

Immuno-Parasitology


Arthropods



protozoa



helminths



arthropods


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PARASITIC ARTHROPODS


(two main assemblages)

ARACHNIDS



2 segments
8 legs
palps

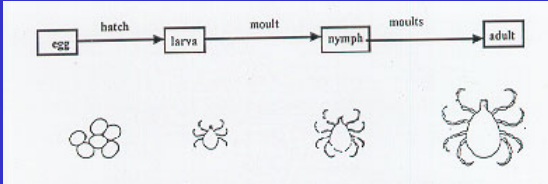
INSECTS



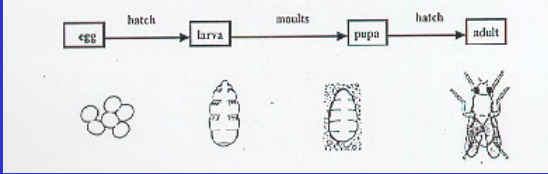
3 segments
6 legs
antennae

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INCOMPLETE METAMORPHOSIS (gradual change)




COMPLETE METAMORPHOSIS (sudden change)



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INSECTS

FLEAS




laterally flattened
wingless

LICE



flattened
wingless

FLIES




not flattened
winged

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DIPTERA (flies, mosquitos, etc)

known as:

- annoying pests
 - painful bite
 - allergic response
- vectors of disease
 - protozoa
 - bacteria
 - viruses






















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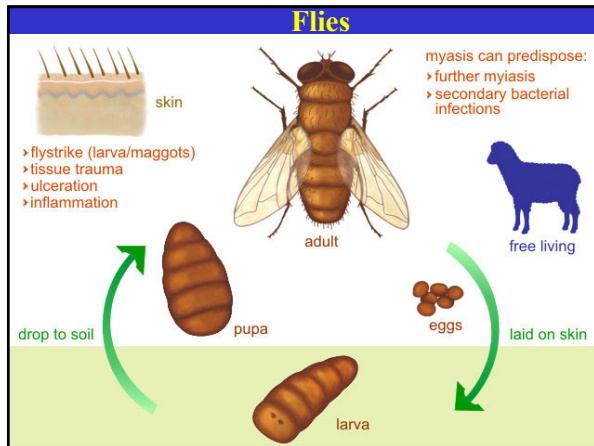
Life cycle

All undergo complete metamorphosis

- egg
- ↓
- larva
- ↓
- pupa
- ↓
- adult

| | Eggs | Larvae | Pupae | Adults |
|---|---|---|---|---|
| 1 |  |  |  |  |
| 2 | Not free |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |

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FLIES

Over 120,000 species belonging to 140 families

| | | | |
|------------|--|---|-------------------------|
| Nematocera | <ul style="list-style-type: none"> - Phlebotominae (sand flies) - Culicidae (mosquitoes) - Simuliidae (black flies) - Ceratopogonidae (midges) | } | adult stages parasitic |
| Brachycera | <ul style="list-style-type: none"> - Tabanidae (horse flies) - Glossinidae (tsetse flies) - Hippoboscidae (louse flies) - Muscidae (house flies) | | |
| | <ul style="list-style-type: none"> - Calliphagidae (blow flies) - Sarcophagidae (flesh flies) - Oestridae (bot flies) | } | larval stages parasitic |

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Larvae parasitic (myiasis)

| Flies | Tissues |
|---|------------------|
| • screw-worm (<i>Chrysomya</i>) | mucous membranes |
| • blow flies (<i>Lucilia</i>) | body/breath |
| • flesh flies (Sarcophaga) | wounds |
| • skin bot flies (<i>Dermatobia</i>) | skin |
| • cattle grubs (<i>Hypoderma</i>) | skin |
| • stomach bots (<i>Gasterophilus</i>) | stomach |

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Human myiasis

Tumbu fly (*Cordylobia anthropophaga*)

- common in Africa
- larvae (maggots) penetrate skin
- cause furuncle-like sores
- emerge from 'boils' after 10 days

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Screw-worm

Old World screw-worm fly (*Chrysomya brezziana*)

- Africa, New Guinea, Indonesia, other parts of Asia
- low host specificity (humans, domestic animals, wildlife)
- adults lay eggs near wounds, abrasions
- larvae invade tissues (cause deep lesions)
- emerge 5-7 days later

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Control

- treat wounds
- impose quarantine
- habitat destruction
- spraying programmes
- baiting programmes
- mass sterilization campaigns

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FLEAS

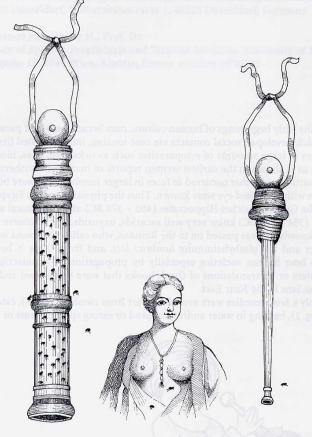
Over 2,500 species described
Most parasitic on mammals and birds
Enlarged hind limbs adapted for jumping
(use highly elastic resilin to cock legs)

- adults suck blood (piercing-sucking mouthparts)
- host specificity variable (preferred hosts)
- attachment time variable
 - transient (feeding only)
 - permanent (sticktight fleas, burrowing chigoes)

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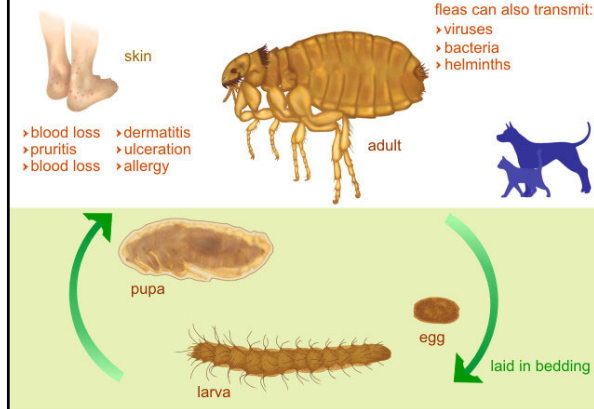
Long association
with human populations

18th century
flea grooming devices



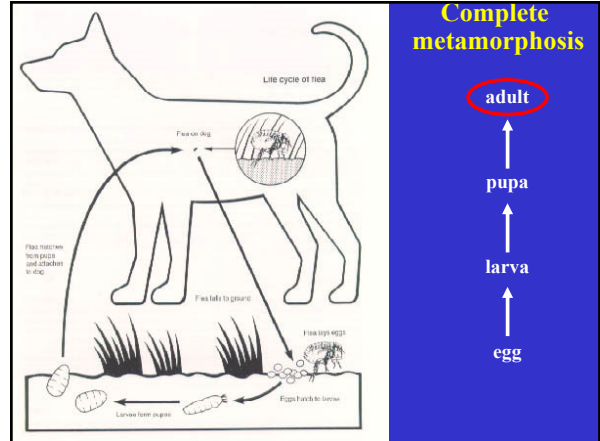
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Fleas



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Complete metamorphosis



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PATHOGENICITY

- blood loss
- tissue trauma
- pain
- itching
- dermatitis
- ulceration
- allergic reactions
- hypersensitivity
- secondary infections



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LICE

Over 3,500 species described
Most parasitic on birds and mammals
Some with long association with humans

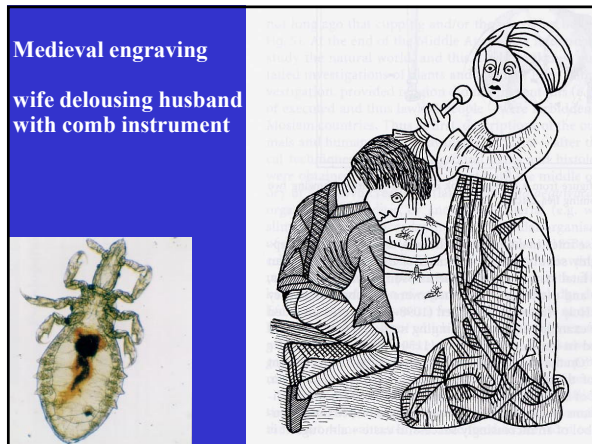
Enlarged tarsal claws for clinging

Mouthparts modified for:

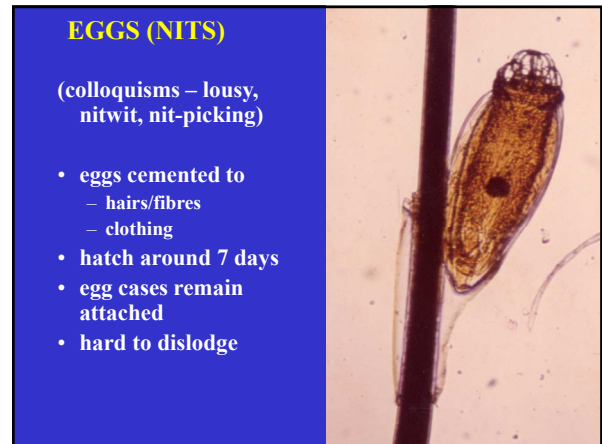
- chewing (3,000 species on birds & mammals)
- sucking (500 species on mammals only)



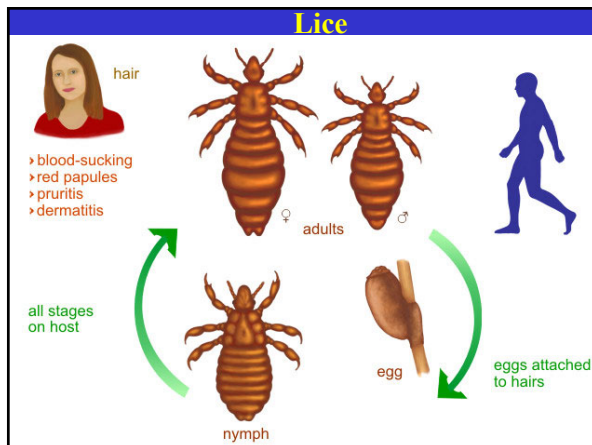
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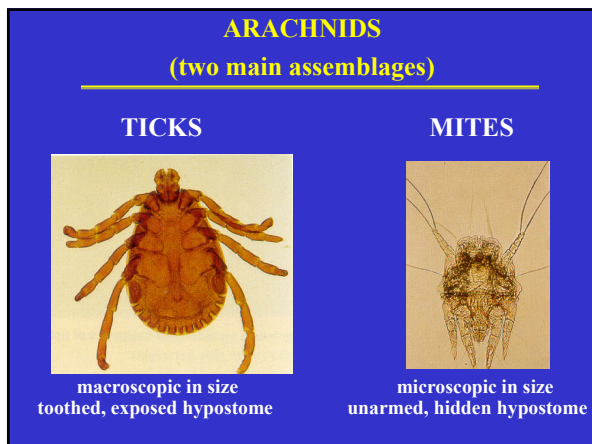
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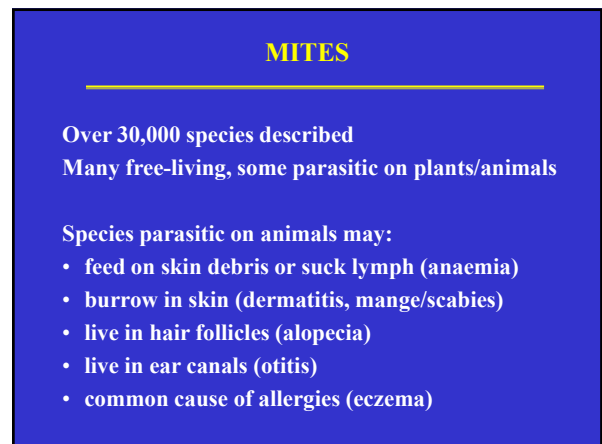
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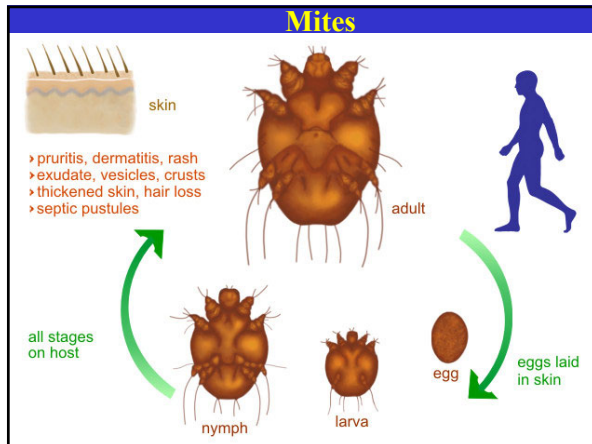
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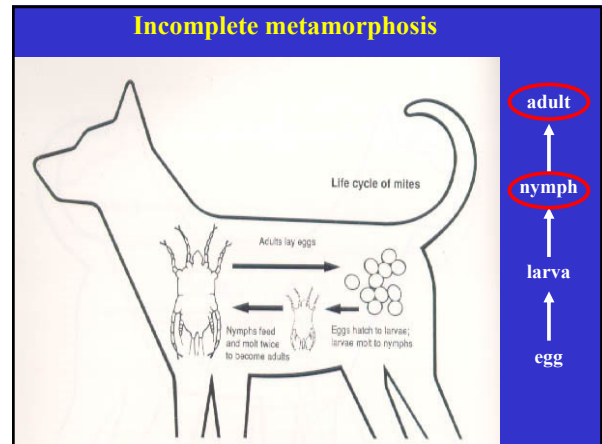
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Sarcoptes scabiei

- circular mites
- all legs are short
- parasites of homiotherms
- subspecies apparently host-specific
- infest horny layer of skin
- cause sarcoptic mange (animals), scabies (humans)

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Scabies in humans

- epidemics in 20 year cycle (esp. in times of war/famine)
- interdigital spaces, backs of hands, elbows, groin, breasts, umbilicus, penis, back, buttocks
- intense itching (nocturnal)
- scratching may cause weeping, bleeding
- characteristic rash (use ink to demonstrate burrows)
- vesicles and crusts form
- thickening of skin
- septic pustules can develop (secondary infections)

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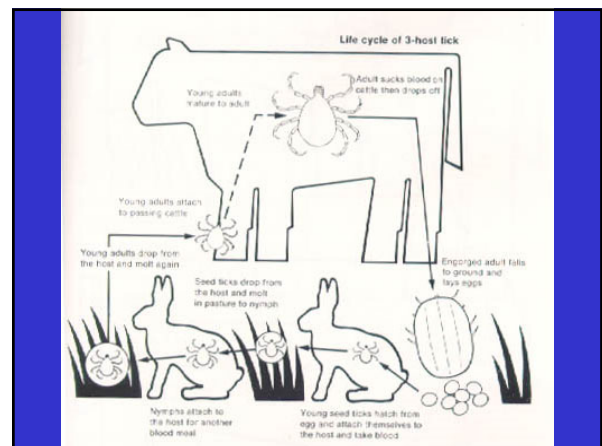
TICKS

Over 800 species described

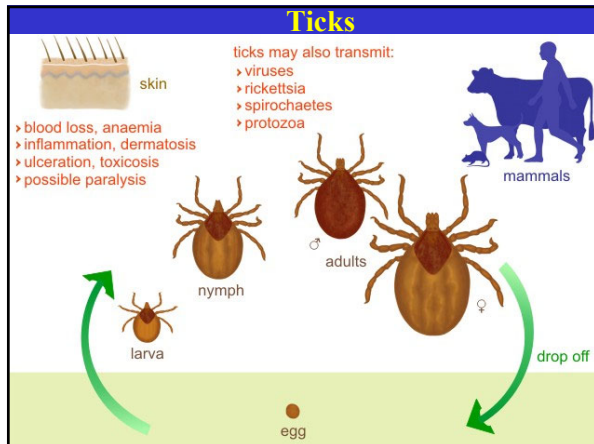
Blood-sucking ectoparasites that may cause:

- anaemia (mild-severe blood loss)
- dermatosis (inflammation, ulceration, itching)
- toxicosis (serum exudation)
- ascending paralysis (due to toxins)
- otoacariasis (infestation of ear canal)
- other infections (viral, bacterial, rickettsial, spirochaete, protozoal or helminth infections) e.g. Lyme disease, tick fever (babesiosis), East Coast fever (theileriosis), Rocky Mt spotted fever

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Ixodes spp.

- some 200 species of 3-host ticks on small mammals
- scrub tick *Ixodes holocyclus* found on native animals
- bite may cause scrub itch

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Ixodes holocyclus

- infestation of domestic animals and humans can result in ascending motor paralysis
- due to neurotoxic anticoagulants released by engorging females
- one tick can kill dog or infant

Ixodes holocyclus
(scrub or paralysis tick)

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Ixodes holocyclus (paralysis tick)

left facial paralysis Bell's phenomenon
(following local paralysis of seventh cranial nerve)

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Immunoparasitology (ectoparasites)

Parasite

- many external to host (transient feeding)
- some infest skin (myiases, mites)
- immuno-diagnosis (usually not warranted)

Host immunity

- limited protection (against infestation or disease)
 - inflammatory responses at bite site
- vaccination (none yet)
 - anti-infestation (parasite gut antigens)

Problems

- immuno-evasion (transient parasitism, haematophagy)
- immuno-pathology

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