

روز جهانی بهداشت ۲۰۱۴

بلای بی سروصدا

بیماری های منتقله از حشرات و سایر ناقلین



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مرکز مدیریت بیماری های واگیر
معاونت بهداشت
وزارت بهداشت درمان و آموزش پزشکی

چند مثال از بیماری های منتقله از طریق حشرات

- **Malaria:** شناخته شده ترین؛ ۳ میلیارد در معرض مالاریا؛ ۲۱۹ میلیون مورد بیماری؛ بیشترین مرگ و میر



- **Dengue:** ۳۹۰ میلیون بیمار سالانه؛ ۲۰۱۰۰۰۰۰ مورد؛ شدید و نیاز به بستری
- (۳ برابر تخمین سازمان جهانی بهداشت)

- **Leishmaniasis:** آسیب شدید به چهره افراد، شکل های سریعا کشنده

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ویژگی های بیماری های منتقله از حشرات و سایر ناقلین



- بسیار پیچیده هستند
- بار اقتصادی سنگینی دارند
- در حال حاضر واکسن موثر ندارند
- درمان آنها ساده نیست
- پدیده مقاومت به حشره کش ها و داروها



ویژگی های بیماری های منتقله از حشرات و سایر ناقلین



- فوت سالانه یک میلیون نفر در اثر این بیماری ها
- ۵۰ درصد جمعیت جهان در معرض خطر
- مناطق فقیر نشین با سطح بهداشت پائین در معرض خطر بیشتری هستند



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ویژگی های بیماری های منتقله از حشرات و سایر ناقلین



- اپیدمیولوژی واقعی این بیماری ها روشن نیست
- **مورد غفلت** واقع می شوند؛ ۷ مورد از ۱۷ بیماری مغفول مورد نظر سازمان جهانی بهداشت

Neglected tropical diseases (NTDs) •

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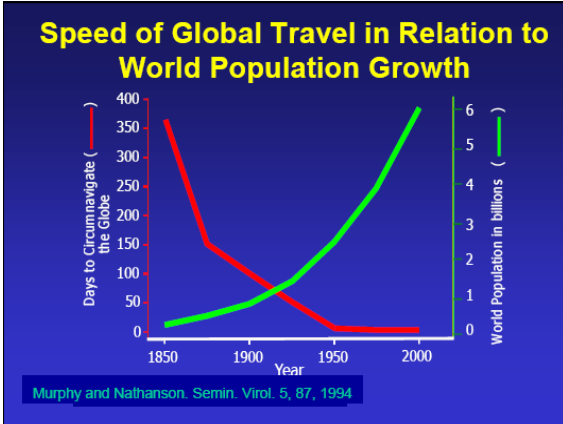
ویژگی های بیماری های منتقله از حشرات و سایر ناقلین



- تحت تاثیر رفتارهای انسان
- تحت تاثیر تغییرات آب و هوایی
- اطلاعات کم مردم در معرض خطر
- شیوع بیماری بسیار بیش از موارد کلینیکی است



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Dengue fever

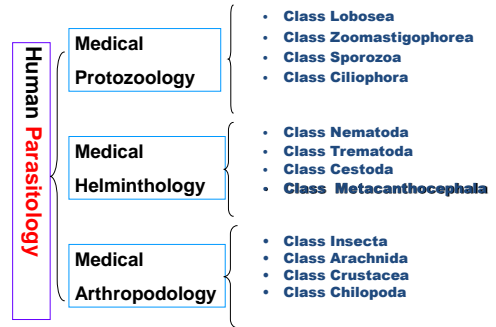
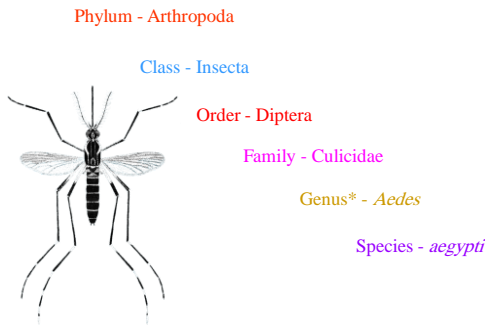


- 40% از جمعیت جهان در معرض خطر هستند
- موارد بیماری در عرض 50 سال گذشته 90 برابر شده است
- در یکی از کشورهای همسایه 20 میلیون نفر در معرض خطر این بیماری هستند
- علل گسترش:

- جمعیت در حال ازدیاد، شهرسازی بدون برنامه، بهداشت محیط نامناسب، مسافرت های بین المللی، کنترل نامناسب حشرات

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Kingdom - Animalia



Insect Morphology

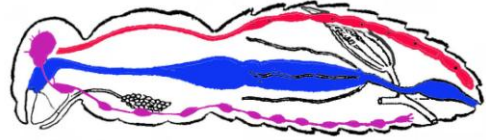
- **Segmented body divided into three sections: head, thorax, abdomen**
- **Three pairs of legs attached to the thorax**
- **One pair of antennae.**
- **External skeleton (exoskeleton)**
- **Usually, one or two pairs of wings attached to the thorax**

30 Common Orders of Insects

- | | |
|--|---|
| A. Protura (proturans) | P. Mallophaga (chewing lice) |
| B. Collembola (springtails) | Q. Anoplura (sucking lice) |
| C. Diptera (diplurans) | R. Thysanoptera (thrips) |
| D. Thysanura (silverfish) | S. Hemiptera (true bugs) |
| E. Ephemeroptera (mayflies) | T. Homoptera (aphids, cicadas, hoppers) |
| F. Odonata (dragonflies, damselflies) | U. Megaloptera (dobsonflies) |
| G. Blattodea (cockroaches) | V. Neuroptera (lacewings, antlions) |
| H. Mantodea (mantids) | W. Coleoptera (beetles) |
| I. Isoptera (termites) | X. Strepsiptera (Twisted-Wing Parasite) |
| J. Grylloblattodea (Ice Insect) | Y. Mecoptera (scorpionflies) |
| K. Dermaptera (earwigs) | Z. Siphonaptera (fleas) |
| L. Plecoptera (stoneflies) | AA. Diptera (flies) |
| M. Orthoptera (crickets, grasshoppers, katydids) | BB. Trichoptera (caddisflies) |
| N. Phasmatodea (walking sticks) | CC. Lepidoptera (butterflies, moths) |
| O. Psocoptera (booklice and barklice) | DD. Hymenoptera (ants, bees, wasps) |

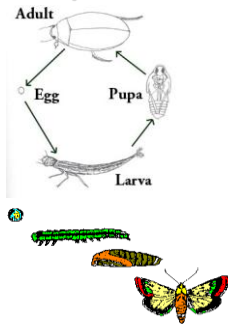
Metamorphosis

- **Ametabolous – Without Metamorphosis**
 - Young resembles the adult, except smaller
- **Hemimetabolous-Incomplete Metamorphosis**
 - Egg, nymph, adult
- **Holometabolous –Complete Metamorphosis**
 - Egg, larva, pupa, adult



Holometabolous Complete metamorphosis

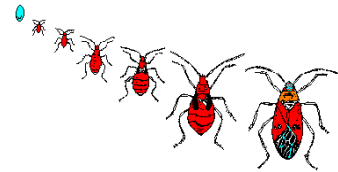
Egg, larva, pupa, adult •



Hemimetabolous

Incomplete Metamorphosis

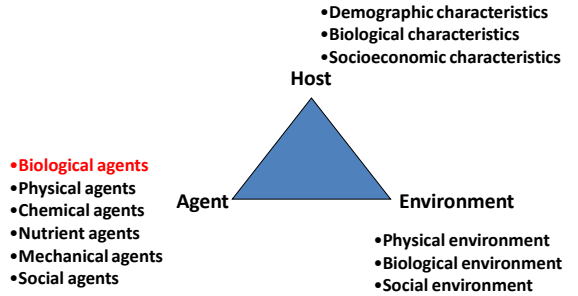
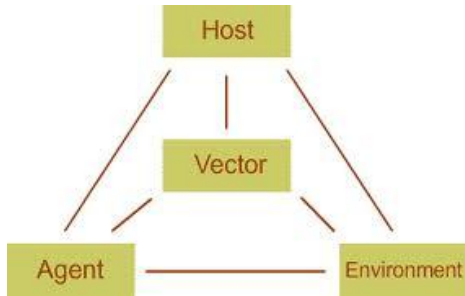
Egg, nymph, adult •



Insects of Medical Importance

- Directly cause damage to human tissue
 - Act as Vectors
-
- Provide useful medical services/drugs
 - Are useful model systems in genetic studies

Epidemiologic triad ?



Vector- borne

- 1 Mechanical transmission
- 2 Biological transmission
The arthropod is used as an environment for development and/or reproduction to their infective stages.

Modes of Transmission

- Airborne or Contact
- Food- and Water-borne
- Blood-borne
- Sexually Transmitted
- **Arthropod-borne**

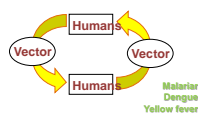


Arthropod-borne viruses (arboviruses)
are viruses that can be transmitted to man by arthropod vectors.

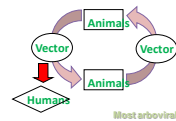
Humans are usually not the natural reservoir for the virus.

Transmission cycle

- **Anthroponotic Infections**
- **Zoonotic Infections**

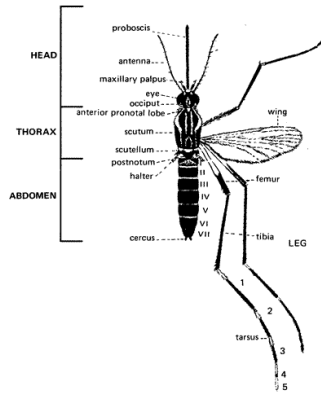


Malaria
Dengue
Yellow fever



Lyme disease
Most arboviral diseases (e.g., WNV)

Morphology



Pterygota زیررده : بالداران

Order راسته

- Diptera دوبالان
- Anoplura شیشهای مکنده
- Siphonaptera كك ها
- Hemiptera نیم سخت بالپوشان
- Dictyoptera سوسریها

Myiasis



- Greek *myia* = fly
- "the infestation of live human and vertebrate animals with dipterous larvae, which at least for a period, feed on the host's dead or living tissues, liquid body substances, or ingested food".

Taxonomy of Diptera

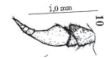


- Nematocera

Malaria, Leishmaniasis, Onchocerciasis, Filariasis, Arboviruses, ...

- Brachycera

- Tabanomorpha (Orthorrhapha)
Loasis, Anthraxis, Tularemia, Anaplasmosis, ...
- Muscomorpha (Cyclorrhapha)



Amoebic and bacterial dysentery
Typhoid fever and cholera (bacteria)



Classification of myiasis

- Classification of myiasis according to the type of host-parasite relationship (parasitological terms)

Classification	Definition	Example
Obligatory parasites	Must develop in live hosts	Gasterophilidae and Oestridae
Facultative parasites *Primary (1) *Secondary (2)	Can develop on both living and dead organic matter	Calliphoridae, Sarcophagidae and so on
Accidental (pseudomyiasis) myiasis	Fly eggs or larvae are inadvertently swallowed	Some flies

MYIASIS

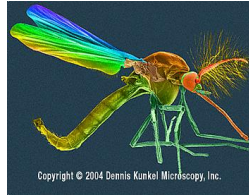
- Mainly a problem for **rural** populations especially in tropical and subtropical regions
- Can be considered as an occupational diseases.



Mosquitoes

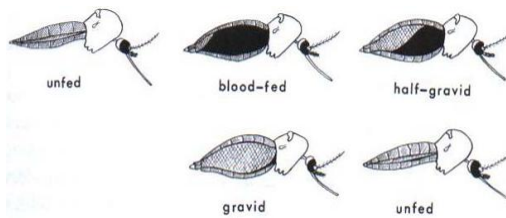
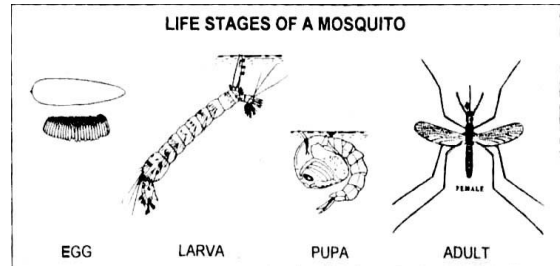
Three important Genus:

- Anopheles*
- Aedes*
- Culex*



Family **Culicidae** > 3500 species

Anopheles mosquito life cycle



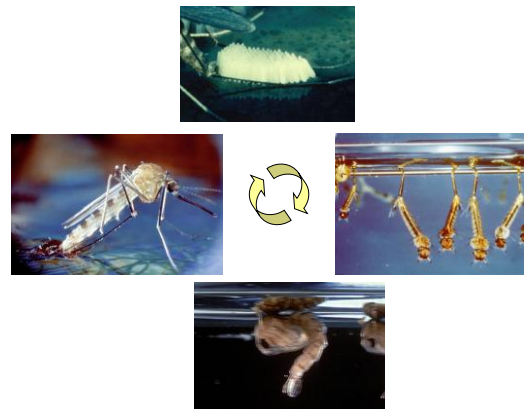
Gonotrophic cycle :
blood meal → eggs maturation → oviposition

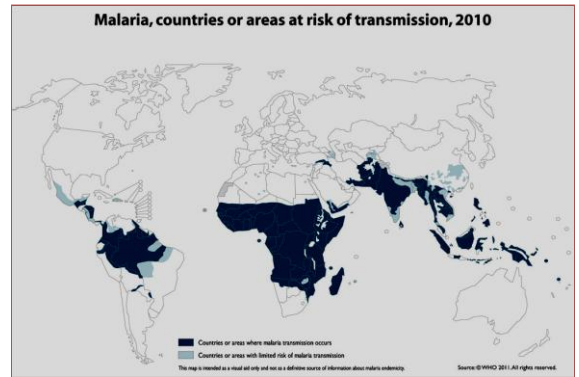
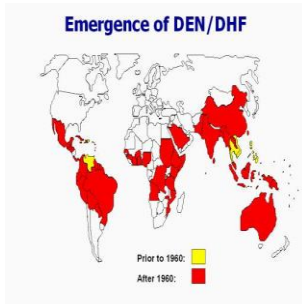
LARVAL HABITAT - *An. albimanus* in Cuba



Relationships to diseases

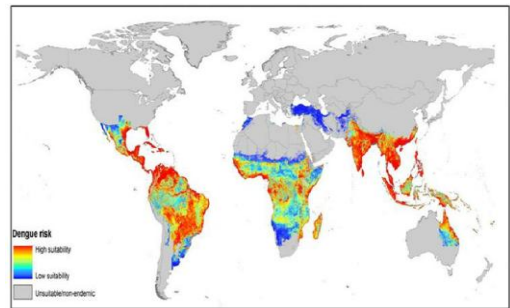
- Malaria
- Dengue fever
- Chikongunya
- West Nile
- Filariasis
- Japanese encephalitis
- Yellow fever, etc.



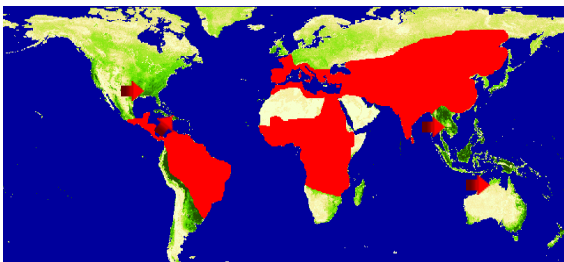


Psychodidae

Female sand fly feeding on blood



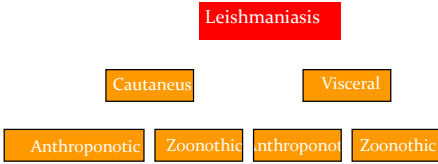
Global distribution of the leishmanaises



Characteristics

- Small (2-3 mm)
- Brown (but appear white when illuminated)
- Wings held in erect V-shape
- Nocturnal
- Painful bite

لیشمانیوز تقسیم بندی



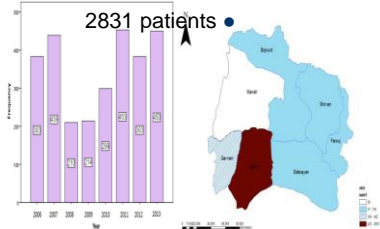
Leishmaniasis

Visceral mucocutaneous cutaneous



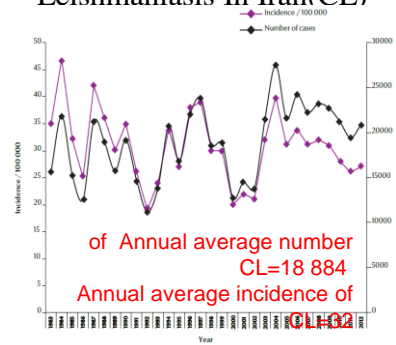
Visceral mucocutaneous cutaneous

Leishmaniasis In North Khorasan (CL)

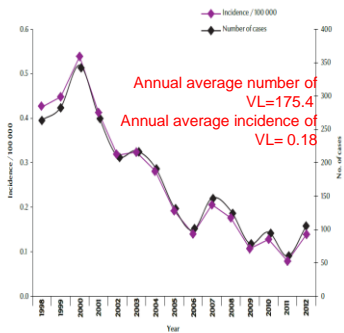


Rajabzadeh R, Arzamani K, Shoraka HR, Riyhani H, Hosseini SH. Epidemiological survey and geographical distribution of cutaneous Leishmaniasis in North Khorasan province, 2006-2013. International Journal of Epidemiologic Research. 2015 Nov 1;2(4):197-203.

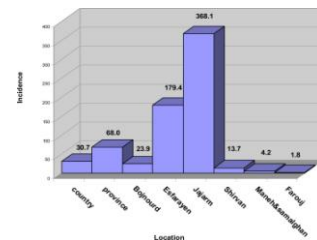
Leishmaniasis In Iran (CL)



Leishmaniasis In Iran (VL)



Incidence of CL in North Khorasan

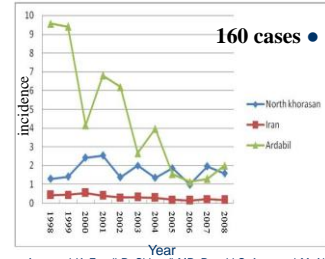


Alavinia SM, Arzamani K, Reihani MH, Jafari J. Some epidemiological aspects of cutaneous leishmaniasis in Northern Khorasan Province, Iran. Iranian journal of epidemiology and biostatistics. 2006;9(2):43

Order : Anoplura ,sucking lice

- Small, hard
- dorso-ventrally flattened
- Wingless, All lice are wingless
- Suck blood of mammals
- Tarsal claws are often enlarged, an adaptation to allow them to cling to hair and feathers of their hosts
- Gradual metamorphosis, Hemimetabolous
Egg → Nymph → Adult

VI in North Khorasan (incidence)



Arzamani K, Fazeli R, Shirzadi MR, Raeghi S, Arzamani M, Alavinia SM. Visceral Leishmaniasis in North Khorasan Province, Iran. Journal of

- All are parasitic of mammals
- The family Pediculidae includes the human **head louse** and the **body louse**, both in the genus *Pediculus*

Pediculus humanus "Lice"



© 1997 Richard C. Russell
Raed Z. Ahmed, Medical Parasitology Lab, 2012

- The body louse, *P. humanus humanus* (= *P. corporis*)
- The head louse *P. capitis*
- Females can lay from 150-300 eggs (nits) during their lives; eggs are either cemented to clothing (body lice) or to hair (head lice)

Pediculidae

- Abdomen longer than basal width





Fig. 10.6 A head of hair heavily infested with head lice. Numerous eggs can be seen.

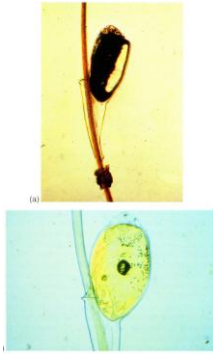


Fig. 10.5 Head louse eggs. (a) Ovary of the head louse glued to a hair shaft. (b) Developing head louse in egg.

Pediculus humanus cont.

- **Body lice** can be transmitted from one person to another through **contact, clothing or bedding**;
- **Head lice** usually transmitted through **physical contact**
- Infestations with lice usually are not life threatening,
- The lice carry some sort of disease organisms (e.g., it is a major vector for **relapsing fever, epidemic typhus and trench fever**)
- The lice normally cause red papules and cause severe itching which can lead to dermatitis and secondary infection; years of infection can lead to darkened, thickened skin a condition known as **vagabond's disease**

Phthirus pubis

- Possesses a wide thorax
- It frequents the **pubic hairs** and **perianal regions** of man, other parts of the body, including the head
- It is smaller and much broader than the other human
- Transmission is often from person to person by **close personal contact**



Phthiridae

- Human pubic or crab louse/genus **Phthirus**
- Abdomen not longer than basal width
- Mid and hind legs expanded.



Family Cimicidae

(Bed bugs, poultry bugs, bat bugs)

- Nocturnal.
- Host specific,
- main species:
 - *Cimex hemipterus* (Tropical Bed Bug)
 - *Cimex lectularius* (Bed Bug)



Order: Hemiptera

- 80,000 known species most in tropics.
- Worldwide distribution
- The most successful of the Hemimetabolic insects.
- **Family**
 - Cimicidae**
 - Reduviidae**

اهمیت پزشکی

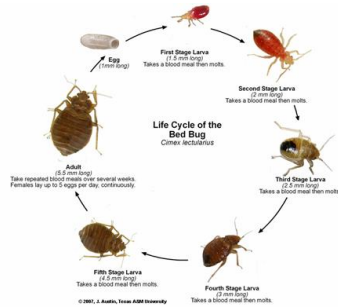
آزار گزش

ممکن است به صورت دسته جمعی بر روی افراد خونخواری نمایند
ایجاد کم خونی و کمبود آهن در بچه ها می نماید (به جز موارد
فوق ساسهای تختخواب بیماری خاصی را منتقل نمی کنند)

ایجادبوی نامطبوع در اثر ترشح نوعی ماده روغنی از بدنشان



Life Cycle



- Egg → Nymph (5 instars) → Adult
- Both sexes take blood meals.
- Can live up to one year without meal.
- Visit host only for bloodmeal then leave.
- Females lay 2-3 eggs a day (150-200 in lifetime).
- Adults can live up to 4 years.



Bed Bugs & Rusty Spots on Sheet



Chagas Disease

- **Host:** Variety of vertebrates.
- **Vector:** *Triatoma* spp.
 - *Triatoma infestans*
 - *Triatoma dimidiata*
 - *Triatoma brasiliensis*
 - *Rhodnius prolixus*
 - *Panstrongylus megistus*
- **Etiologic Agent:** *Trypanosoma cruzi* (protozoan)
- **Reservoir:** Wild animals (opossums, armadillos, rodents, monkeys, etc).

Family Reduviidae (Assassin bugs, Kissing bugs)

- Sub-family: Triatominae
- More than 130 species in 16 genera.



Order:

dictyoptera



American Cockroach

Periplaneta americana

- Originally from Africa.
- the largest species found indoors
- brown with large wings.
- Nymphal stage 10-14 months



- Order: Blattaria
- 4000 species worldwide
- 18 species have become serious domestic pests
- The most important medically are:
 - *Blattella germanica* (German cockroach)
 - *Blatta orientalis* (Oriental cockroach)
 - *Periplaneta americana* (American cockroach)
 - *Supella longipalpa* (Brown-banded cockroach)

Blatta orientalis (Oriental cockroach)

- Smaller than American Cockroaches.
- Identifiable from other cockroaches by the lack of wings and darker color

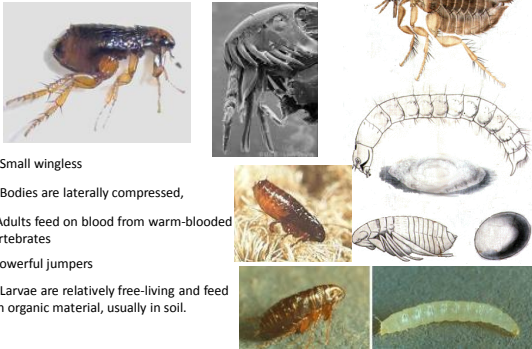


German Cockroach *Blattella germanica*

- Originally from Africa.
- Smaller than American.
- Carries egg capsule.
- Nymphal stage 2-3 months long.

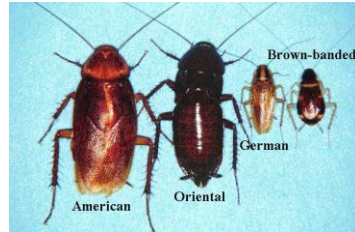


Order: Siphonaptera (Fleas)



- Small wingless
- Bodies are laterally compressed,
- Adults feed on blood from warm-blooded vertebrates
- powerful jumpers
- Larvae are relatively free-living and feed on organic material, usually in soil.

Supella longipalpa (Brown-banded cockroach)



Flea Biology and Ecology

Order: Siphonaptera

- Hind legs are adapted for jumping
- 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),



Life Cycle

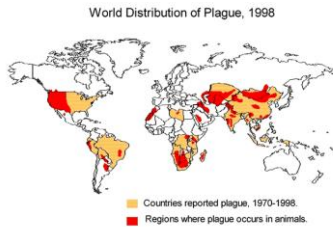
- Holometabolous
- Egg → Larvae → Pupa → Adult
 - 18 days to 20 months
- Eggs (3-18 at one time in several batches)
- Larvae need high humidity
 - 9-15 days optimal (up to 200 days)
- Pupa
 - 7 days to 1 year
- Adult
 - Live up to 4 years.

Importance

- (1) Irritation and Discomfort
 1. Tunga Penetrans
 2. Annoyance from bites – Anemia
- (2) Vectors of Disease
 - Murine Typhus , Rickettsia typhi
 - Bubonic Plague , Yersinia pestis

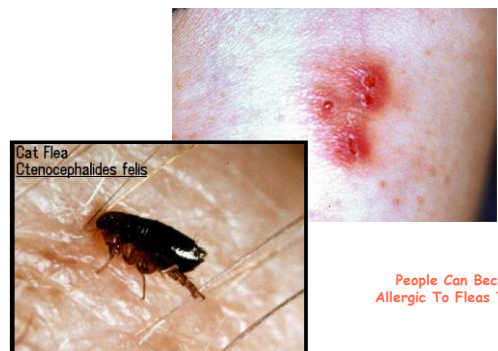


Is there still plague in the world?



Yes!!!

But today we have good antibiotics to kill the bacteria.



People Can Become Allergic To Fleas Too!