channeling the flies into a collection chamber or by exposing the flies to insecticide sprayed on the cloth.

Tsetse are also attracted to large dark colors like the hides of cow and buffaloes.

## use of chemicals as attractants to lure tsetse to the traps:

Carbon dioxide, octenol, and acetone >>>> which are given off in animals' breath and distributed downwind in an *odor plume* .

# Releases of irradiated males

## sterile insect technique

- used to reduce tsetse populations.
- This technique involves the rearing of large numbers of tsetse, separation of the males ,irradiation of these flies with large doses of gamma rays to make them sterile and then release into to the wild.
- Since females only mate a few times in their life, generally only once, any mating with a sterile male prevents that female from giving birth to any offspring.

The sterile insect technique has recently been used on Zanzibar ,an island off the coast of East Africa .



لتحقيق حلمك.. تصرّف  
وكأنك حقيقة ودع قلبك  
يؤمن بذلك.



## F. Hippoboscidae



- They have a flattened body with leathery wall.
- The head is closely united to the thorax or is folded back upon it.
- Thorax is highly chitinized
- Flattened abdomen sac-like and leathery.
- The wings may be present or absent.

**Bite humans**

Sheep shearers are particularly vulnerable to attacks

Bite as painful as a wasp bite

# Hippobosca.



## Morphology

Wings: veins crowded up to its anterior border.

The body is flattened with a leathary wall.

The head is flattened and fitted into the anterior border of prothorax.

The mouth parts are adapted for piercing and sucking blood in both sexes.

The maxillary palps form a sheath for the proboscis.

Antennae are in groove and bare.

The legs are short and strong ending with a pair of strong claws.

# *Hippobosca*



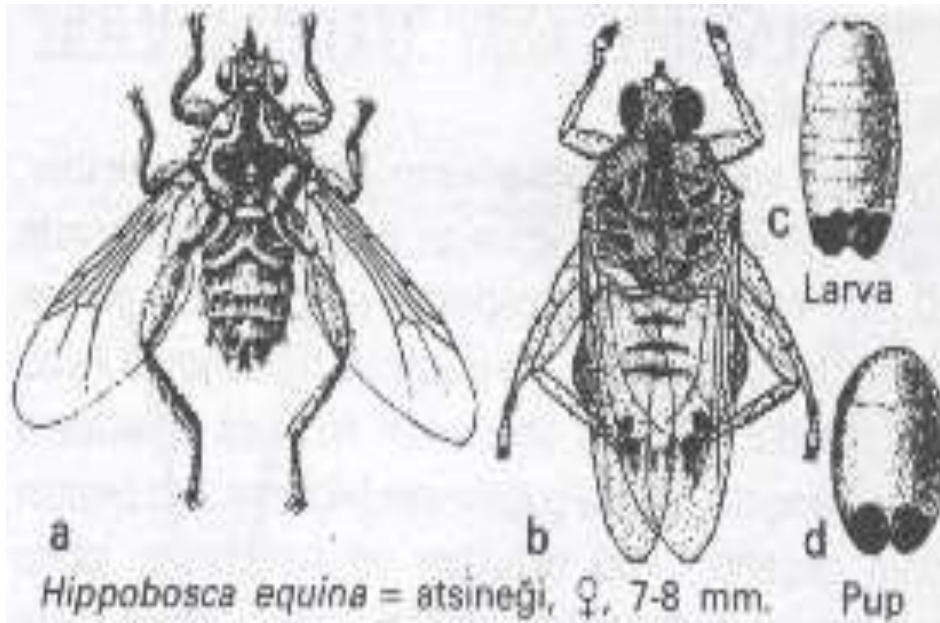
- **The adult flies remain for a long period on their hosts and are not easily removed or disturbed.**
- They cluster on the soft skin
- specially on *the perineal region*
- *under the tail between the thighs*
- *under the belly*
- or on any other parts of the body.

# Hippobosca.



- The female deposits one larva at a time in a sheltered spots.
- The larvae pupate at once >>> turn from yellow to black.
- The flies are frequent in **summer** and attack their hosts in **sunny weather**.

# Hippobosca



- Larvae >>> retained within the female >>> feeding secretions form special glands >>>
- born ready to pupate

# Hippobosca



## *Hippobosca equina*

horses, mules, donkeys, cattle, buffaloes  
especially calves and dogs.

>>> Cause irritation

>>> transmit the non-pathogenic

“*Trypanosoma theileria* >> cattle.

*Hippobosca longipennis* >>> domestic dogs >> irritation.

*Hippobosca camalina* >>>> camels >>> irritation.

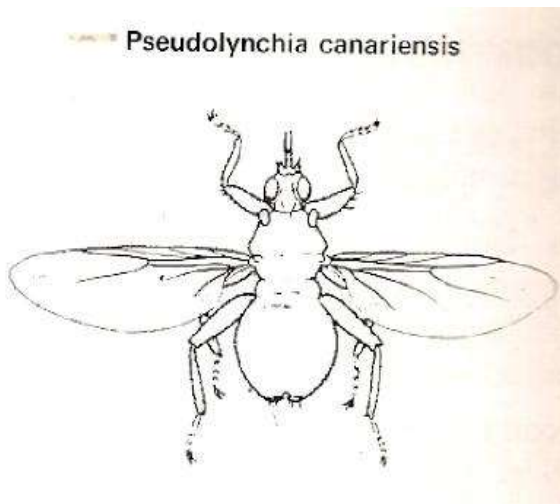
# *Pseudolynchia canariensis*



**Host: domestic pigeon and other birds.**

## Importance

- vector of *Haemoproteus columbae*
- cause irritation and anaemia.





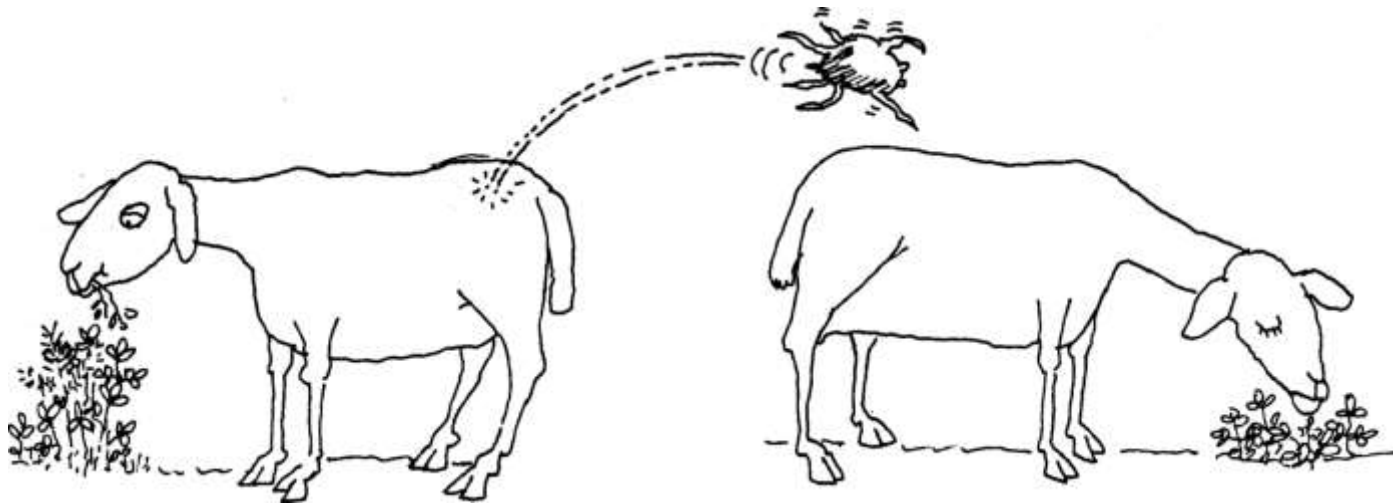
اقبل كل فرصة تأتيك ولا  
تتردد فإن لم تقبلها ذهبت  
لغيرك وإن قبيلتها أتتك بأخرى.



# *Melophagus ovinus*

(Sheep tick, sheep kid, sheep louse)

**Wingless & permanent** ectoparasite



# *Melophagus ovinus*

(Sheep tick, sheep kid, sheep louse)

- **Wingless & permanent** ectoparasite.
- Reddish brown blood sucking insect
- Infect sheep in Egypt.



## Transmits

- *Anthrax* bacilli
- nonpathogenic sheep trypanosome >>

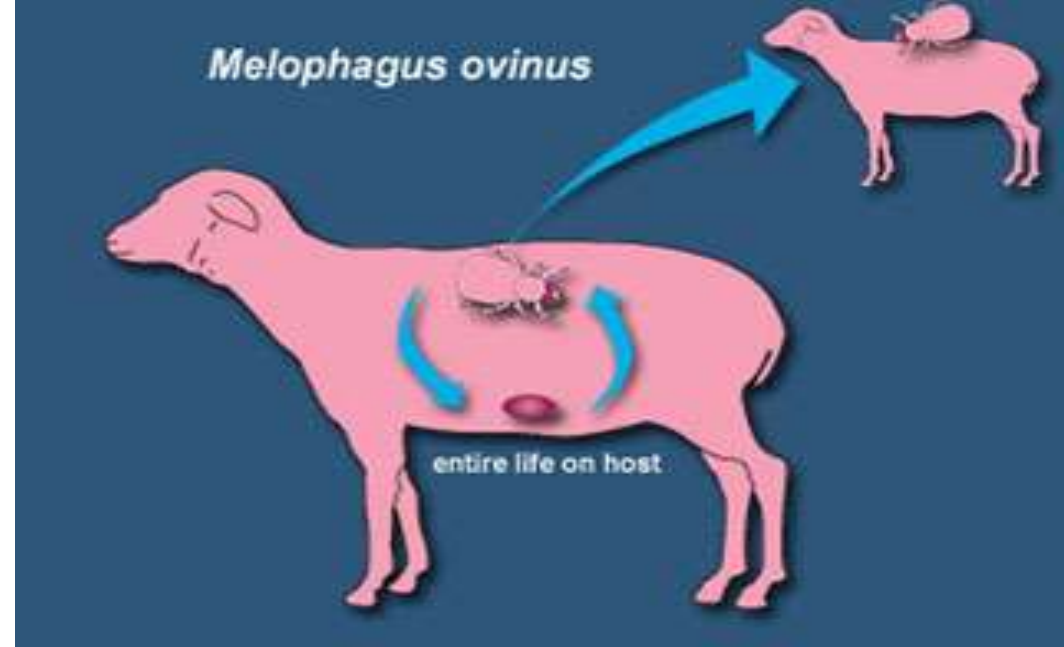
*Trypanosoma melophagium*.

# *Melophagus ovinus*

(Sheep tick, sheep kid, sheep louse)

- Suck blood >>> anemia.
- In heavy infection of sheep >>> produce intense irritation >>> sheep rub and scratch itself >>> damaging the wool
- Wool >>> **becomes soiled with the pupae** of the flies , **pupal cases & faeces** of flies.





## *Melophagus ovinus*

(Sheep tick, sheep kid, sheep louse)

### Life cycle

- **Female** >>> single larva (L3) at a time >>> (10-12 young total)
- **Larva** >>> **glued to wool** >>> **12 hours** >>> **pupa**
- **Pupa** (3-4 mm) >> easily visible .  
>>> 19-23 days in summer & 37 days or longer in winter.
- **Adult** >>> 14 days >>> larviposition.
- Feeding on **blood** of sheep & sometimes on goat.

## ***Melophagus ovinus***

(Sheep tick, sheep kid, sheep louse)



- **Permanent ectoparasite** (live several month)
- A kid entire life cycle>>> spent on its host >>
- Die when removed from the host within 4 days.
- Spread by contact
- Long wool breeds >> susceptible.

## *Melophagus ovinus*

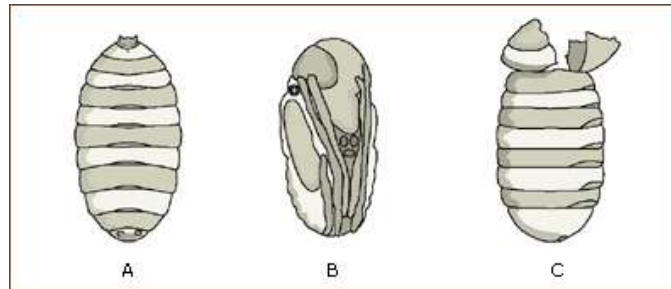


### Control

- As blow flies and ticks
- Pupae >> resistant to treatment
- Chearing >>> remove pupae and adults

# Cyclorrhapha

## Muscomorpha



“circular-seamed flies’ >> the circular aperture through which the adult escapes the puparium.



كن قطرة المطر التي تحيي  
الأرض الميتة، فكم من صحراء  
قاحلة لا تحتاج إلا لقطرة  
واحدة للحيا من جديد.









حياة بلا أعلام حياة مملّة،  
وحياة مليئة بالأعلام تجعل  
حياتنا بروعة الأعلام فلا تتخلّ  
عنها واعمل على تحقيقها.

Dr. Hanem Khater

# Order: Hemiptera

## “True bugs”

- These are insects of agricultural importance, few individuals feed on the blood of vertebrates and are of parasitological importance.
- The mouth parts are adapted for piercing & sucking.
- They consist of a binged labrum, bilobed maxillae, grooved blade-like mandibles and a 3-jointed labial sheath.
- Antennae are long, 4-5 segmented.
- Eyes are prominent.
- Thorax consists of a large prothorax, small meso- & meta-thorax. There are two pairs of wings.
- The fore wings serve for protection of the second delicate wings.
- Abdomen of 8 segments, ovipositor long male have large claw like claspers.
- Metamorphosis is incomplete

# Bed bugs” *Cimex lectularius*



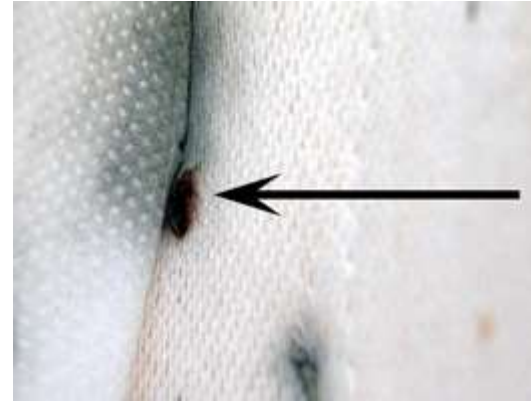
- Bed bugs are small, flat insects that **feed on the blood at night (of sleeping people and small animals, and birds).**

**Adult: reddish-brown, flattened, oval and wingless.**

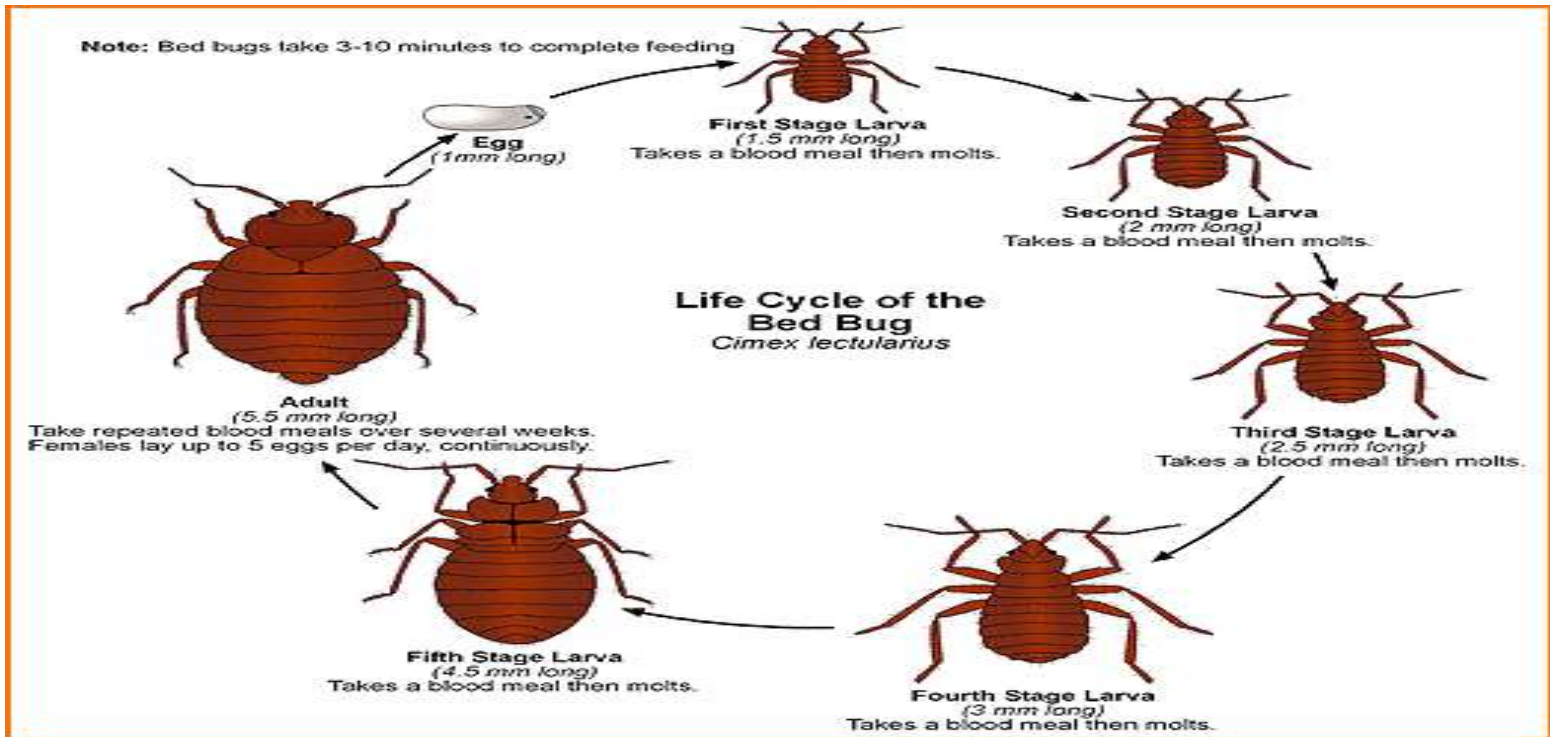
- range from 1 to 7 millimeters in length.
- They can live several months without a blood meal.

Newly hatched nymphs are translucent, lighter in color and become browner as they moult and reach maturity. **The fore-wings are small & the second wings are rudimentary >>>> wrong.**

- Wingless, adults has no wings, although rudimentary wing pads form in nymphs
- >> for adaptation for inhabiting narrow crevices in which bed bugs reside between feedings >>>>> correct







Life cycle of bed bugs

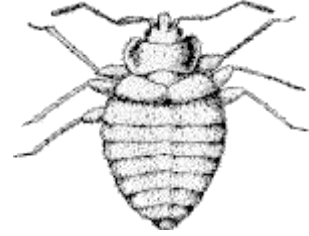
Female >>> 200-500 eggs in batches of 10- 50 >>>>

**5 nymphal instars** (each must have at least one bl. Meal)

Male, female >>> blood meal >> mate >> female oviposit eggs

Eggs >>>>> adults ( 37-128 days)

# Disease transmission bed bugs



**Although bed bugs can harbor pathogens in and on their bodies,  
>>>>> transmission to humans is considered unlikely.**

Their medical significance is chiefly limited to the **itching and inflammation** from their bites.

Antihistamines and corticosteroids may be prescribed to reduce allergic reactions, and antiseptic or antibiotic ointments to prevent infection.

**Though not known to carry diseases,  
>>> reduce quality of life by causing discomfort, sleeplessness,  
>>>> anxiety, and embarrassment.**

**Sleeping with the lights on is not likely to deter hungry bed bugs either.**



# Life Cycle of the Bed Bug



**Egg**  
(1mm long)



**First Stage Larva**  
(1.5mm long)  
Takes blood meal then molts.



**Second Stage Larva**  
(2mm long)  
Takes blood meal then molts.



**Third Stage Larva**  
(2.5mm long)  
Takes blood meal then molts.



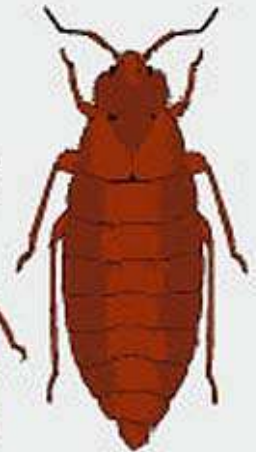
**Fourth Stage Larva**  
(3mm long)  
Takes blood meal then molts.



**Fifth Stage Larva**  
(4.5mm long)  
Takes blood meal then molts.



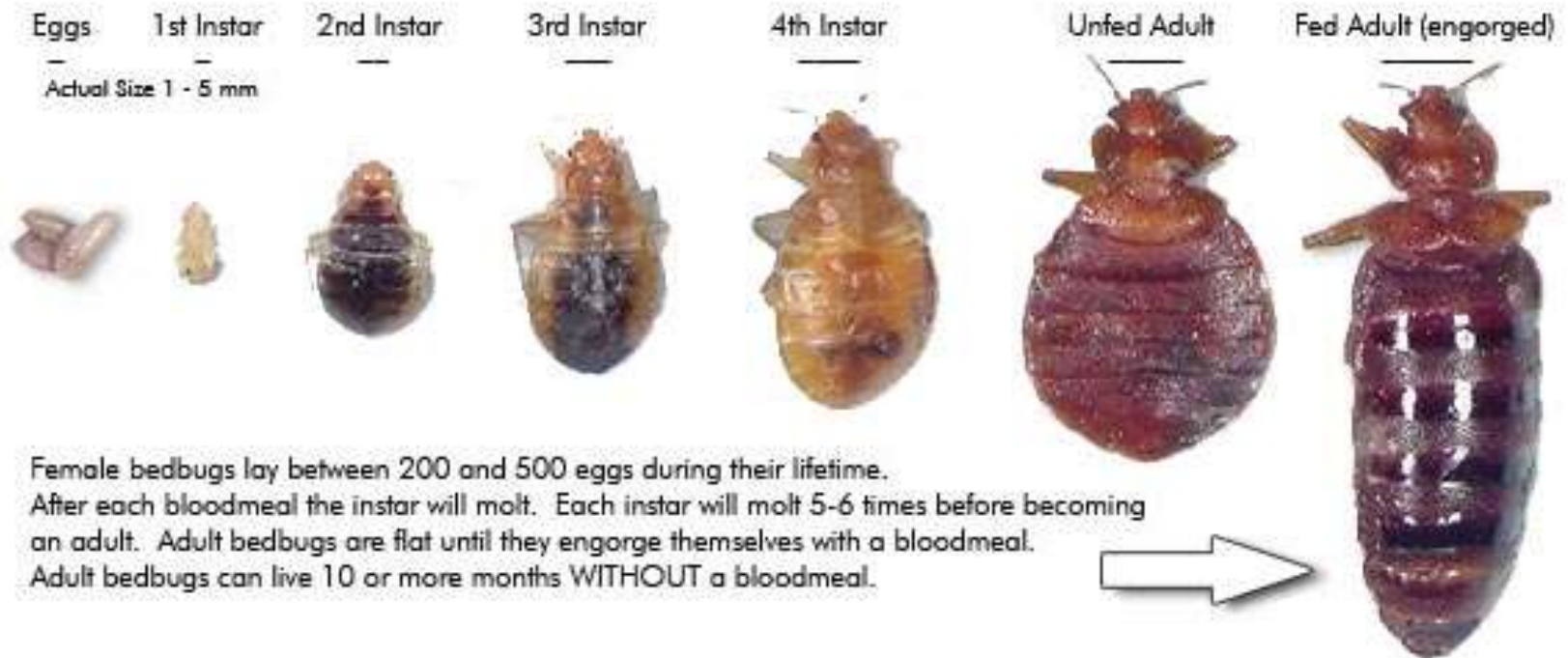
**Adult**  
(5.5mm long)  
Takes repeated blood meals over several weeks.



**Adult Female**  
(6.5mm long)  
Females lay up to 5 eggs per day, continuously.

# Bedbug Life Cycle

**4 Weeks - 5 Months Depending On Conditions**



# Do bed bugs carry diseases?

Although bed bugs can harbor pathogens in their bodies, although there are currently no documented cases of bed bugs transmitting any diseases to humans at this time reported by the CDC.

**>>>> However, lab tests have found that bed bugs can carry the causative agents for anthrax, plague, typhus, tularemia, yellow fever and numerous other blood infesting disease organisms**

# حشرات في غرف النوم

## بق الفراش



Female *Cimex lectularius* - unfed

وتكفي وجود انثى واحدة بالمنزل لكي تتواجد بؤرة إصابة جديدة  
البق يعرف ضحاياه عن طريق درجة الحرارة و ثاني أكسيد الكربون ( Co2 ) في هواء الزفير.

Bed bugs can live 10 or more months without blood feeding.

Typical symptoms include a raised, inflamed, reddish weal at each bite site, which may itch





Dark spots as a sign of bed bug



## المظاهر الجلدية لبق الفراش



Typical excoriated bedbug bite.



**Bedbug infestation.** A prison cell had become infested, the bedbugs laying eggs in the mortar cracks on wall. Nymphs and cast skins can also be seen.



(a)



Typical appearance of bedbug bites on

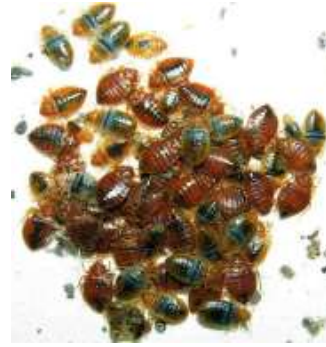
- عادة ما تظهر كنقاط صغيرة حمراء  
تثير الرغبة في حكها. بينما تزيد  
الأعراض أحيانا لتصل مساحة الالتهاب  
والاحمرار إلى عدة سنتيمترات  
ويصاحبها ألم شديد.

-- وأحيانا يجد المريض أن لباس النوم  
وأغطية الفراش قد اصطبغت بالدم .

**The bites of bedbugs are irritant, produce red itching-wheals and cause loss of sleep. Some persons show no reactions while others shows severe allergic symptoms.**

## أماكن اختباء البق :-

البق يعيش في الشقوق والأماكن المحمية  
اختبائها في أماكن تكون غالباً قريبة من مصدر غذائها (دم النائم) كالمفارش والوسائد والمراتب  
وشقوق الجدران وتحت السجاد وكذلك شقوق وزوايا السرير أو حتى أماكن المسابير بالسرير وورق  
الحائط الغير مثبت جيداً وصور الحائط والبوتاجازات القديمة غير المستعملة حيث تختبئ في فرن  
البوتاجاز وغيرها من الكراكيب وكذلك في عشش الطيور .





## أماكن اختباء البق :-



- They are nocturnal in their habits, hiding the day in the crevices of wooden bed-seeds, under wall-paper between wall and wooden -articles;... etc.

They survive starvation for long periods





Bed bug nymph



Bed bugs hiding under seam of mattress



*Bed bug expanding in size as it fills up with human blood less than 15 min of sucking bl. And engorged 3 times its normal size*

Dr. Hanem Khater



Bed bug eggs



## كيف يمكن الاستدلال على وجود البق؟

يكون برازها على هيئة **نقط بنية محمرة** على المراتب والأثاث (وتكون من طريق خروجها من مخابها إلى السرير حيث ينام الإنسان وتمص دمه ليلاً خاصة قبل الفجر) وبهذه الطريقة لو تتبعنا خط سير هذه البقع نستطيع أن نعرف أين تختبئ نهاراً ويسهل مكافحتها .

❖ وجود لطخات صغيرة من الدم (بقع مائلة للاحمرار) نتيجة عض البق على أغطية الأسرة أو المراتب أو المناطق التي تختبئ فيها أثناء النهار (خلف السرير ، خلف ورق الحائط المتهتك ، خلف لوحات الحائط ، ثنايا الكنب أو الشقوق) .

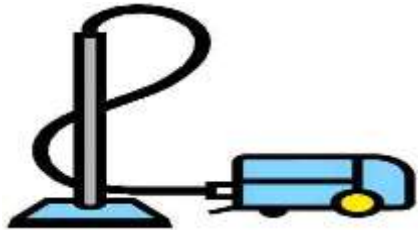
❖ وجود قشور البيض والحوريات وكذلك الحوريات والحشرات الكاملة .  
❖ انبعاث رائحة مميزة كريهة نتيجة وجود الحشرات بكثافة عالية .

❖ لان البق ينتشر من منزل إلى آخر إلى أن يغزو جميع أرجاء المبنى، فيجب التنبيه إلى فحص جميع الغرف داخل المبنى لكي يتم التخلص منها بصورة جماعية ولا تعود بوأ الإصابة مرة أخرى إلى المبنى.





التخلص من ورق الحائط القديم



تنظيف المنزل جيداً مرة أسبوعياً باستعمال  
المكنسة الكهربائية خاصة في الأماكن المحيطة  
بالأسرة والأماكن العميقة في الأثاث



التخلص من الكرايب



يفضل طلاء المنزل قبل الإقامة فيه ولذلك لسد الشقوق



• إبعاد الطيور عن المنزل و يفضل عدم تربيتها فيه

## كيفية التخلص من بق الفراش



Dr. Hanem Khater

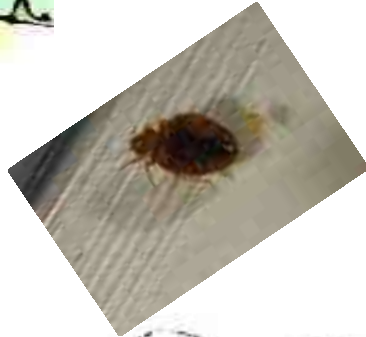


سد الثقوب التي تتواجد في الجدران أو الأثاث

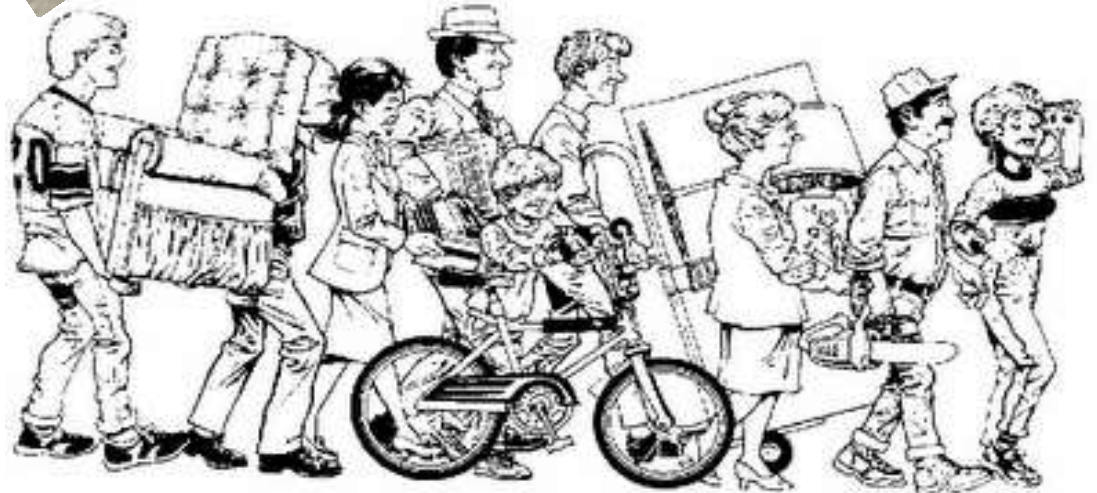


"You spelled garbage wrong."

الفحص الجيد للملابس المستعملة



الفحص الجيد للملابس الخادمت



Dr. Hanem Khater  
الفحص الجيد لأثاث المستعملة



تفتيشاً دقيقاً للأسرة وتفكيكها تماما وكذلك الغرف  
والمنازل المجاورة ويفضل أن يكون ذلك ليلاً



• الفحص الجيد للغرف التي سوف تقيم بها أثناء الرحلات  
• حتى ولو كانت في أرقى الفنادق والشقق المفروشة.



Dr. Hanem Khater

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الفحص الجيد لحقائب السفر





• ابعاد السرير عن الحائط

• تغيير الملائات (الشرشف) وأغطية الوسائد مرة كل أسبوع مع غسلها بالماء الساخن .

• تعريض المفارش والوسائد والمراتب لأشعة الشمس

• المكنسة الكهربائية

• نضع شريط لاصق من الجانبين علي أرجل السرير



• وضع أرجل السرير في برطمان زجاجي أو معدني أو صفيحة, أنها لا تصعد على الزجاج أو المعدن

• وضع فازلين أو زيت معدني بعرض 5 سم



وضع بعض اوراق النعناع بالقرب من السرير

يفضل غسل اسرة النوم والاثاث  
بالماء الساخن.

العطور والكلور والجاز والماء الحار لها  
تاثير قاتل لبق الفراش في ثوان قليلة.



حينما نفتح النور فجأة  
نري البق يبحث عن ضحاياة

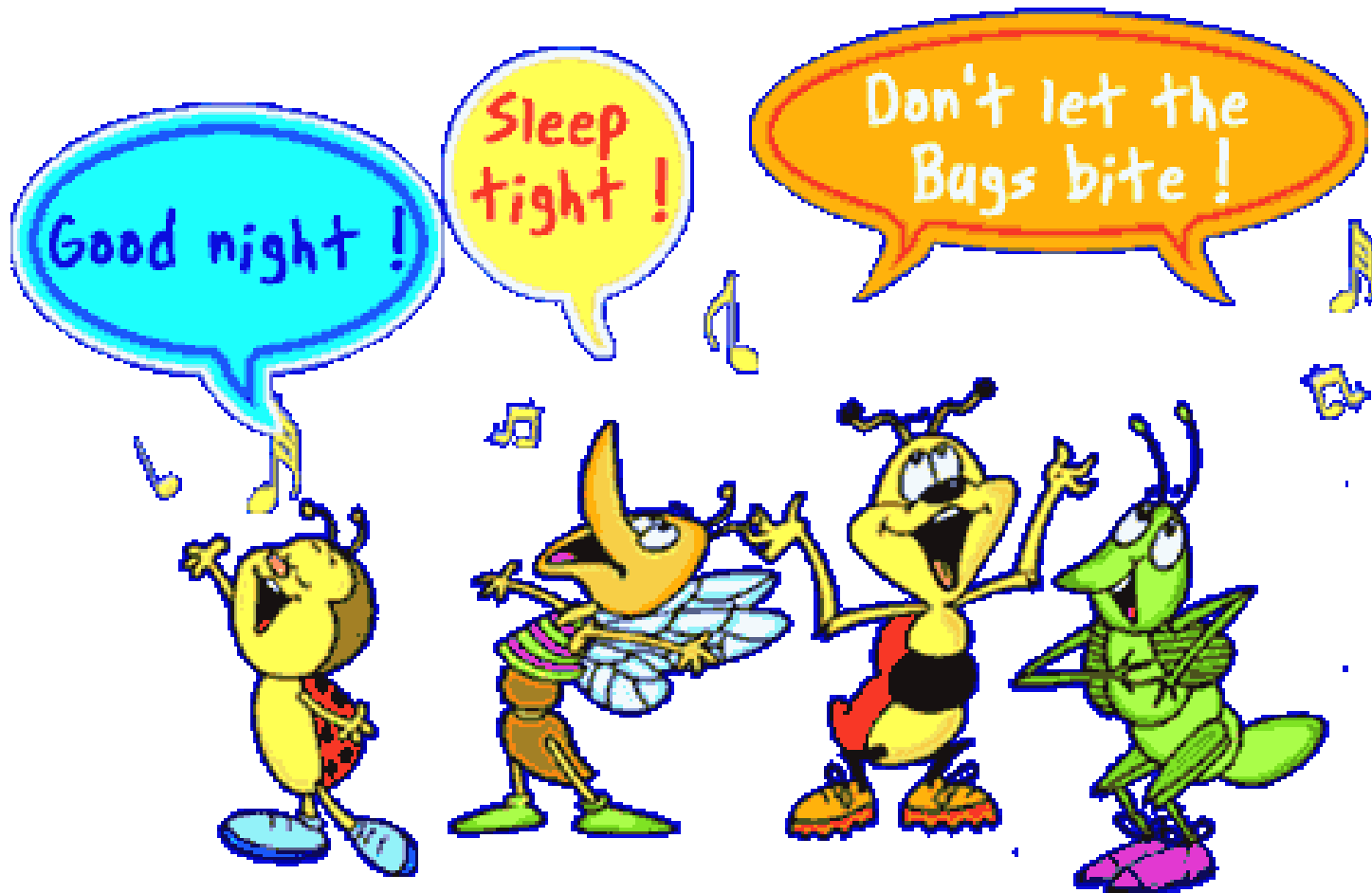
**الدعاء قبل النوم  
بالأدعية الماثورة**

**وضع طارد للبق على الجلد قبل النوم**

**(1 ملعقة زيت كافور + 2 كوب ماء دافئ).  
(وضع قطرات قليلة من أبوفاس)**

عندما تظهر الحشرات فرادى فان ذلك يدل علي قرب التخلص منها  
ومع استمرار المكافحة تختفي تدريجيا





[PIMP.MYYEARBOOK.COM](http://PIMP.MYYEARBOOK.COM)

# Order Hemiptera (bugs)

## Family: Reduviidae



Adult insects have wings and often range from 4 to 40 [mm](#).

They most commonly have an elongated head with a distinct narrowed *neck*, long legs, and a prominent, segmented tube for feeding ([rostrum](#)).

Most reduviids are **predators on other insects** >> called **assassin bug**

Most of these can but usually do not bite humans >>> **painful bite**

## Superfamily: Triatominae



## Conenose bugs, kissing bugs, or triatomines

feed on vertebrate blood.

They are mainly found and widespread in the Americas, with a few species present in Asia, Africa and Australia.

These bugs usually share shelter with nesting vertebrates, from which they suck blood.

**They hide in crevices by day and attach their sleeping hosts by nights in the manner of bed bugs, argasid ticks, and some spp. of mesostigmatid mites.**

# Superfamily "Triatominae"

Triatomines of the genera *Triatoma*, *Rhodnius*, and *Panstrongylus* transmit **Chagas disease** to humans and other mammals >>> (from the southern United States to southern Argentina)

Cone nosed bug >>>

*T. cruzi*

C shaped

Children

Cardiac lesion >>>> Chagas disease

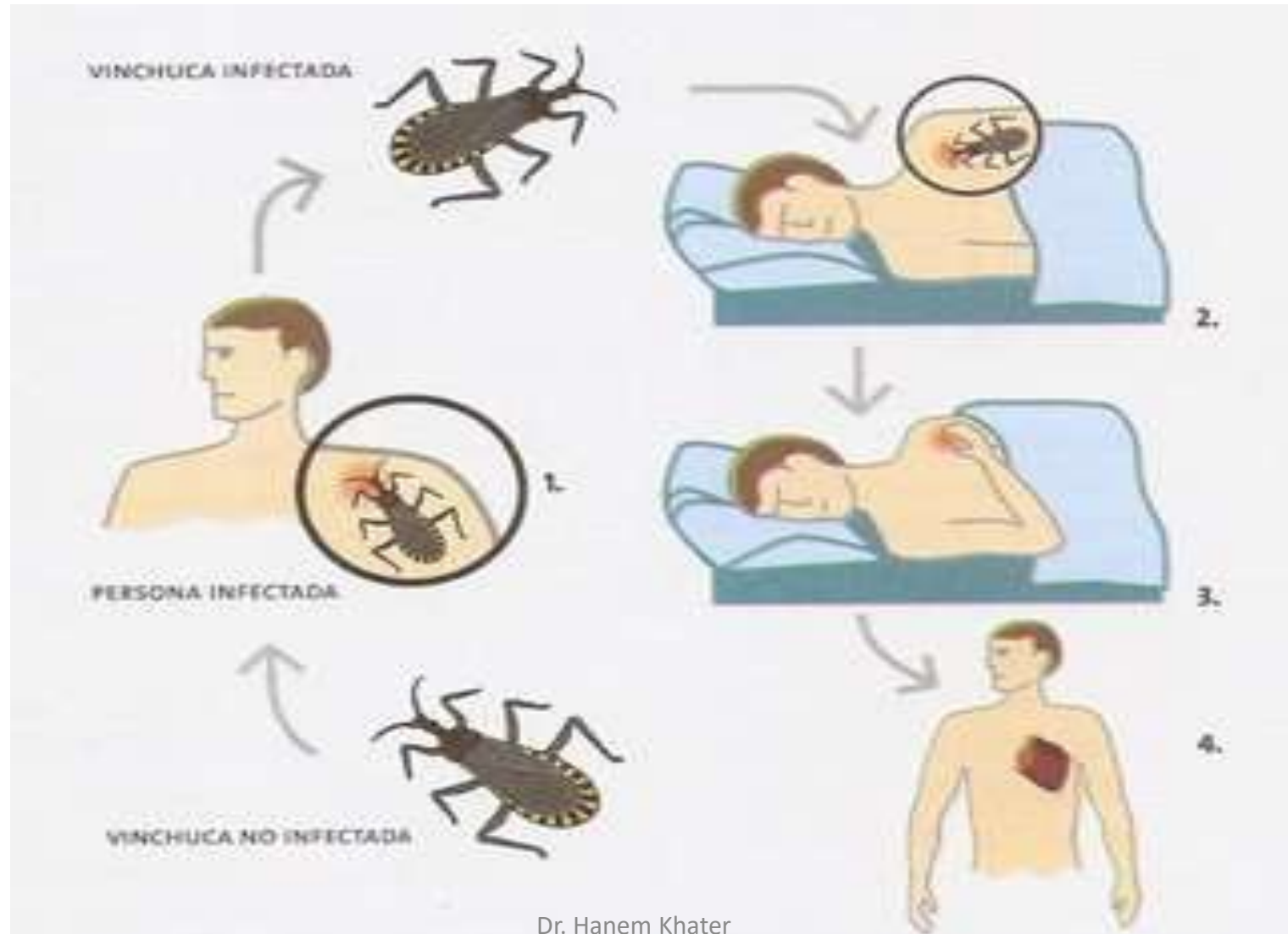
Central & south America



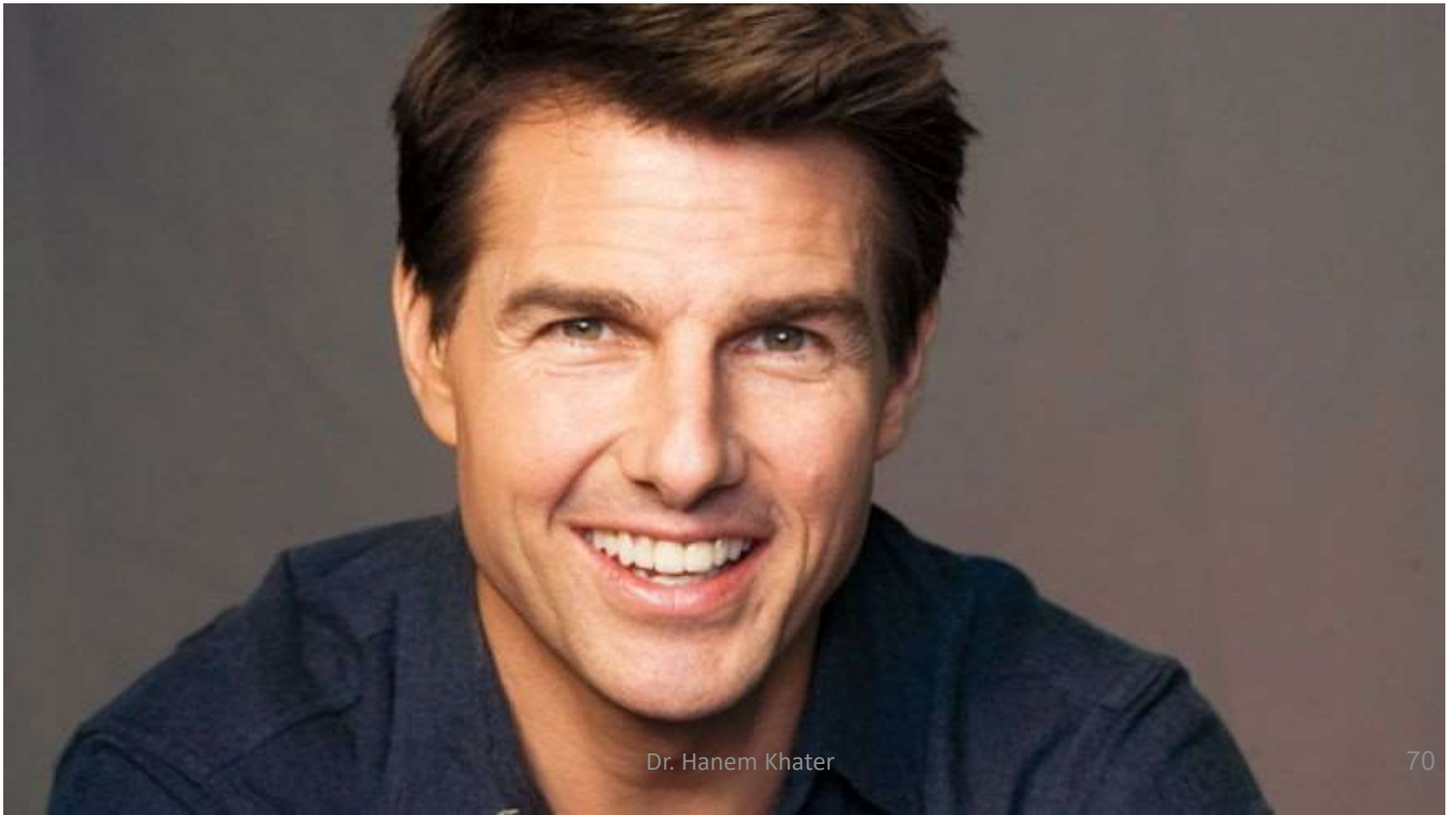
*Triatoma sanguisuga* play a minor role in the transmission of

>>>>> **Equine Encephalomyelitis Virus**

# Superfamily "Triatominae"



*T. cruzi*  
**Tom Cruise**



# Trypanosomiasis, American (Chagas disease)

(*Trypanosoma cruzi*)

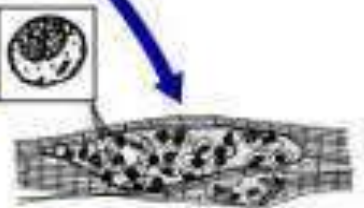
## Triatomine Bug Stages

- 1** Triatomine bug takes a blood meal (passes metacyclic trypomastigotes in feces, trypomastigotes enter bite wound or mucosal membranes, such as the conjunctiva)



## Human Stages

- 2** Metacyclic trypomastigotes penetrate various cells at bite wound site. Inside cells they transform into amastigotes.



- 3** Amastigotes multiply by binary fission in cells of infected tissues.

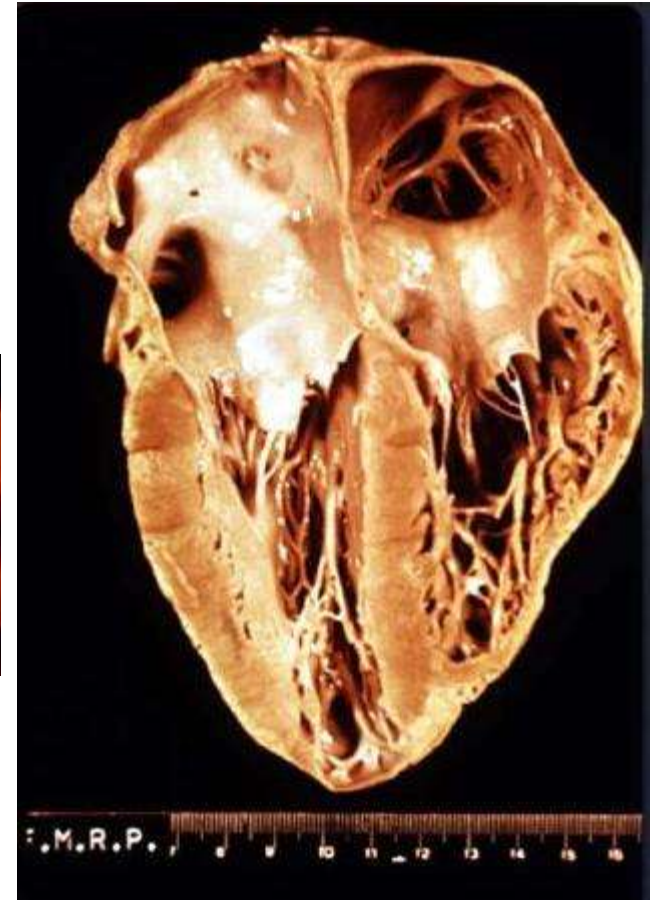
Trypomastigotes can infect other cells and transform into intracellular amastigotes in new infection sites. Clinical manifestations can result from this infective cycle.

- 4** Intracellular amastigotes transform into trypomastigotes, then burst out of the cell and enter the bloodstream.

# Chagas disease



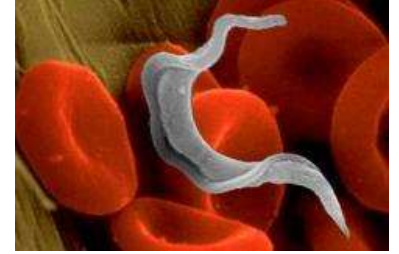
An acute Chagas disease infection with swelling of the right eye



Gross anatomy of a heart that has been damaged by chronic Chagas disease



# Chagas disease



represent the third- largest parasitic disease burden after malaria and shistosomiasis

Cone nosed bug >>>

*T. cruzi*

C shaped

Children

Cardiac lesion >>>> Chagas disease

Central & south America



# Superfamily "Triatominae"

Cone nosed bug

T. cruzi

C shaped

Chagas disease

Central & south America



Carlos Chagas, in his laboratory  
at the Instituto Oswaldo Cruz

# Superfamily "Triatominae"



*Rhodnius prolixus* is the principal vector in Colombia, Venezuela, Guatemala, Honduras and some parts of Nicaragua and El Salvador.



*Rhodnius prolixus* nymphs and adult

# Extra info

## Wheel bugs



Insect predators should be avoided since they can inflict a painful bite

**If there is a well >>>  
there is a way**





هليئاً لك .. لقد خرجت من  
الظلام، لكن هناك من طال  
بقاؤهم فيه. فكن المنارة  
التي تنير قلوبهم وعقولهم.

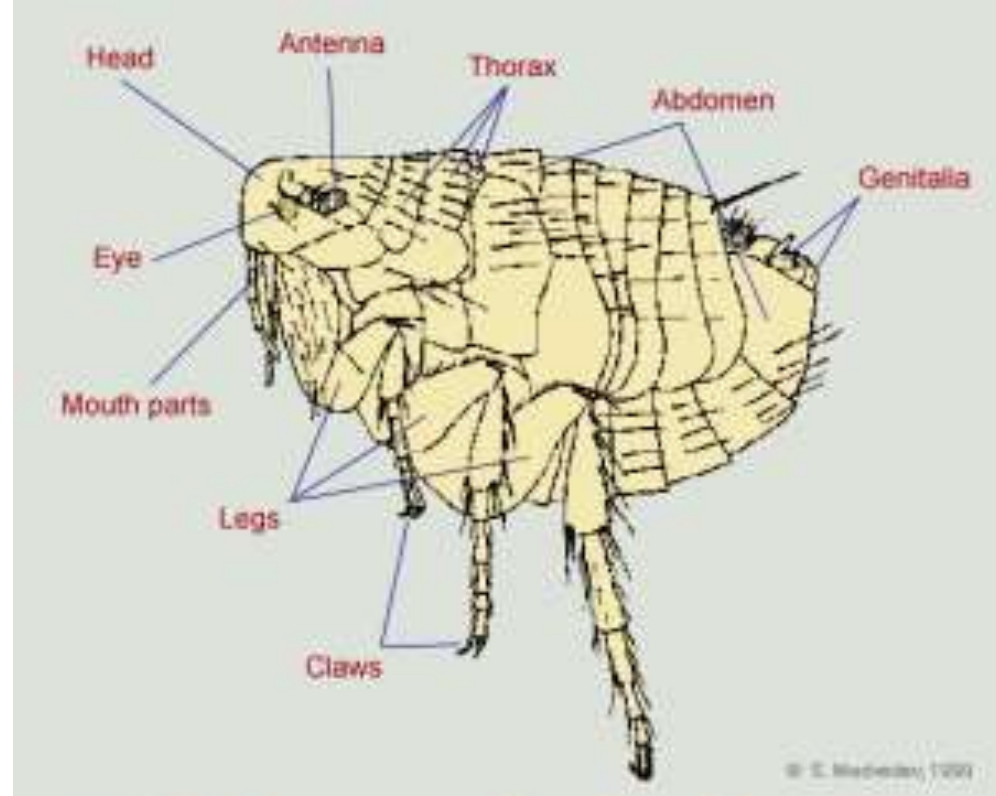




إن كنت ترى أن حلمك يستحق  
العناء، ويضيف لك الكثير.. فلا  
تتردد أكثر من ذلك وانطلق.



# Order: Siphonaptera



Fleas are wingless temporary ectoparasites of man, animals and birds. They are dark brown insects bilaterally compressed more or less oval convex in the female and flattened dorsally in the male. The head is angulated.

Antennae are 3 segmented and lie in groove behind the eyes. The mouth parts are adapted for piercing and sucking, composed of an epipharynx, a pair of triangular short maxillae, a single labium, a pair of an epipharynx, a pair of triangular short maxillae, a single labium, a pair of 4-segmented maxillary palps and labial palps of a basal plate and a pair of 4-segmented palps.

Mandibles may be present; they are long, finely serrated.

thorax is 3-segmented.

# Order: Siphonaptera

## Fleas



The posterior border of the pronotum may be carries the pronotal comb; a mesopleural suture may be present.

Legs are 3 pairs adapted for hopping and rapid movement, the third pair being the longest and best developed.

The abdomen is of 10 segments, the 8th carries the pygidium and the last two abdominal segments are modified into the external genitalia.

In the male, there are 2 claspers and an aedeagus while in the female there is a C-shapecl spermatheca.



# Order: Siphonaptera

Fleas live on blood.

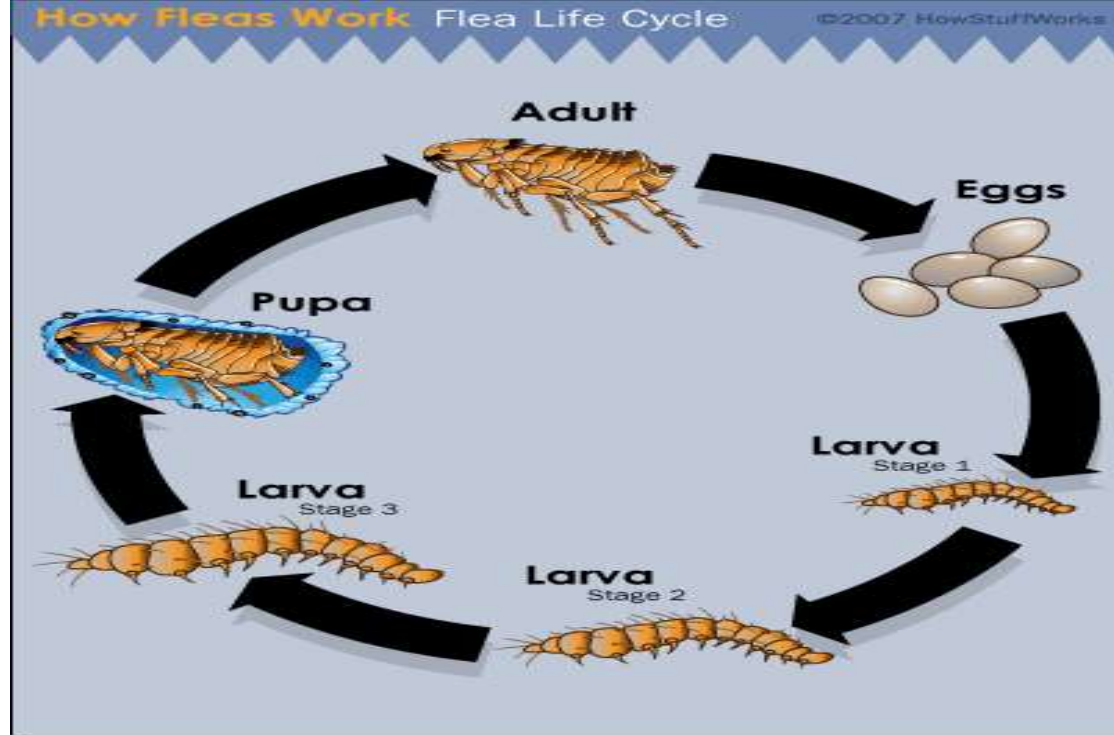
temporary ectoparasites and frequently leave their hosts and attack species other than their normal host.

**live >>> 1 year**

In hot dry weather fleas die quickly

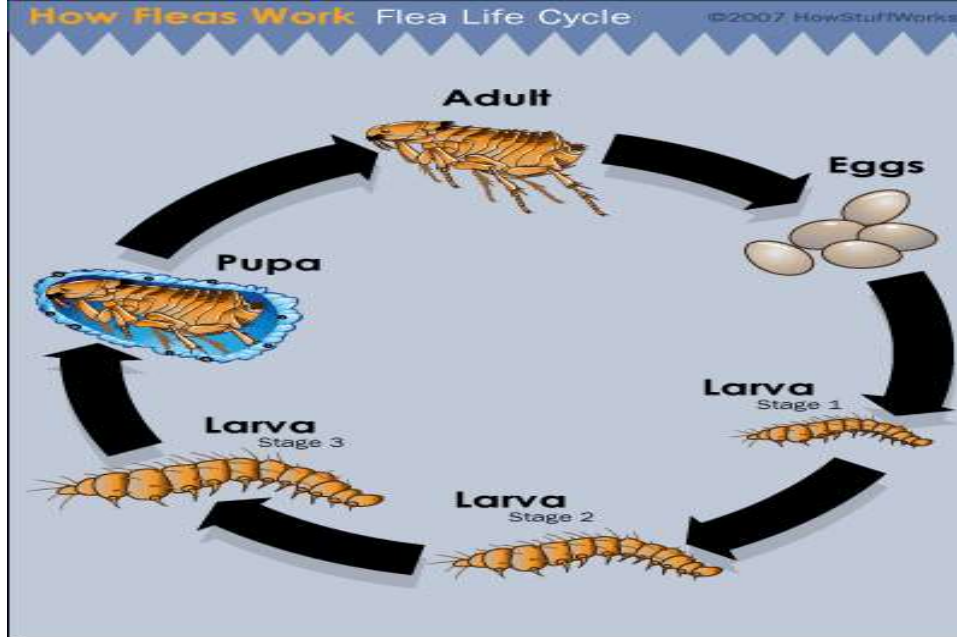
but in cool and moist conditions they can live for several months even without food

# Fleas



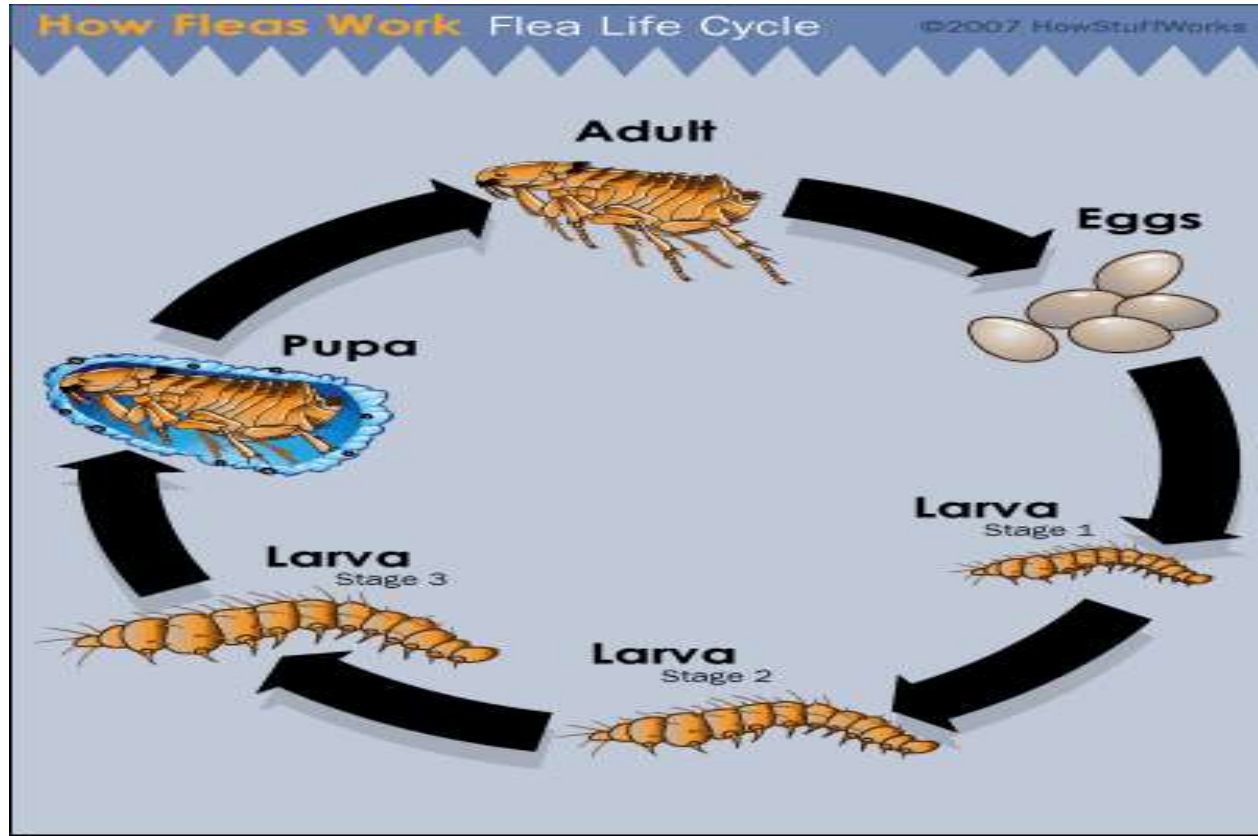
## Eggs

Female >>>> eggs in the host's nest, bedding in dusty corners.  
(3-10 eggs daily with a total number 300-500 in life time).  
small oval, whitish about 0.5 mm.



**larva** L1, L2, L3 >>> 7-14 days

elongated, slender worm-like, of 14 segments, each carries few backwardly directed long hairs  
move actively in the dust and debris, hiding from light and feed on organic matter as clotted blood, feces of the adult fleas.



# Fleas life cycle

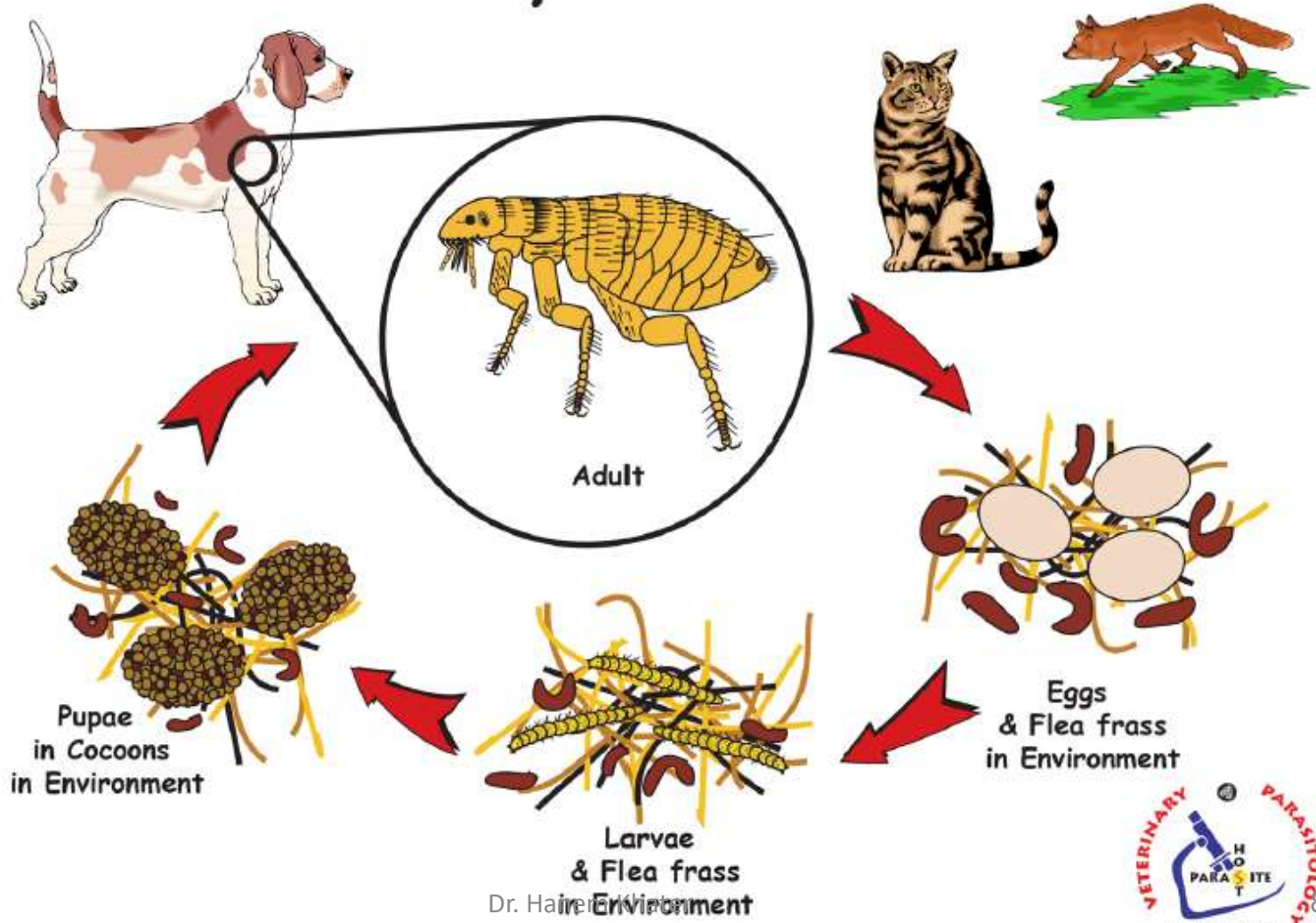
**Cocoon** (pupa)

larva >> secretes protoplasmic sticky threads

>>> threads around larva >>>> surrounded with dust particles.

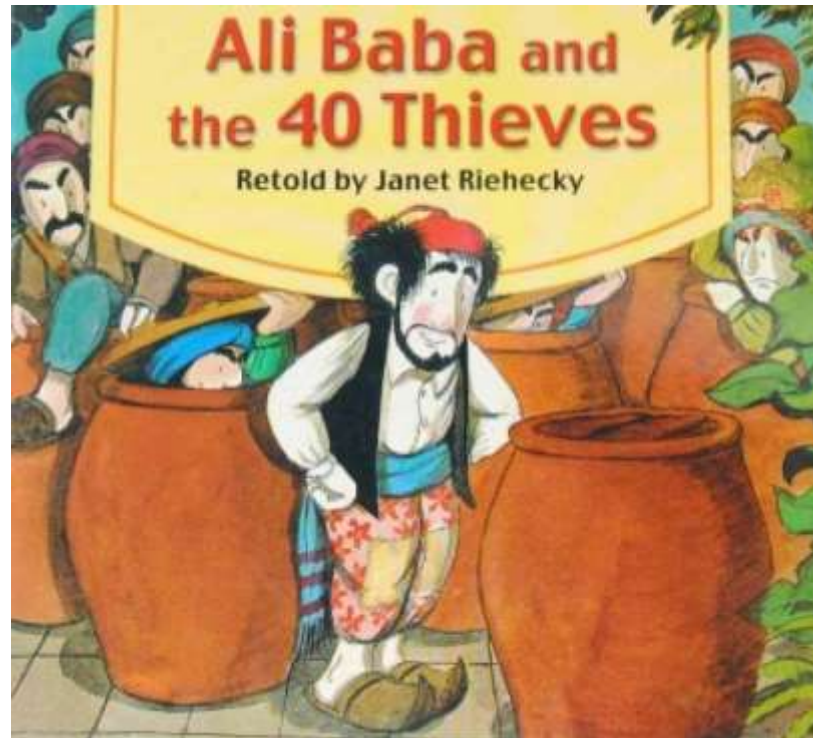
NC STATE UNIVERSITY

# *Ctenocephalides felis*



# Synchronized eclosion





Fleas till you



Welcome  
Back  
We Missed You





# Fleas life cycle



For any flea on the host >>> there are immature stages in the environment >>> concentrated wherever the host habitually rests.

The longer the host stay in one place >>> the more eggs >> adult flea will be deposited there.



## Fleas

Eggs >>>> 14-140 days >>> adults.

Temp >> more than 35 C >>> lethal to fleas

Most of the fleas are living in your pet's environment, rather than in its fur.



( Every flea found on your pet means that there approximately 30 more living in your home)

# Life cycle Order: Siphonaptera



The worst part of fleas is the part you don't see.



Order: Siphonaptera

# Fleas



✓ >>> irritation to the animals by their bites.

# Order: Siphonaptera

*Pulex irritans*: Human flea

*Ctenocephalides canis*: Dog flea

*Ctenocephalides felis*: Cat flea

*Ceratophilus fasciatus*: Rat flea

*Xenopsylla cheopis*: rat flea

*Ceratophilus gallinae*: Fowl flea

*Echindnophaga gallinacean*: Tropical hen flea.

*Tunga penetrans* : Jigger flea.



# Medical and veterinary importance of Fleas



Host	Flea type	Transmitted diseases
Man	<i>Pulex irritans</i>	<i>Hymenolepis nana</i> (as D.H & I.H)
Dog	<i>Ctenocephalides canis</i>	<i>Dipylidium caninum</i> The non pathogenic subcut. filaroid, <i>Diptalonema reconditum</i> but do not transmit the serious, <i>Dirofilaria immitis</i>
Cat	<i>Ctenocephalides felis</i>	As <i>C. canis</i> + feline parvovirus ( <b>feline panleukopenia</b> ) + <b>Murine typhus</b> ( <i>Rickettsia typhi</i> )

Host	Flea type	Transmitted diseases
Man	<i>Pulex irritans</i>	<i>Hymenolepis nana</i> (as D.H & I.H)
<b>Rabbit</b>	<i>Spilopsylla cuniculi</i>	<b>Myxomatosis</b> ( <i>Myxoma</i> virus) >>> A serious and fatal disease



Dr. Hahem Khater



# Myxomatosis

Rabbit

*Spilopsylla cuniculi*

**Myxomatosis** (*Myxoma* virus)  
>>> A serious and fatal disease



Look for signs of flea dirt or sore areas of skin.



Fleas can carry myxomatosis,

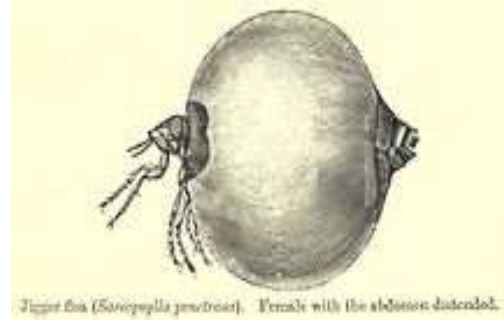


# Fleas of Rats

Host	Flea type	Transmitted diseases
Rat	Oriental rat flea ( <i>Xenopsylla cheopis</i> )	<i>Hymenolepis nana</i> , <i>H. diminuta</i> <i>Murine typhus</i> (rat ↔ man) <b>Plague (<i>Yersinia pestis</i>) &gt;&gt; bacilli multiply and block the gut of flea (rat ↔ man)</b>
Rat	Northern rat flea ( <i>Nosopsyllus fasciatus</i> ).	<i>H. nana</i> , <i>H. diminuta</i> Non pathogenic <i>Trypanosoma lewisi</i> to rats

Host	Flea type	Transmitted diseases
Man	<i>Pulex irritans</i>	<i>Hymenolepis nana</i> (as D.H & I.H)
Dog	<i>Ctenocephalides canis</i>	<b><i>Dipylidium caninum</i></b> The non pathogenic subcut. filaroid, <i>Diptaltonema reconditum</i> but do not transmit the serious, <i>Dirofilaria immitis</i>
Cat	<i>Ctenocephalides felis</i>	As <i>C. canis</i> + feline parvovirus ( <b>feline panleukopenia</b> ) + Murine typhus ( <i>Rickettsia typhi</i> )
Rabbis	<i>Spilopsylla cuniculi</i>	<b>Myxomatosis</b> ( <i>Myxoma virus</i> ) >>> A serious and fatal disease
Rat	Oriental rat flea ( <i>Xenopsylla cheopis</i> )	<b><i>Hymenolepis nana</i> , <i>H. diminuta</i></b> <b>Murine typhus</b> (rat ↔ man) <b>Plague</b> ( <i>Yesina pestis</i> ) >> bacilli multiply and block the gut of flea (rat ↔ man)
Rat	Northern rat flea ( <i>Nosopsyllus fasciatus</i> ).	<b><i>H. nana</i> , <i>H. diminuta</i></b> Non pathogenic <b>Trypanosom</b> <b>a lewisi</b> to rats

# The **chigoe flea** = **jigger** (*Tunga penetrans*)



- Found in tropical climates, especially South and Central America and the West Indies
- The smallest known flea

If the flea is left within the skin >> infection and/or other dangerous complications can occur



# Sticktight flea

## *Echidnophaga gallinacea*

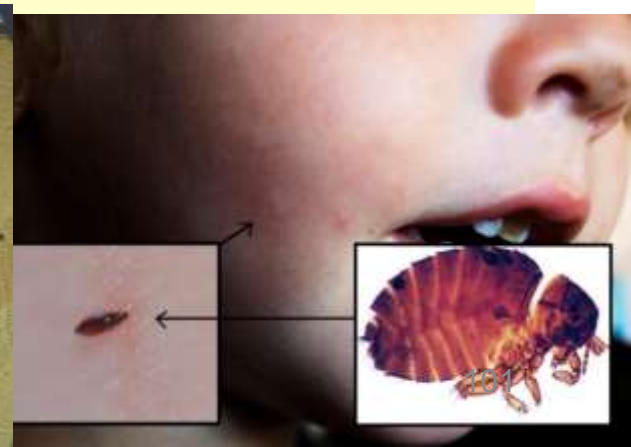
A major pest of domestic chicken in Southern United States.

Burrowed into the skin of its hosts, mostly chicken

Can attack *humans, cats or dogs*.

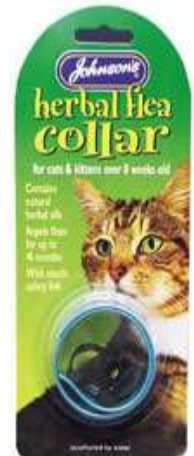
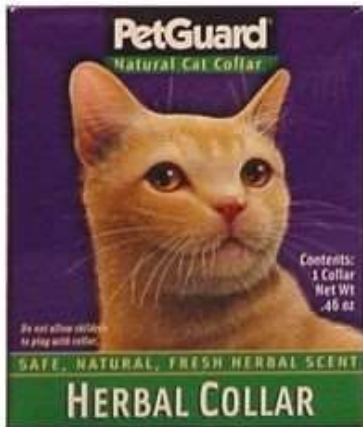
While remaining attached to fleshy parts of chicken's head around the eyes, wattles and other bare spots, females cause ulcers in which they lay their eggs.

**Heavy infestations >>> anemia, blindness, or death of birds if untreated**





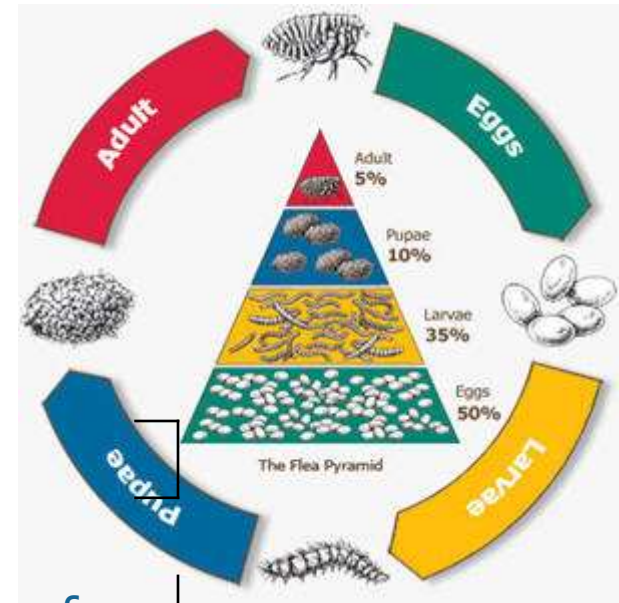
# Natural Flea and Tick Control for Pets



## An herbal collar.

Herbal collars contain natural ingredients such as **citronella and eucalyptus oils**.

The collars last around three months



**Flea collars:** There are many different types of flea collar on the market. Some are insecticide only & work by killing adult fleas on the cat. Other flea collars contain IGR's to kill the eggs & larvae. Flea collars often only kill fleas on the cat's head & neck, but fleas further down the body survive.

*propoxur  
in cat flea collar >>>> cancer*

## ***Shampoo/Dips:***

Flea shampoos contain insecticides which kill adult fleas.

## ***Flea Combs:***



Flea combs aren't overly effective,

**only removing 10 - 50% of fleas on your cat.**

place a small bowl of water with some detergent in it close by & drop the fleas into the bowl.

This will drown the fleas.

Placing a small amount of petroleum jelly onto the teeth of the comb will help the fleas stick to it.



# Flea Trap



*Flea trap*



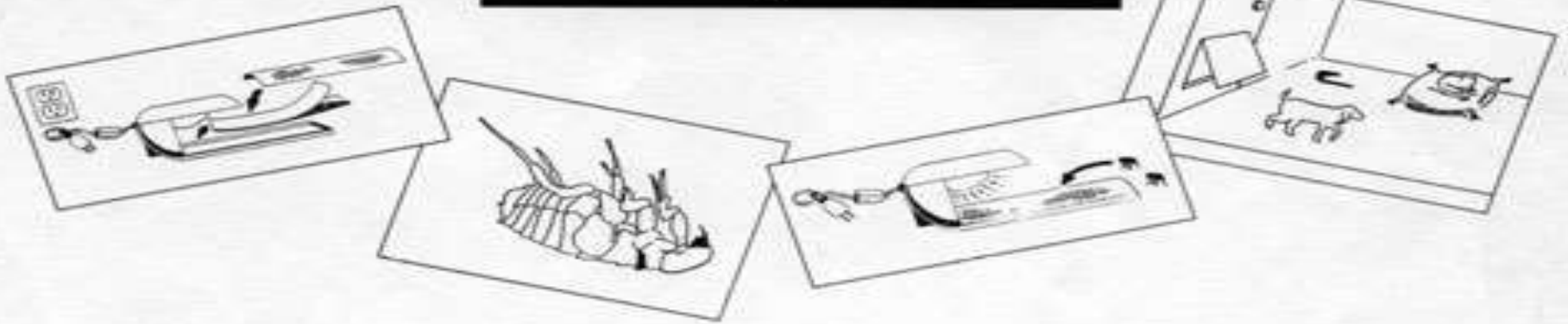
# FLEA KILLER



## Attracts & Captures Fleas

- Works 24 Hours a Day • No Pesticides • No Assembly Required

**It Really Works!**



This great looking flea trap is designed to work and is easy to use. It controls fleas without using pesticides. Simply plug it in and the soft light will attract fleas. For best results leave it on 24 hours a day (it costs only pennies a month to operate).

Adult fleas are caught by the FLEA KILLER before they get onto pets. Trapping a single female flea prevents her from laying 200 eggs. The replaceable sticky pads do not contain pesticides and work for up to 3 months.

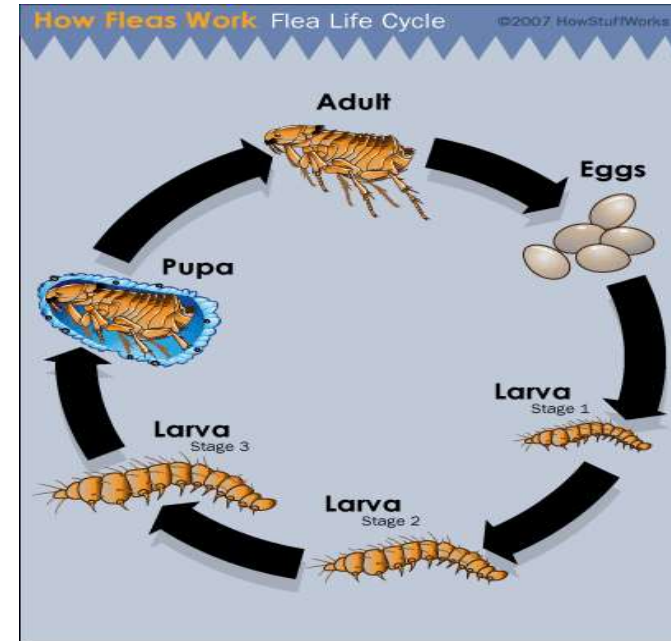
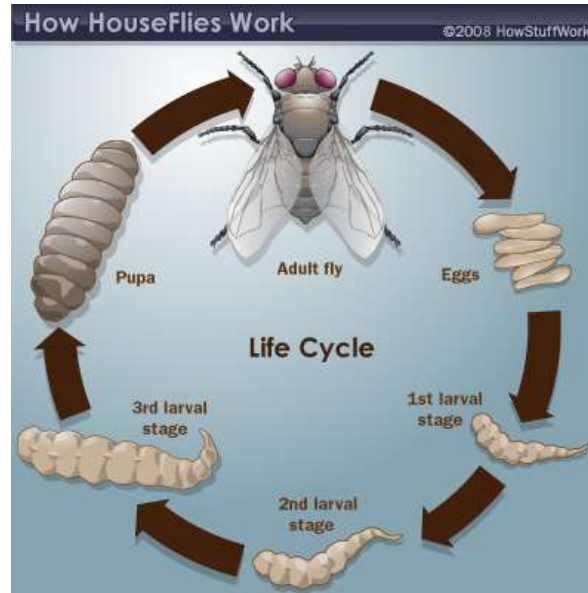
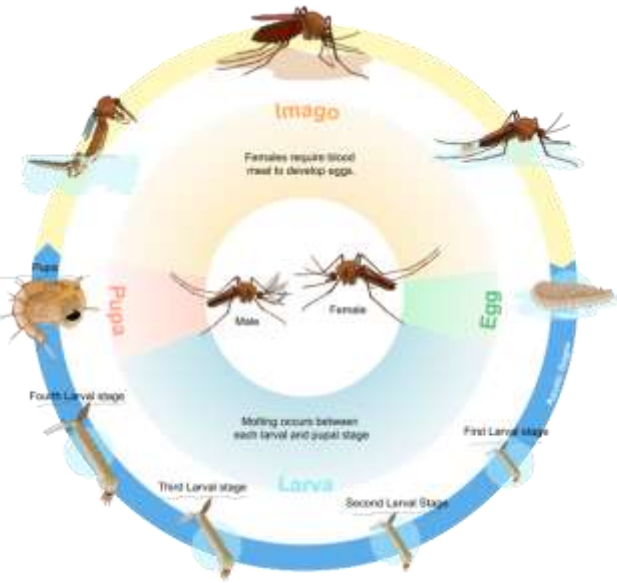
Fleas are attracted to the light when it is on. They pass through the protective screen and are caught on the sticky pad where they die. The screen prevents children and pets from being caught.

The FLEA KILLER is safe for pets and people. To catch fleas, place the trap where your pet sleeps, eats, rests or walks. The trap is portable and you can move it to different areas as needed. No fleas? Keep the trap turned on to catch fleas that develop later.

*Price: \$4.74*



# DEVELOPMENT of ARTHROPODA



## I- Metabola:

(1) Holometabola (complete metamorphosis)

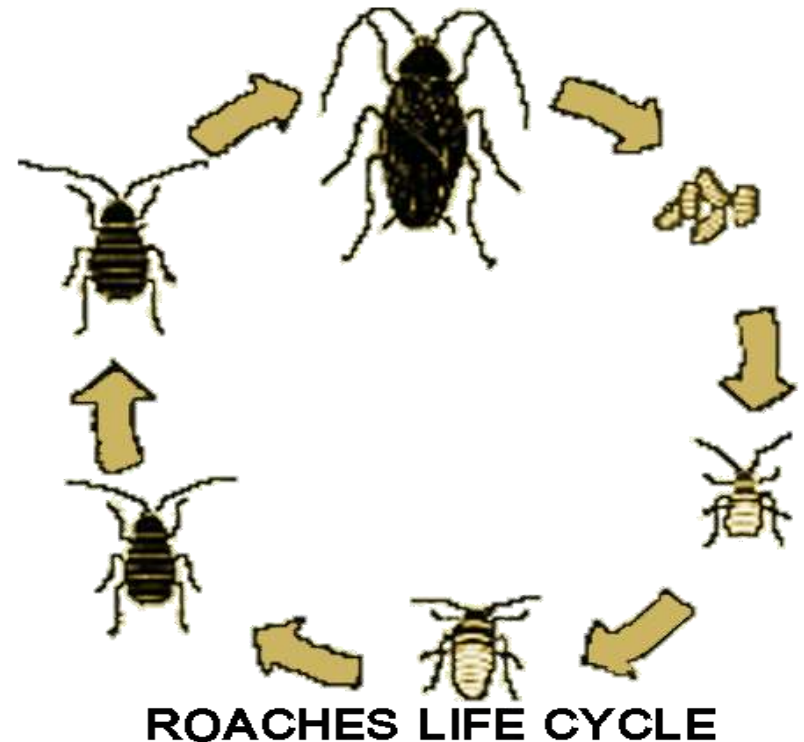
The eggs hatch into larvae which are different from the adult insect and usually feed on different food.

Eggs>>>>>larva >>>> pupa>>>>> adult.

# DEVELOPMENT of ARTHROPODA

## 2) Hemimetabola (incomplete metamorphosis)

ex. ticks, cockroaches.



- The eggs
- Larvae >>>similar to adult,  
>>>but only small with **more delicate transparent integument.**
- nymphs (pre-adult phase)>>> exactly similar to the adults  
>>>**incomplete development of wings and reproductive organs.**
- Larvae and nymph feed on the same food and have the same habitat as adults.



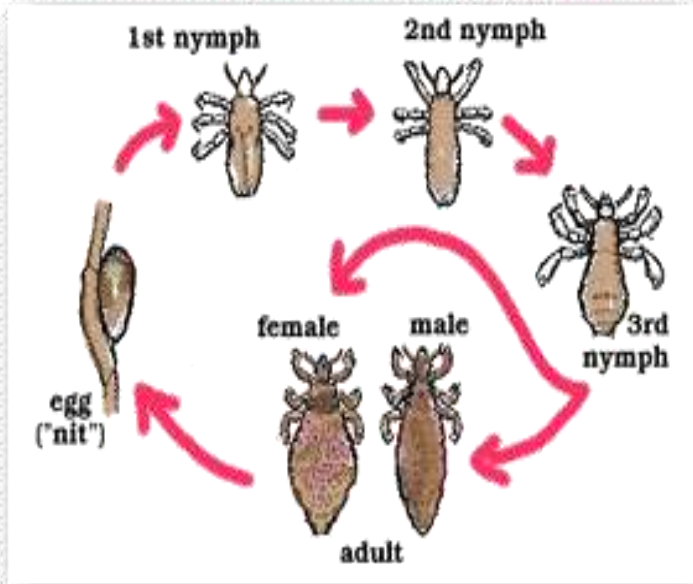
# DEVELOPMENT of ARTHROPODA

## II- Ametabola

- wingless
- do not undergo any metamorphosis
- hatch from the egg nearly in the same form they keep throughout their life.
- Ex. lice

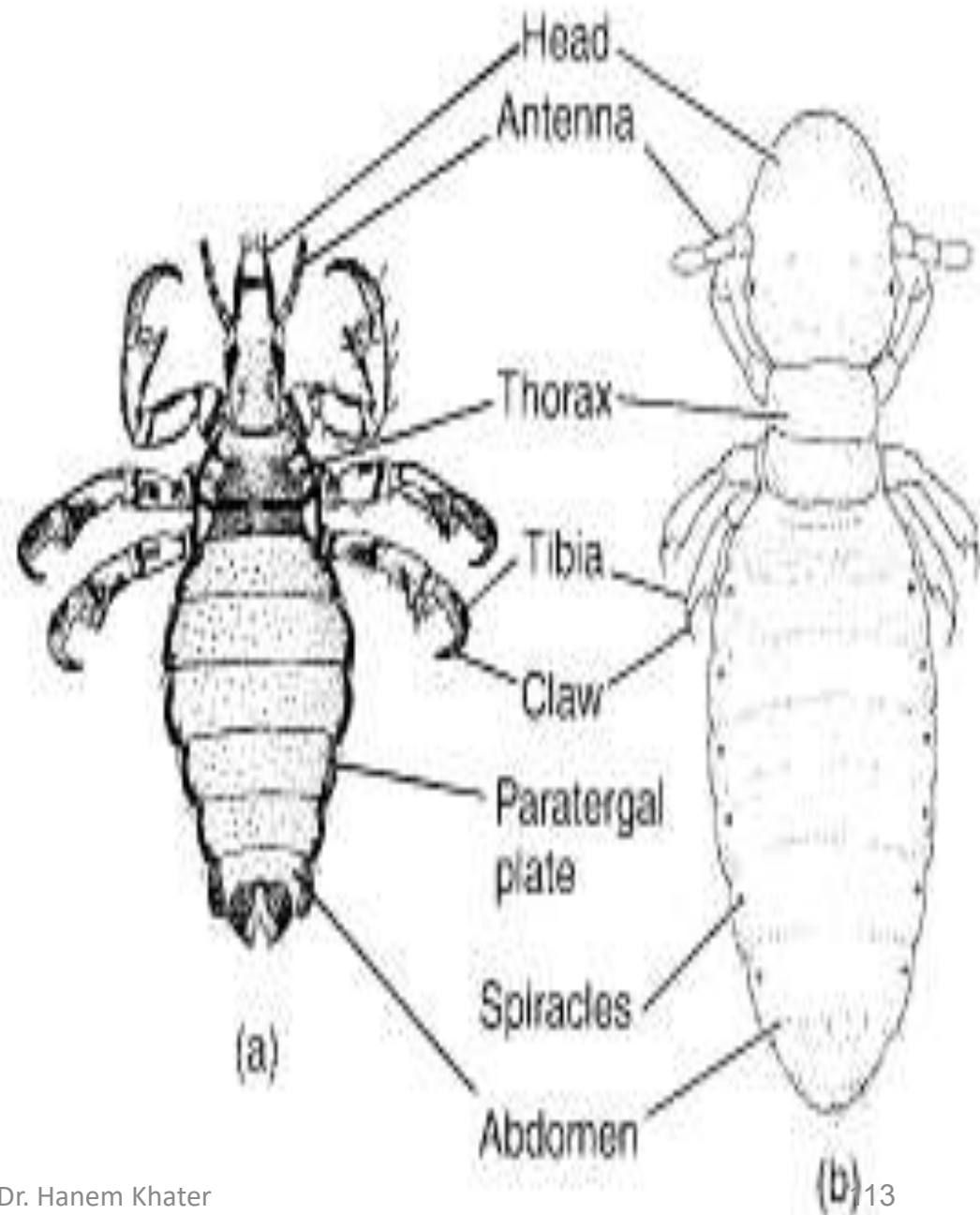


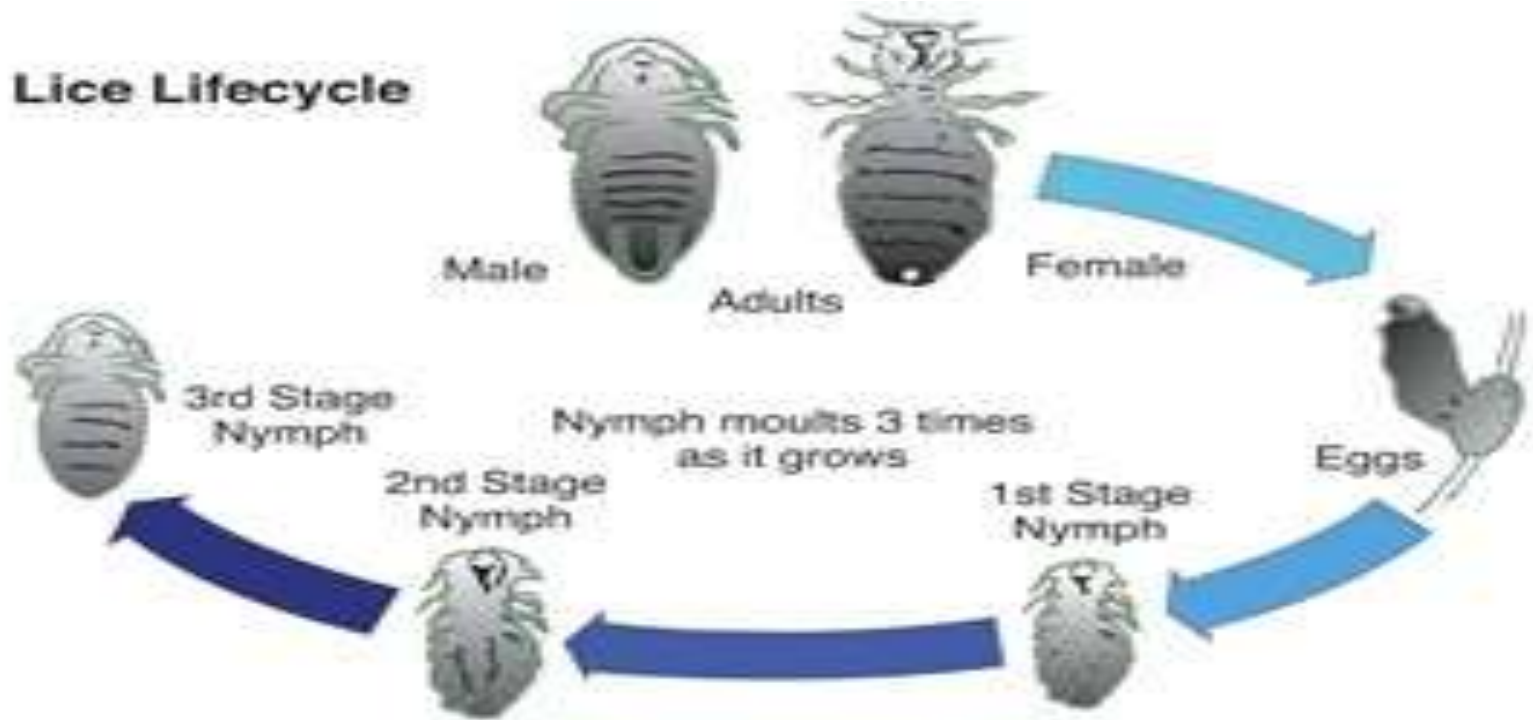
Which Came First...  
the Itchin' or the Egg?





- These are small, wingless leathery dorsoventra flattened insects. They are permanent ectoparasites of mammals and birds. They only leave their host, when the temperature of the is very high or when the host becomes very we and heavily infested or accidentally by mechan means as corabirvg or cuttings of the hairs. The possess a considerable host specificity and the various species are largely restricted to a single host species or to a very closely related one. T body is differentiated into a head, thorax and a abdomen. The head carries short antennae wh have 3-5 segments. The eyes may be reduced c absent. The segmentation of the thorax is indi tinct. The legs are usually short and powerful a the tarsi are 1 or 2 segmented ending with 1 or segmented claws. Spiracles are 7 pairs, one in thorax and 6 pairs in abdomen.





exopterygotes, born as **miniature versions of the adult**, nymphs.

The young moult three times before reaching the final adult form, which they usually reach within a month of hatching.

♀ >>> Eggs >>> attached either to the hairs or feathers of their hosts >>> hatch within 4-14 days at the body temperature.

**The emerging larvae >> wrong**

Order: Phthiraptera

**Suborder: (Anoplura)**

**(Sucking Lice)**

('an·ə'plür·ə)

**Lice (singular: louse)**

blood-feeding "obligatory" ectoparasites of mammals.

Piercing Mouthparts

Narrow head



### **Transmission**

Pass form host to host when a bridge of hair exists between host individuals.

**1- Pediculosis** >>> an infestation of blood sucking lice.

blood-borne diseases 2- vectors of several of

# LICE: Host specificity? Why?



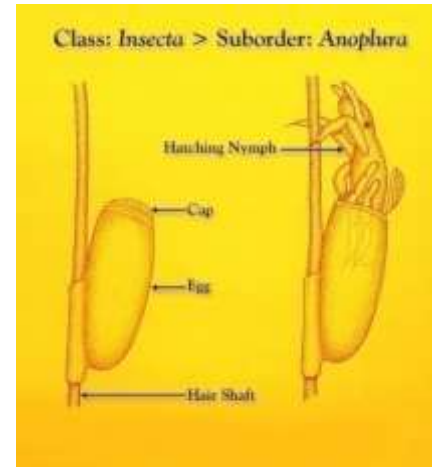
**Pincer like claws >> for clinging to hair**

**The size of claws >>> related to the diameter of hair shaft >>> important in establishing host specificity and host site specificity.**

# Head louse



## *Pediculus humanus capitis*



Head louse

Louse eggs (nits)



## The body louse

***Pediculus humanus humanus***  
(*Pediculus humanus corporis*).



Female >> lay their eggs on or near the seams of clothing.  
feed on blood and usually only move to the skin to feed.

**crowded living conditions >>> Poor hygiene >>> Infestations >>> spread rapidly**

**( in ware, homeless, refugees,  
in prisons or natural disasters).**

**Spread through prolonged direct physical contact** with a person who has body lice or through contact with articles such as clothing, beds, bed linens, or towels that have been in contact with an infested person.

# Importance of body louse

Body lice are a nuisance in themselves and cause intense itching.

They are however, also vectors (transmitters) of other diseases.

Body lice can spread epidemic typhus, trench fever, and louse-borne relapsing fever.

**Pediculosis**



# Body louse >>>> Epidemic typhus



Rash caused by epidemic typhus

- The causative organism is *Rickettsia prowazekii*
- Typhus killed hundreds of thousands of prisoners in Nazi concentration camps during World War II.



# Body lice >> Trench fever

A moderately serious disease

World War I >>>> *infected armies including those in Egypt.*

The disease is caused by the bacterium *Bartonella quintana*

# Body louse>>> louse-borne relapsing fever

*Causative agent: Borrelia recurrentis*

Occurs in epidemics:

- \* in poor living conditions
- \* famine (i.e., food shortage)
- \* war in the developing world

Currently prevalent in Ethiopia and Sudan



# *Phthirus pubis* (crab louse) "pubic lice"



They feed exclusively on blood.

cause a condition known as crabs.

Notorious for infesting human genitals.

May also live on other areas with hair, as abdomen and eyelashes.

Humans are the only known hosts of this parasite, although a closely related species, *Phthirus gorillae*, infects gorilla populations.

## **Transmission**

1- sexually transmitted infections (STIs)

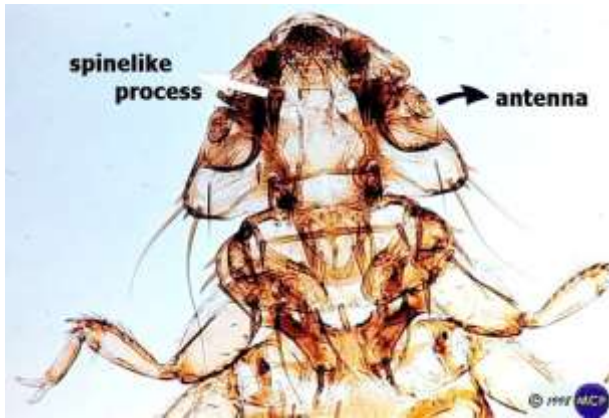
2- Infection in a young child or teenager is not necessarily indicative of sexual abuse.

3- Parent-to-child infestations are more likely to occur through routes of shared towels, clothing, beds or closets.

# Examples of sucking lice:

- **Cattle** : *Haematopinus eurysternus*  
*Linognathus vituli*
- **Buffaloes:** *Haematopinus tuberculatus*.
- **Sheep** : *Linognathus ovis*, *L. pedalis*.
- **Horse** : *Haematopinus asini*
- **Dogs:** *Linognathus setosus*.
- **Man** : *Pediculus humanus capitis*, *P. Humanus humanus*  
*Phthirus pubis*.

# Suborder: Mallophaga (Biting Lice)



parasites of birds and mammals

feed on the epithelial debris of the skin or on feathers of birds, clotted blood and have their mouth parts adapted for chewing.

head >>> broader than thorax.

The prothorax is free while the meso and meta-thorax are fused to form an undifferentiated part known as pterothorax.

The legs are with two claws.

There are 11 abdominal segments, of which 9 are visible.

# Biting lice

- **Cattle** : *Damalinia bovis*
- **Sheep** : *Damalinia ovis*
  
- *Equines* : *Damalinia equi*



# *Trichodectes canis*



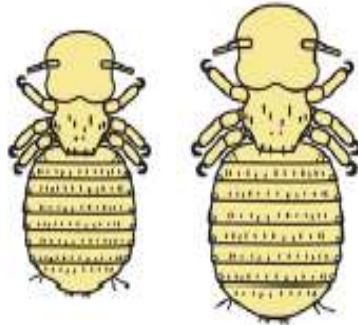
Transmission to  
Other Hosts  
via Direct Contact  
or  
Infested  
Grooming Tools

Eggs (Nits)  
attached to  
Hair



All Stages  
occur on the  
Host's  
Integument

Adults



Nymphs  
hatch from nits



*I.H of  
Dipylidium  
caninum*



***Louse populations are highest during late winter and may cause disrupted feeding patterns, fleece damage/loss, and self-inflicted trauma.***



***Heavy louse infestation in an emaciated ewe.***



***Heavy louse infestation in an emaciated ewe.***

Dr. Hanem Khater



- Sheep lice infestation are often introduced onto a farm by:
  - Infected cattle
  - Via vehicles
  - Purchased sheep
  - Wildlife especially rabbits, badgers and deer
- 4 Louse populations are highest:
  - During late winter in sheep in poor body condition
  - During a hot summer
  - During a wet summer
  - Immediately after shearing



# birds) ( Biting lice



Do not usually spread disease pathogens

**Heavy infestations in poultry**

>> severe skin irritation

>> weight loss

>> reduced egg production 10-20%



Young often are killed by the great numbers of lice that transfer from the hen to the young soon after hatching.

Birds >> dull, ruffled plumage; often, they damage themselves by pecking at infested body areas.

# Chewing lice of birds



Eggs masses attached at the base of the feathers



large populations on poultry.



## ***Menopon gallinae* (the shaft louse)**

2mm, little economic loss

## ***Menocanthus stramineus* (Yellow body louse)**

The most pathogenic >>>  
capable of causing anaemia in heavy infestations.  
3 mm. (↑ 35.000 louse/ bird)



# Lice >>> Disease to birds

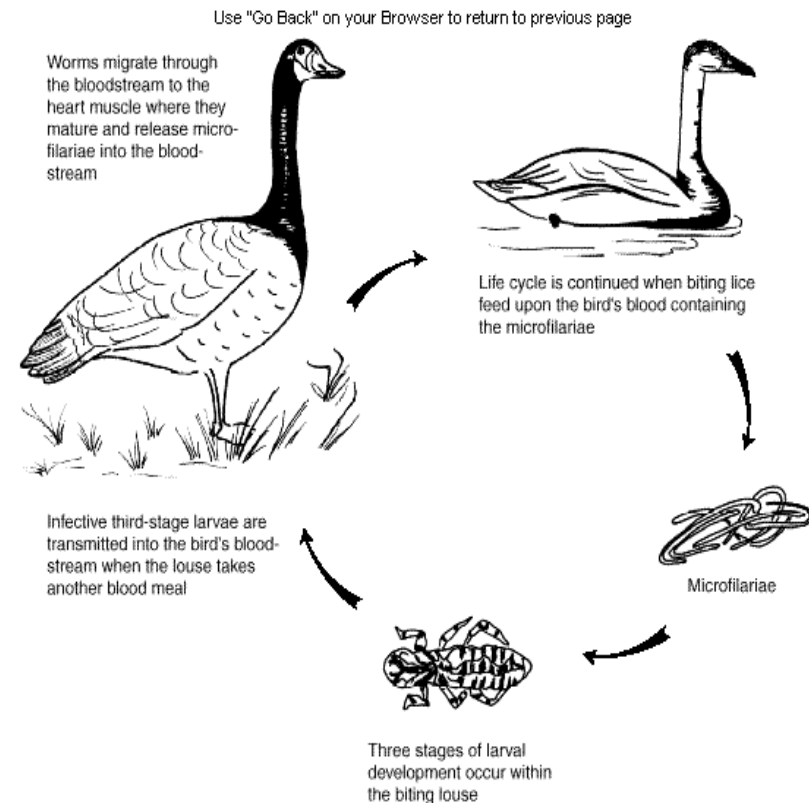
## Filarial heartworm

- ***Trinoton anserinum***>>

### IH of *Sarconema eurycerca*

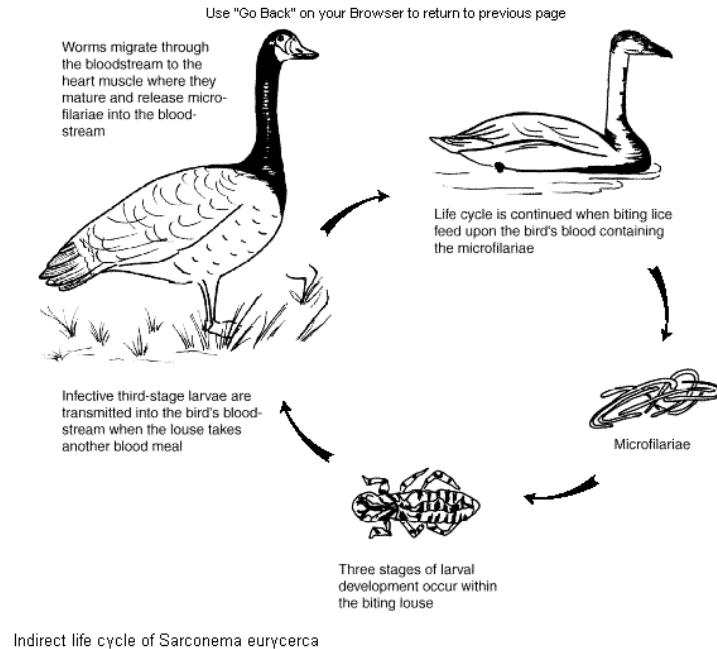
#### >>Heartworm in swans and geese

- **Filarial nematode** in legs, ankles of **grebes, parrots, coots** >>> lice pick up MF through chewing on skin and eating blood form minor wounds.
- found throughout the range of its swan and goose hosts.
- ~~fowl spirochaetosis~~ >> wrong >> transmitted by *Argas persicus*



# Lice >>> Disease to birds

## Filarial heartworm



Photograph / Copyright - James Runningen.  
Heartworms (arrows) on the inner surface of the heart of a tundra swan.

***Trinoton anserinum***>>

IH of *Sarconema eurycerca*

>>Heartworm in swans and geese

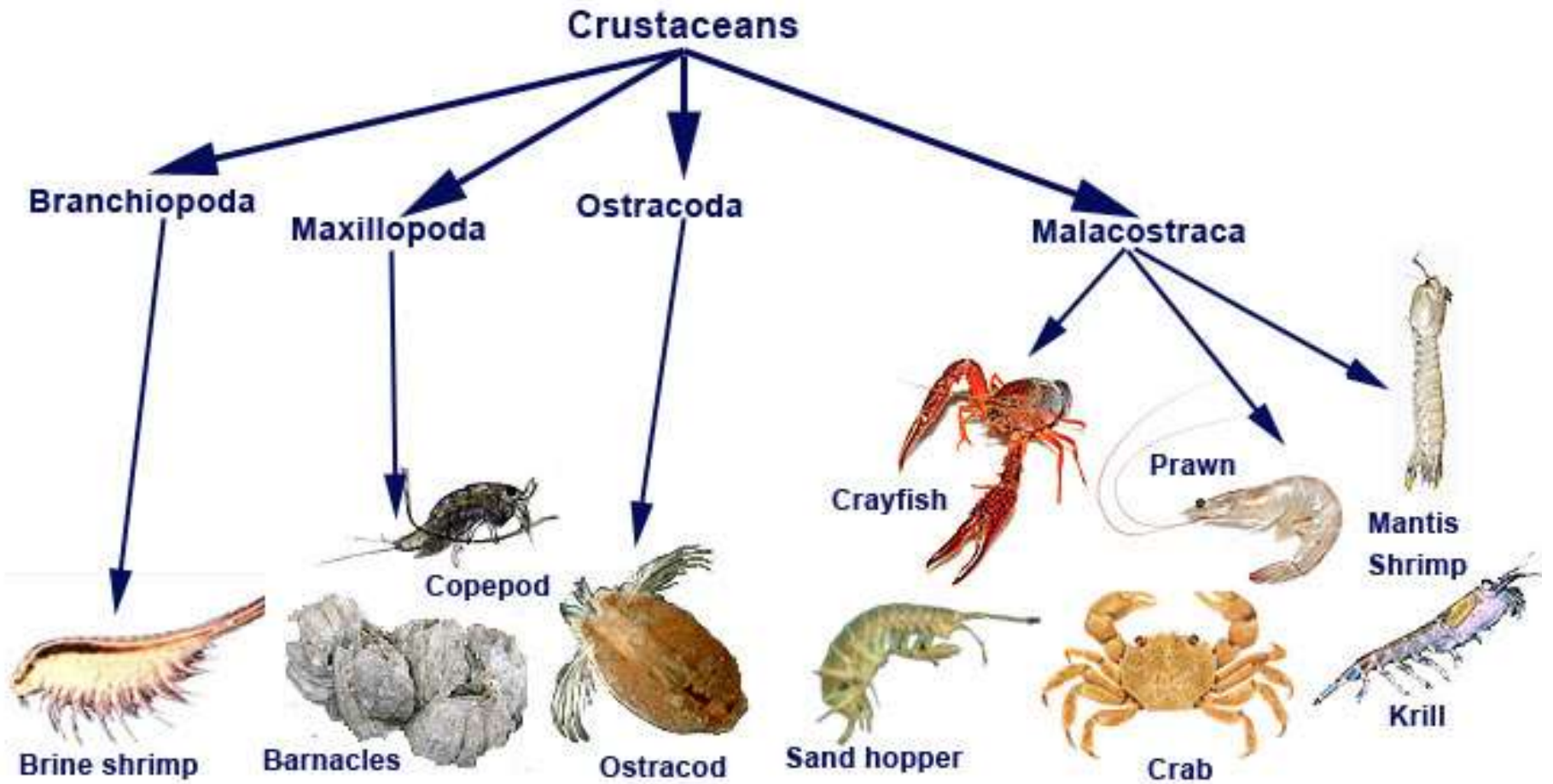


يكفيك لعباً لدور الضحية،  
اعقد العزم وتحمل  
مسؤوليتك من اليوم.



## Class II: Crustacea

- Most Crustacea are aquatic and live either in sea or fresh water, very few live on land.
- Many Crustacea are parasitic on the gills of fishes but none attack farm animals.
- They breathe by gills.
- The body, consists of cephalothorax and abdomen the segments of the body are provided by jointed appendages adapted for feeding, walking and swimming. There are three genera of our importance:



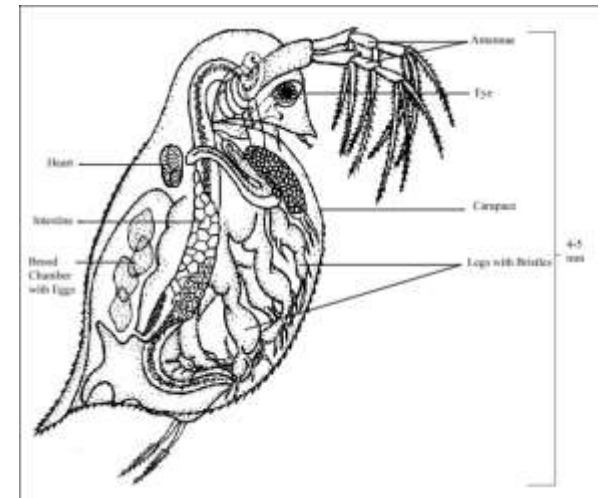


# Class II: Crustacea



## (I) Dephina:

Acquatic animals, having either flat shield like carapace or a laterally bivalve chitinous shell. The legs are leaf-like and lobed.



Intermediate host of nematods  
*Acuaria* and *Tetrameres*

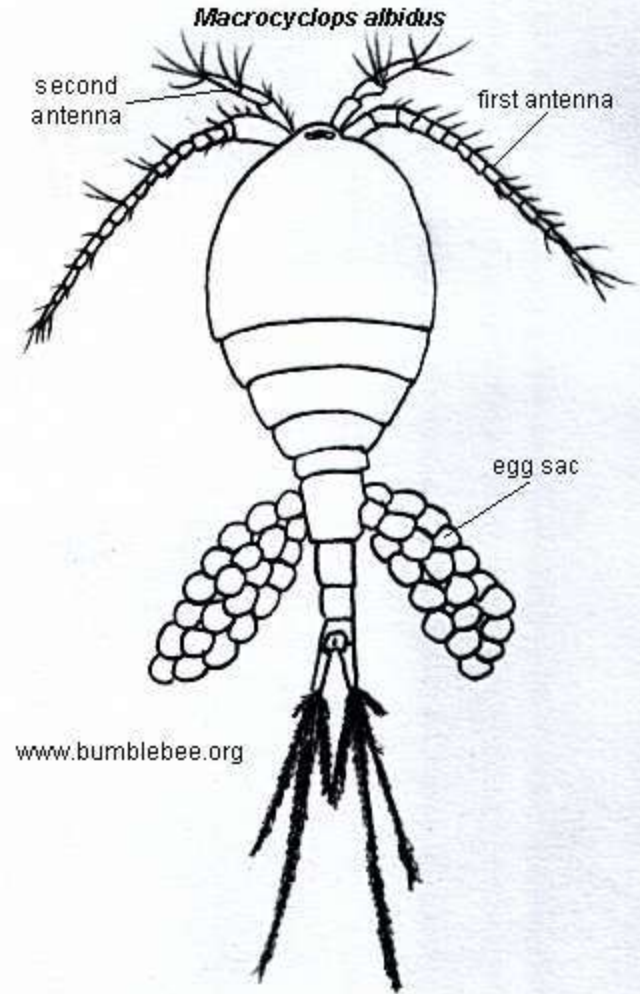
# Class II: Crustacea

Cyclops: Aquatic animals having .  
an elongated well segmented body enclosed in a shell or carapace. The swimming appendages are biramus and there are no appendages on the abdomen. The female carries its eggs in a pair of egg sacs attached to the first abdominal segment.

intermediate hosts of

1- *Diphyllbothrium latum*

2- *Dracanculus medinensis*.



## Class II: Crustacea

### Diaptomus:

Aquatic animals, body slender, carapace covers only the anterior 4 segments. The antennae are more segmented than Cyclops. Second antenna is biramous. Eggs are in single oval sac.

Intermediate host:

*Diphyllobothrium latum.*





Dr. Hanem Khater  
Good luck  
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Goodbye!

