Lesson №25

PHYLUM ARTHROPODA, CLASS INSECTA,

ORDERS Anoplura, Aphaniptera, Blattoidea, Heteroptera

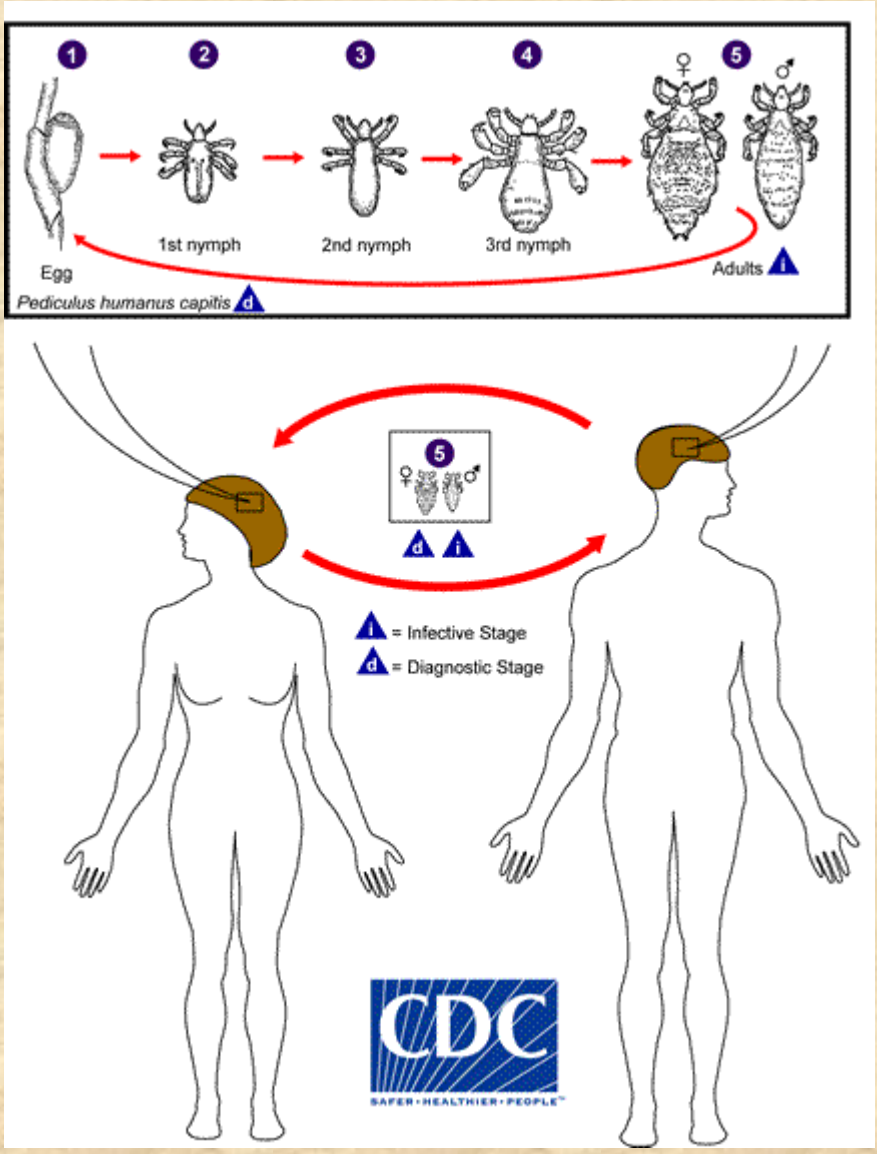
Sucking lice (order Anoplura)

Taxonomy: trere are two genera in order Anoplura: genus **Pediculus** and **Phthirus**. Genus Pediculus is represented by one species. **Pediculus humanus** includes 2 subspecies — the **head louse** and the **body louse** which freely cross and give fertile offspring, but they have some morphological and biological differences.

Head louse (Pediculus humanus capitis)

Morphology: the length of a male is about 2–3 mm, female — 3–4 mm. The posterior end of male's body is rounded, the female body is forked. Mouthparts are piercing-sucking.

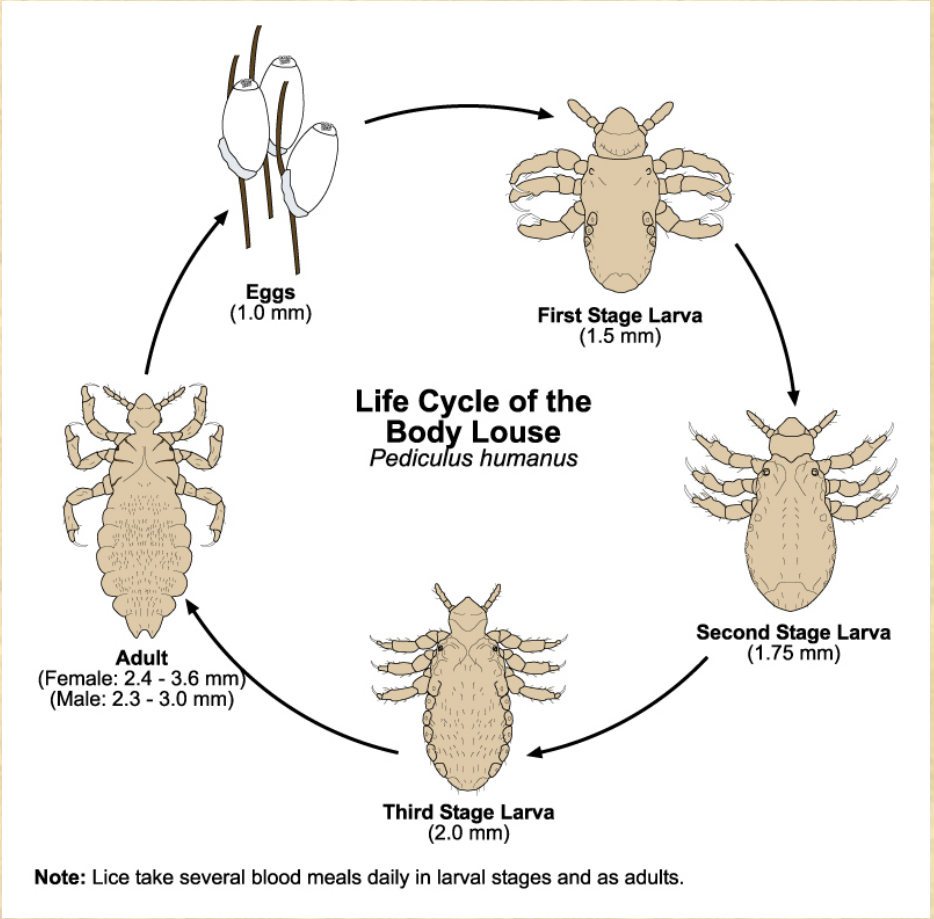
Life cycle: lice live in the hairy area of the head. They feed on human blood 2–3 times a day, may starve for several days. The life cycle of the body louse consists of three stages: egg (**nit**), nymph, and adult. **Nits** are attached to hair with a sticky secretion. During the whole life (about 38 days) a female lays about 300 eggs. A larva (nymph) comes from an egg and in several days transforms into imago (a mature form).



Body louse (Pediculus humanus humanus)

Morphology: body louse has larger body sizes than the head louse (to 4.7 mm), carvings along the body edge are not so deep and pigmentation is slightly marked.

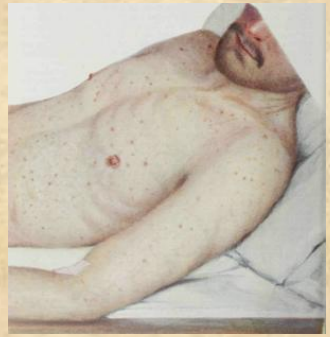
Life cycle: body lice live on underwear and clothes, but feed on the skin. Nits are sticked to the clothes or to the hair on human body. The life span is up to 48 days, the development lasts not less than 16 days. By the end of its life female can have about 4000 offspring.

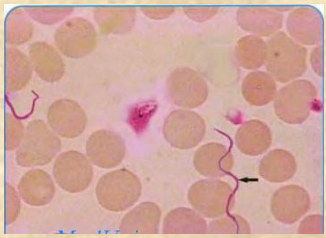


Medical significance: lice of genus Pediculus cause *pediculosis* (or *Vaga-bond's disease*). During blood feeding lice introduce saliva into the wound. This causes itching. Pediculosis is characterized by pigmentation and scraching on the skin.

Lice are specific vectors of *epidemic typhus* (caused by bacterium *Rickettsia prowazekii*)

and a *louse-borne relapsing fever* (caused by bacterium *Borrelia recurrentis*).



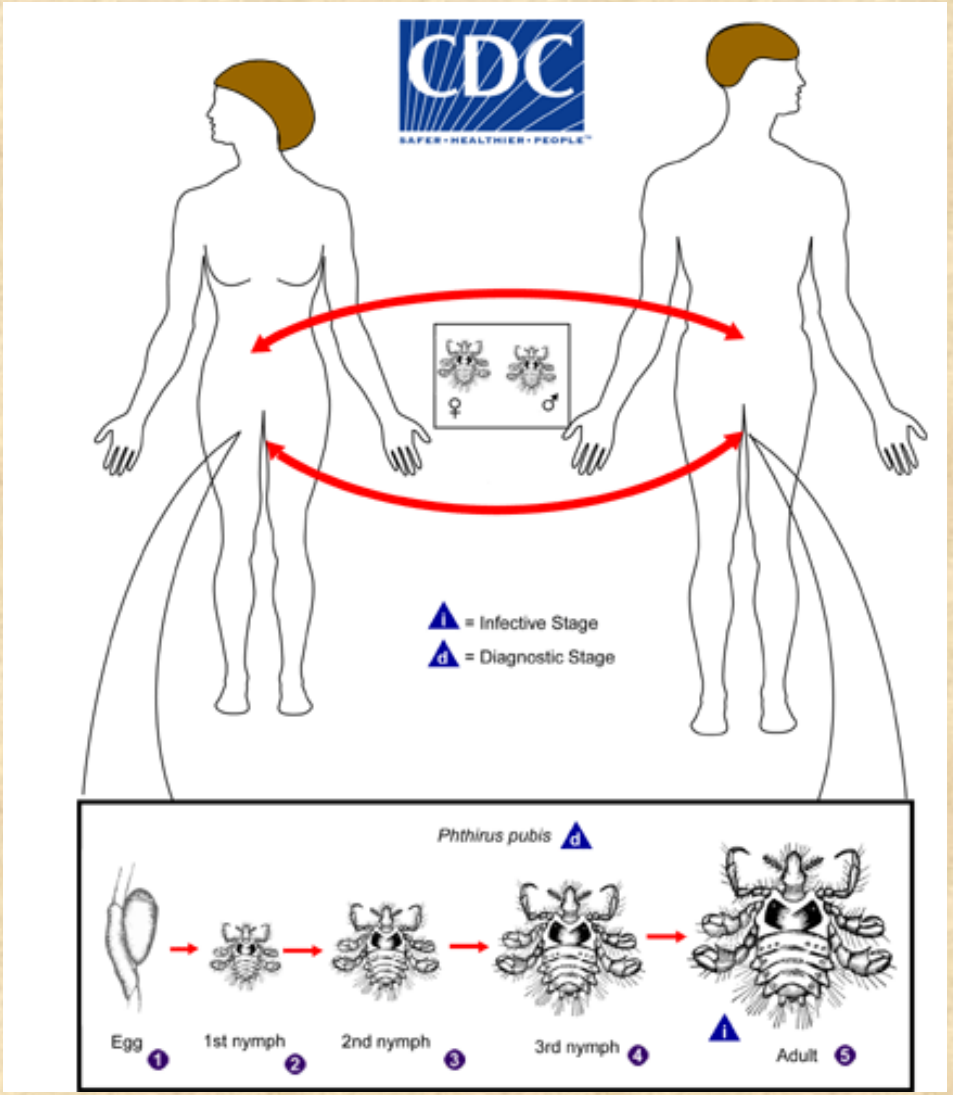


Infection of epidemic typhus occurs by a **specific contamination** — rubbing louse intestine content into wounds or into scratches on the skin, and by **contamination** in rubbing lice feces into the skin during scratching. Human can also get louse-borne relapsing fever by a specific contamination — smashing louse and rubbing its hemolymph into the skin during scratching.

Pubic louse (Phthirus pubis) is an ectoparasite of humans; feeds on blood.

Morphology: sizes up to 1.5 mm. The body is short, almost round.

Life cycle: parasitizes usually in the human pubic hair but can also live in other body areas covered with coarse hair, such as armpits, eye-lashes, beard. The female lays about 50 eggs during its life. The life cycle from an egg to a mature form lasts 22–27 days.

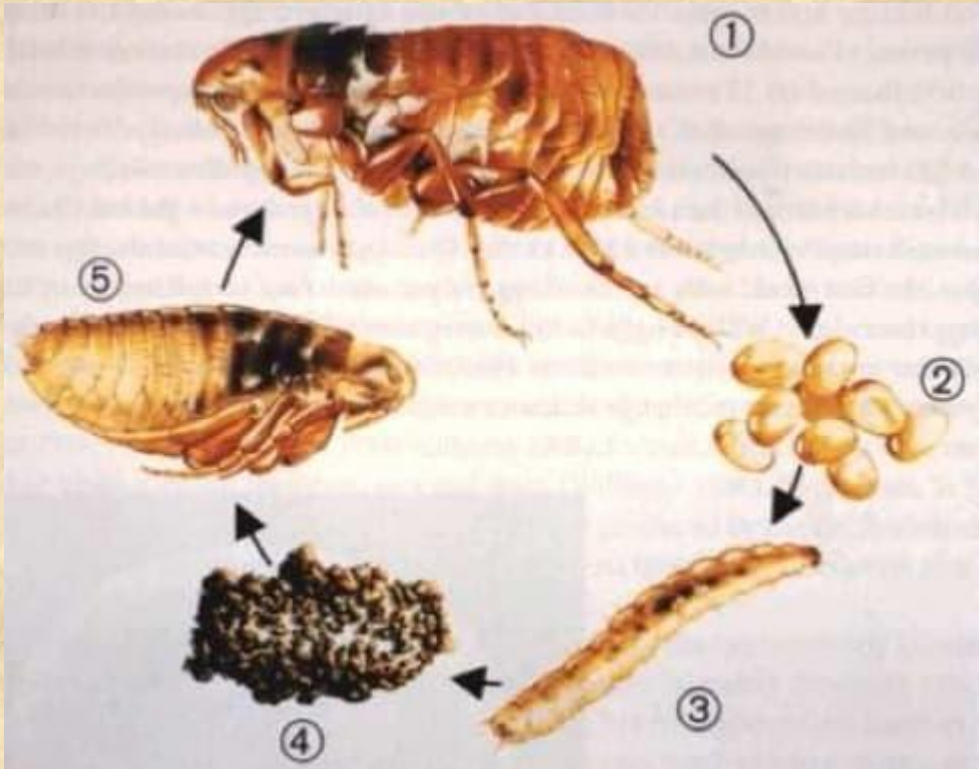


Medical significance: pubic lice cause *phthiriasis* (severe itching usually in the pubic-hair area). Human can get phthiriasis by sexual contacts, rarely — through underwear and clothes.

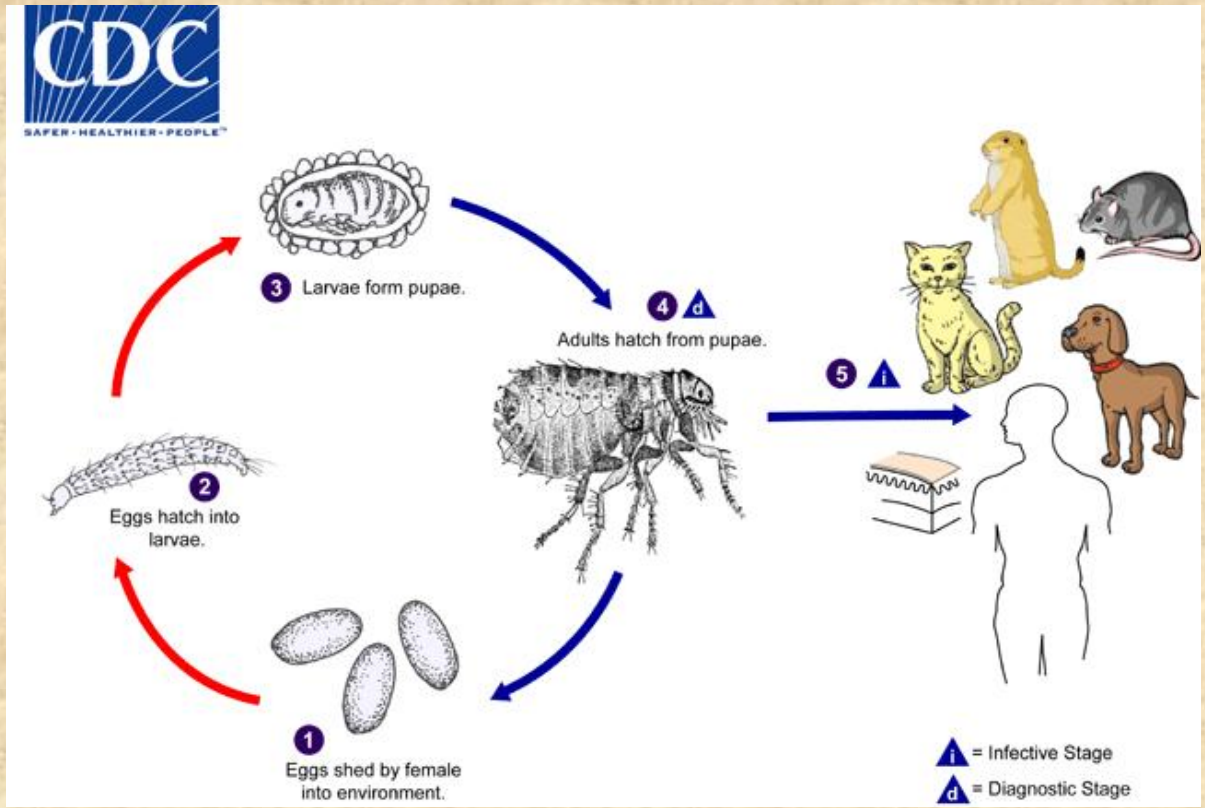
Protective measures against lice: extermination them in the environment, on the human body and on clothes.

Fleas (order Aphaniptera)

Morphology: fleas are wingless insects their body is flattened from the sides, covered with chitin and bristles, mouthparts adapted to blood feeding. There are short feelers and a pair of simple eyes on the head. The last pair of legs is long and well adapted for jumping.

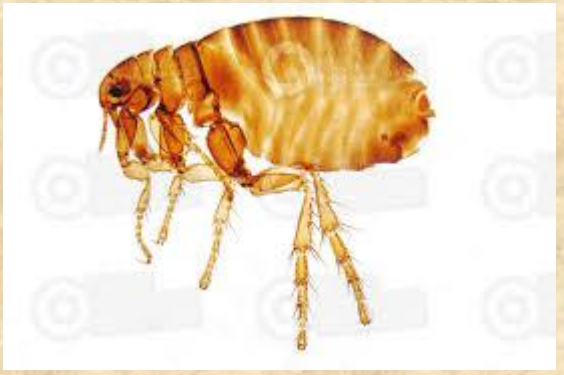


Life cycle: fleas have complete metamorphosis lasting about 19 days. Fleas lay eggs in slits of the floor, in garbage. There are four life cycle stages of egg, larva, pupa, and imago. Larvae have a worm-like shape without limbs. In some time a larva pupates. Adult fleas must feed on blood before they become capable of reproduction. Larvae feed on organic left-overs. The life span of fleas lasts over 1 year.



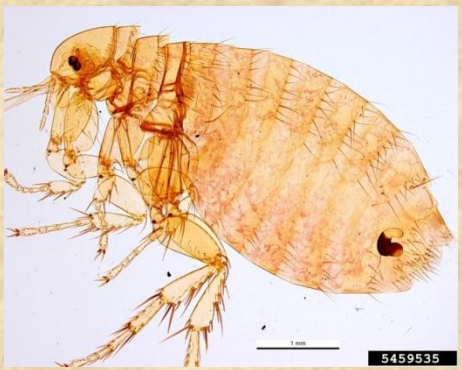
Representatives:

human flea (Pulex irritans)



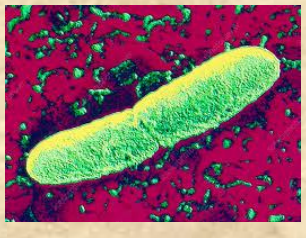
oriental rat flea (**Ceratophyllus fasciatus**

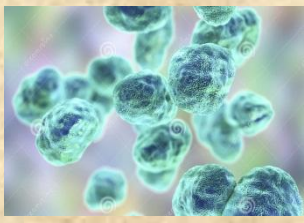
and **Xenopsylla cheopis**)



Medical significance:

fleas are temporary ectoparasites (bites cause itching, dermatitis).

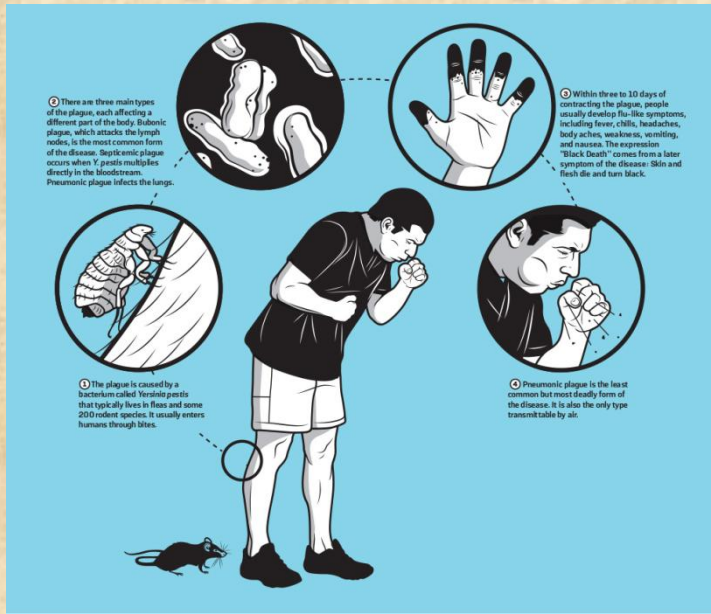




Fleas are also specific vectors of *plague* and *tularemia* bacteria.

Natural reservoirs of the plague are rodents, such as rats, gophers and marmots. The human gets plague infectection during the contacts with a sick animals (skinning) or with a sick person (by airborne route) and transmissively (vector-borne rote).

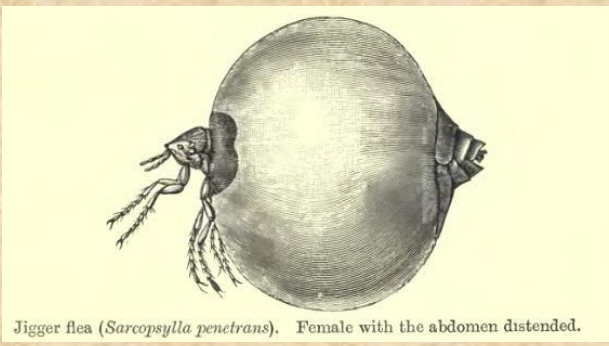
Infection occurs during blood-sucking (*inoculation*) or by contamination: when the plague bacteria with fleas feces get into injured skin during scratching. Fleas of genus Xenopsylla are specific vectors of *tularemia* and *murine typhus* (pathogen bacteria of genus *Rickettsia*), they are also intermediate hosts of animal tapeworms.



Jigger flea (Sarcopsylla penetrans)

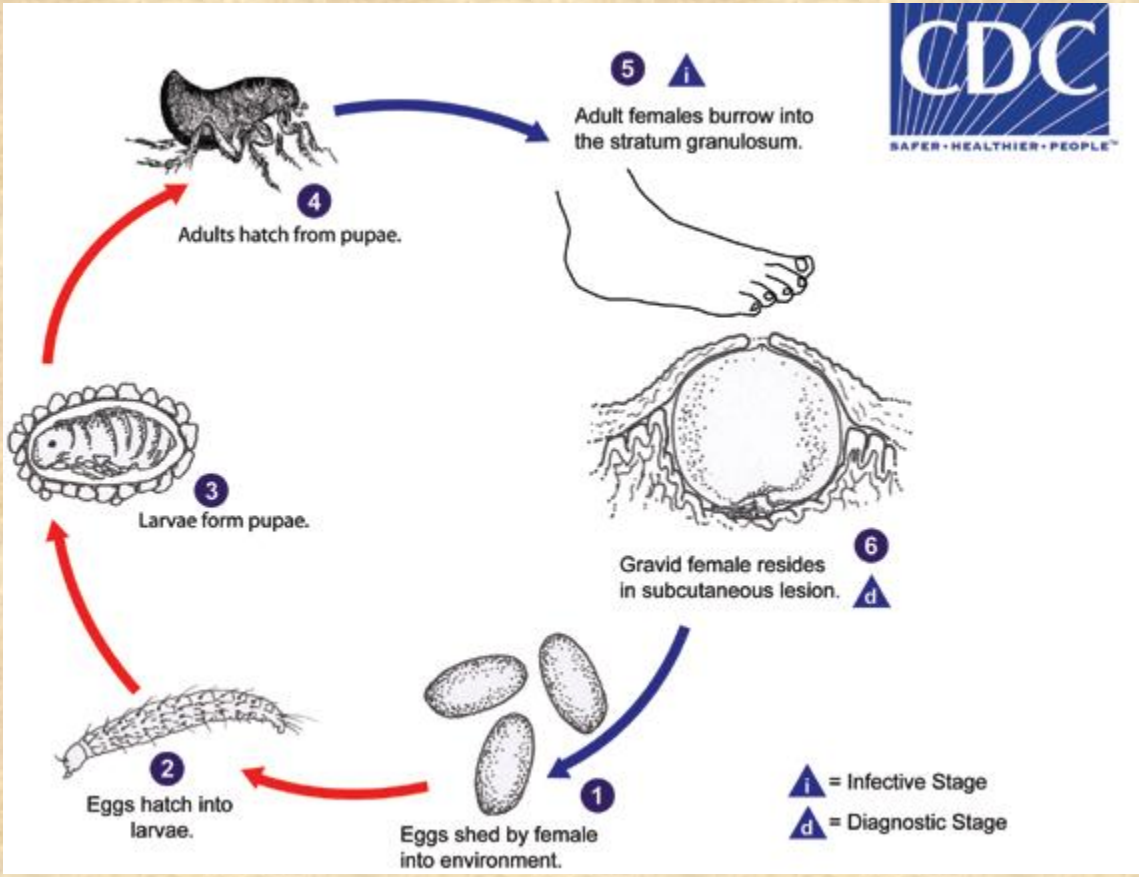
It is common in countries of South America and Africa, lives in sand, in dry grass and in cabins.

Morphology: jigger flea is 1 mm long, has a yellow-grey color.



Jigger flea (*Sarcopsylla penetrans*). Female with the abdomen distended.

Life cycle: fertilized females attack the human, burrow the skin between toes or get under the nails. They feed on blood and lymph, enlarge to the sizes of a pea and develop thousands of eggs. A tumor-like tissue growth around such a flea is marked. Mature eggs are excreted into the environment, females die and cause decomposition of injured tissues.



Medical significance:

jigger fleas are parasites of the human and mammals (dogs, pigs and rodents), they cause *sarcopsyllosis*. The formed wounds get inflamed and are very painful; often a secondary infection follows. Complications of sarcopsyllosis are *tetanus* and *gangrene*.

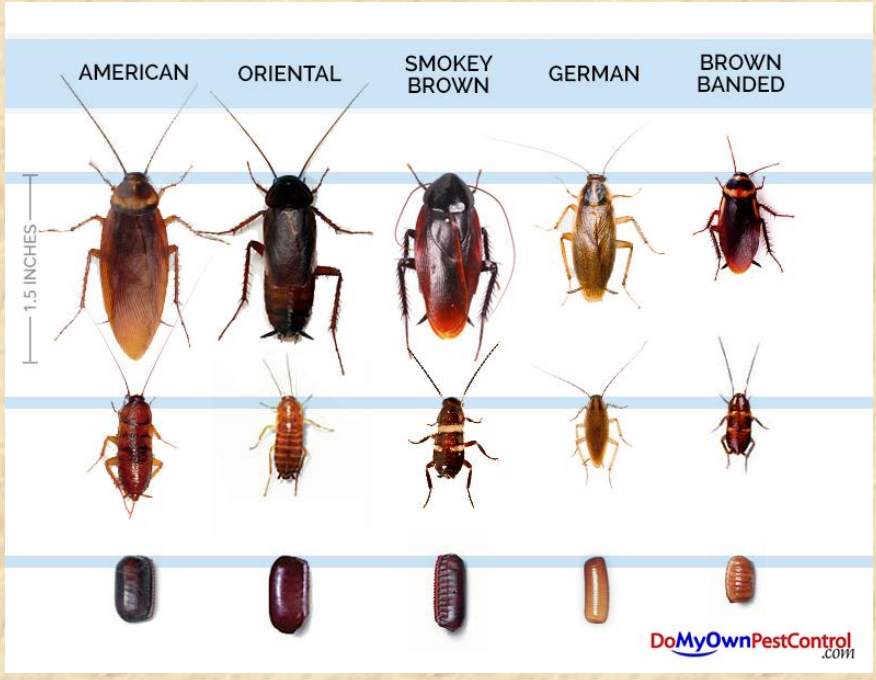
Protective measures against fleas:

keeping a rooms clean, elimination of slits in the floor and walls, fighting against rodents (deratization), using insecticides and repellents. It is not recommended to walk barefoot in the sand in Africa and South America.

Cockroaches (order Blattoidea)

Morphology: large insects, the body length reaches 3 cm. The body is flattened in a dorsal-ventral direction. They have 2 pairs of wings: fore wings are leathery, protective and hind wings are thin, membranous. In females the wings are reduced. Cockroaches have chewing mouthparts.

Life cycle: the development occurs with an incomplete metamorphosis lasts for several months. Females lay eggs in cocoons, which they carry with them about 14–15 days. They are active at night, at daytime they hide in floor slits. They are met in human habitations, at food fabrics and public food services, in shops and canteens. Obligatory conditions for their life in human houses are the presence of fluid, a definite temperature and amount of food. They feed foods, human excretions and various

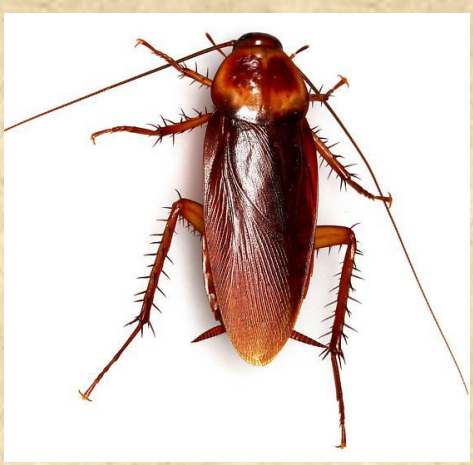


Representatives:

the oriental cockroach (Blatta orientalis),

the German cockroach (Blattella germanica)

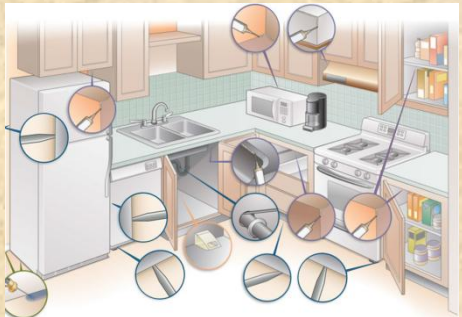
the American cockroach (Periplaneta americana).



Medical significance:

Cockroaches are mechanic vectors of infectious and invasive diseases.

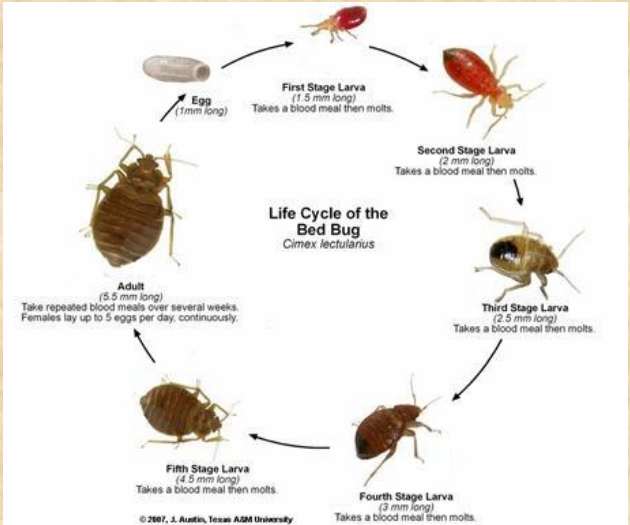
Protective measures against cockroaches: insecticides are used to kill them. It is also necessary to clean the rooms, not to leave leftovers on the table, to fix slits in a floor and walls.



Bugs (order Heteroptera)

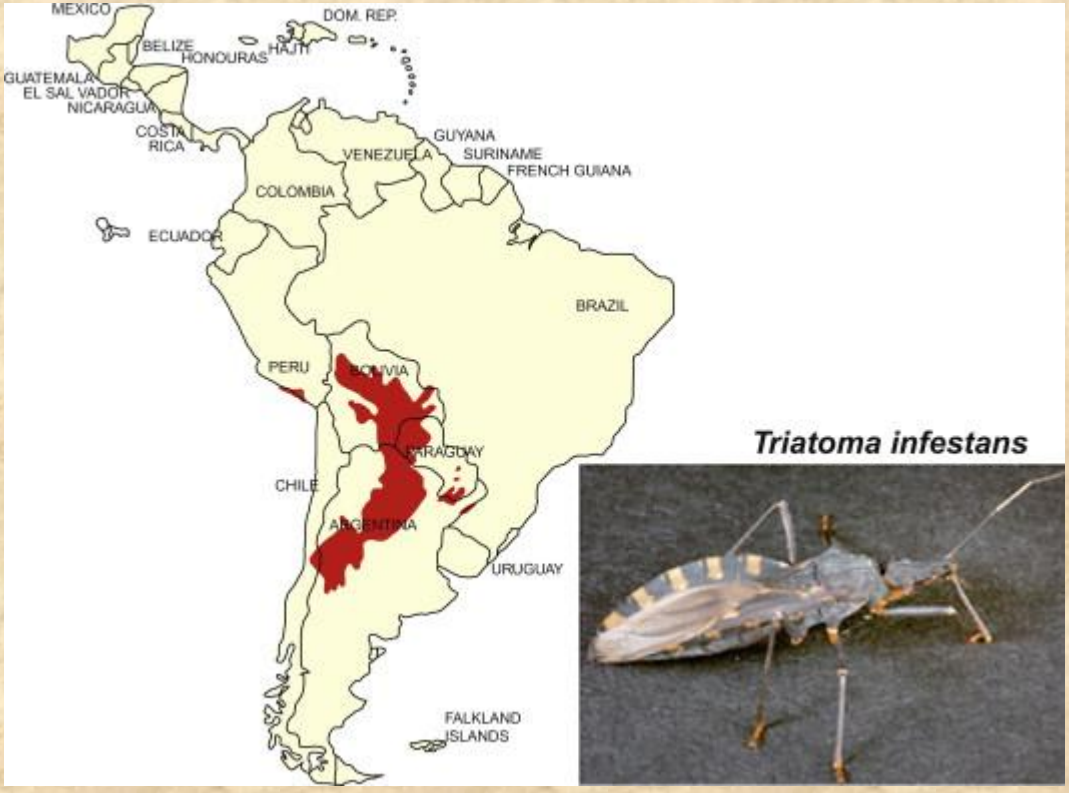
Bed bug (Cimex lectularius) is dark-brown bug that can reach to 8 mm in lenght (males are smaller than females), with reduced wings. It has a specific smell from odorous glands. The body is flattened in a dorsal-ventral direction. The abdomen shape is changeable and depends on blood saturation.

Life cycle: bed bugs live in human habitations near or inside beds or other sleep areas. At daytime and under artificial illumination bugs hide in slits of the floor, under wallcovering, in furniture slits, behind the curtains. At night they go out of their shelter, attack the human and feed on blood. Females lay eggs in slits of the floor, in books, on clothes. In 2–3 weeks (depending on the temperature) larvae come out of eggs and also feed on blood. Larvae moult several times and transform into imagos. Mature bugs and larvae may starve for several months. **Medical significance:** the saliva of the bed bug is poisonous, its bites are painful.

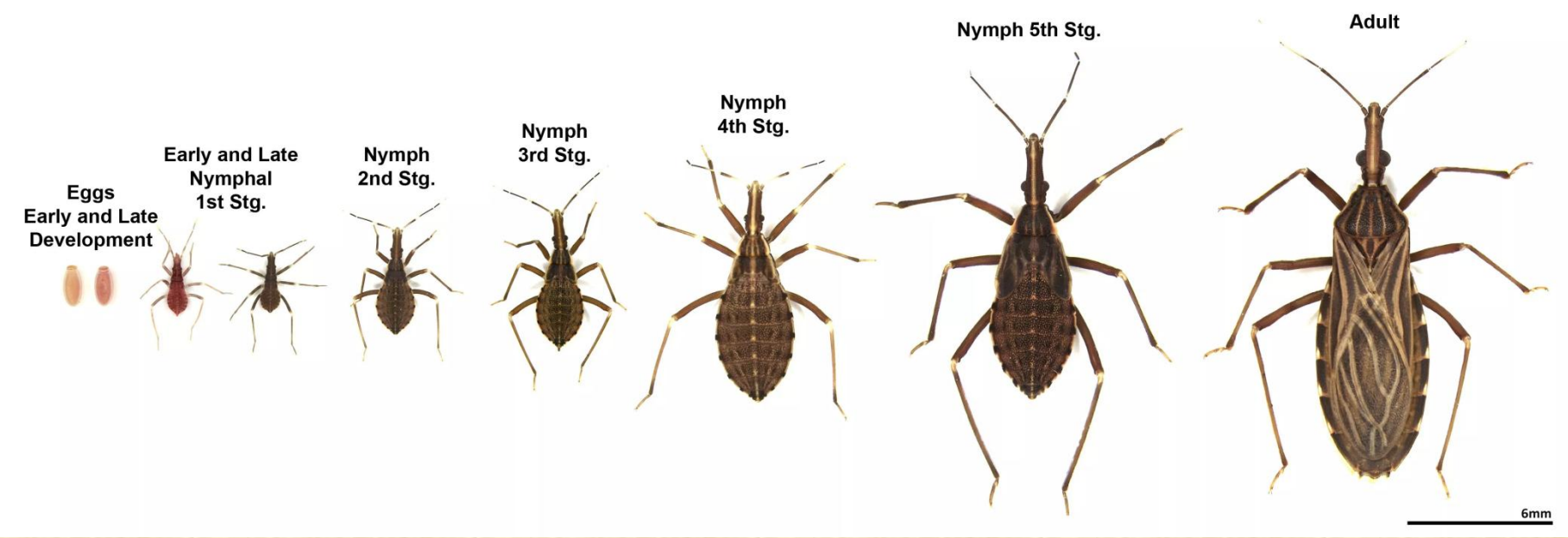


Kissing bug (Triatoma infestans)

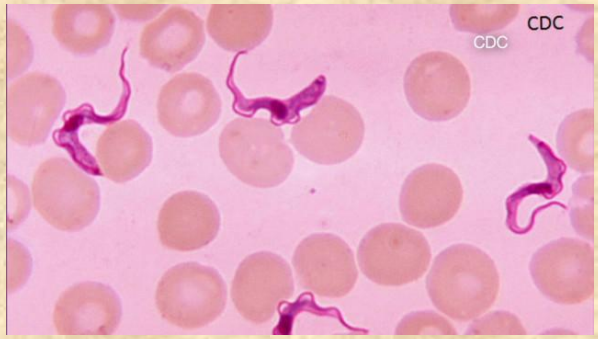
Morphology: the body of kissing bug is oval, flattened in a dorsal-ventral direction and has large sizes (1.5–3.5 cm), also it has well developed wings.

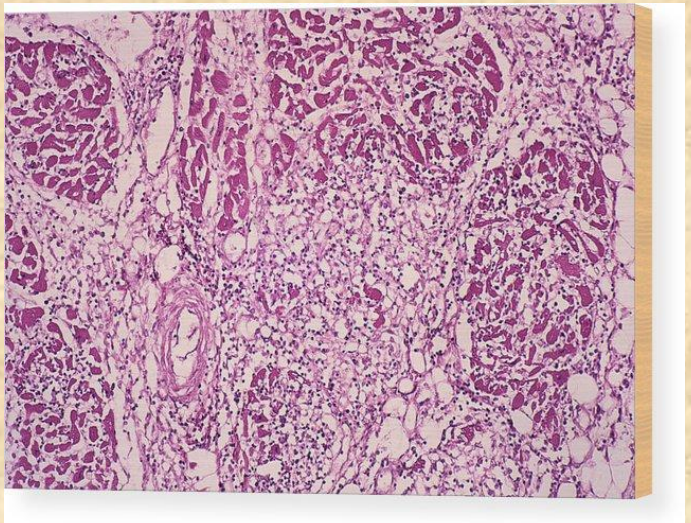


Life cycle: kissing bugs inhabit rodent holes and human habitations. They attack sleeping people at night and insert their proboscis into the skin of the neck, face, more often around lips and feed blood. After feeding the bug turns around and defecates into the bite wound.



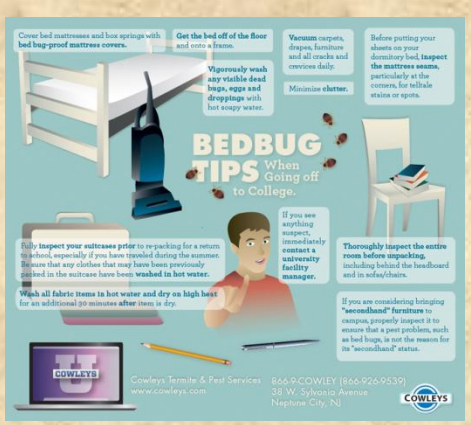
Medical significance: kissing bugs are temporal ectoparasites and specific vectors of *Trypanosoma cruzi* which causes *Chagas disease* — a natural-focal disease common in South America. In some people, saliva of bugs causes severe allergic reaction.





Protective measures against bugs:

insecticides are used to kill bugs. Elimination of rodents living near human, as they are feeders of bugs. It is also necessary to clean the rooms and to fix slits in a floor, walls and furniture.



Write down in your drawing book classification of **Pediculus humanus capitis, Pediculus humanus humanus, Phthirus pubis, Pulex irritans, Cimex lectularius, Triatoma infestans.**

You must draw in your drawing book

1. Adult **Pediculus humanus capitis**

Designate: mouthparts, limbs, claws, antennae, head, chest, abdomen

2. Phthirus pubis

Designate: mouthparts, limbs, claws, antennae, head, chest, abdomen

3. Pulex irritans

Designate: mouthparts, limbs, claws, antennae, head, chest, abdomen