

## Objectives

General aspects of **INSECTA** including morphology, classification and general life cycles;  
 Consideration of the **lower Diptera of veterinary significance** in relation to pathogenesis and the transmission of parasites;  
**Higher Diptera** including muscid flies, with main topic the **Oestridae** and consideration of their life cycles and pathogenic significance;  
**Other insect parasites (lice, fleas)**, economical and veterinary significance.

### Class: INSECTA

#### Order: HETEROPTERA (TRUE BUGS)

##### Order: PHTHIRAPTERA (LICE)

Suborder: AMBLYCERA (*Giricola*, *Gyraps*, *Hohorstella*, *Menacanthus*, *Menapon*, *Trimenapon*, *Trinoton*)

Suborder: ISCHNOCERA (*Anaticola*, *Anatoecus*, *Bovicola*, *Campanulotes*, *Chelopistes*, *Columbicola*, *Culexogaster*, *Felicola*, *Goniocotes*, *Goniodes*, *Lipewus*, *Trichodectes*)

Suborder: ANOPLURA

Family: **Pediculidae** (*Pediculus*, *Phthirus*)  
**Haematophoridae** (*Haematopinus*)  
**Linognathidae** (*Linognathus*, *Solenopotes*)  
**Hoplopleuridae** (*Nisus*, *Polypax*)

#### Order: DIPTERA (FLIES)

Suborder: NEMATOCERA

Family: **Culicidae** (*Anopheles* (*Anopheles*), *Culicinae* (*Aedes*, *Culex*, *Coquillettidia*, *Culiseta*, *Mansonia*, *Stegomyia*), *Psychodidae* (*Lutzomyia*, *Phlebotomus*, *Sergentomyia*), *Simuliidae* (*Austrosimulium*, *Cnephia*, *Prosimulium*, *Simulium*), *Ceratopogonidae* (*Austroconops*, *Culicoides*, *Forcipomima*, *Leptoconops*)

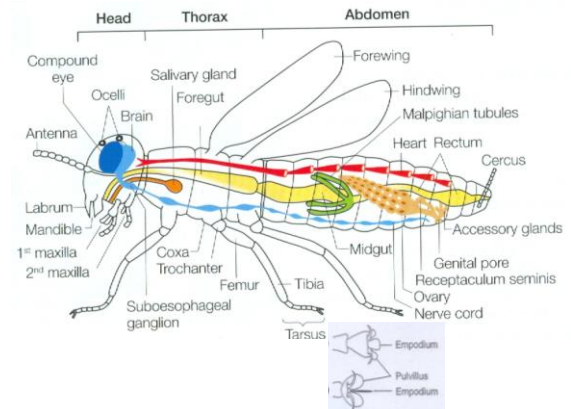
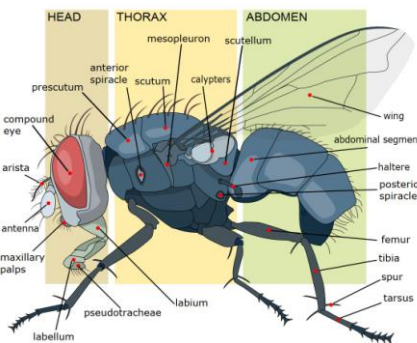
Suborder: BRACHYCERA

Family: **Tabanidae** (*Chrysops*, *Haematopota*, *Heptatoma*, *Hybomitra*, *Silvius*, *Tabanus*)  
**Glossinidae** (*Glossina*)  
**Calliphoridae** (*Calliphora*, *Chrysomya*, *Cordyloba*, *Lucilia*, *Protocalliphora*)  
**Sarcophagidae** (*Sarcophaga*, *Wohlfahrtia*)  
**Oestridae** (*Cephenemyia*, *Oestrus*, *Pharyngomyia*, *Rhinoestrus*)  
**Gasterophilinae** (*Gasterophilus*, *Gyrastigma*)  
**Hypodermiinae** (*Hypoderma*, *Oudemansia*, *Przevalskiana*)  
**Cuterebrinae** (*Cuterebra*, *Dermatobia*)  
**Hippoboscidae** (*Crataerina*, *Hippobosca*, *Lipoptena*, *Melophagus*, *Nealipoptena*, *Pseudolynchia*, *Ornithomyia*, *Stenoteryx*)

#### Order: SIPHONAPTERA (FLEAS)

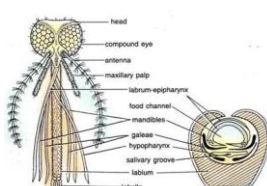
Family: **Pulicidae** (*Archaeopsylla*, *Ctenocephalides*, *Echidnophaga*, *Pulex*, *Spilopsyllus*, *Xenopsylla*)  
**Ceratophyllidae** (*Ceratophyllus*)  
**Tungidae** (*Tungo*)

## General aspects of INSECTA including morphology, classification and general life cycles



## Mouth part

- Complete digestive system with mouth, intestine, and anus
- Mouth has 1 pair of jaws called **MANDIBLES**

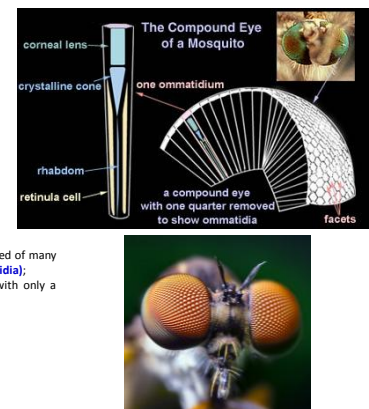


- Mouthparts are highly modified;

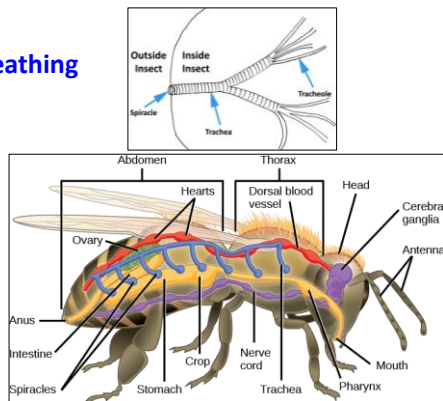
## Eyes

- **Compound Eyes**
  - visual structure with many lenses
- **Simple Eyes**
  - visual structure with one lens for detecting light
- one pair of compound eyes and 3-8 simple eyes

- **compound eyes** - are composed of many visual units called **facets (ommatidia)**;
- Some eyes are simple eyes with only a few photoreceptors;

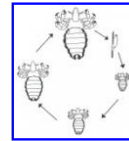
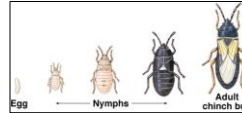


## Breathing

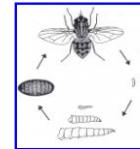
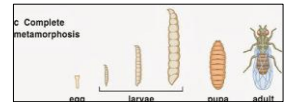


## Reproduction of insects (sex dimorphism)

### Hemimetabolous (Incomplete Metamorphosis) Lice; Bugs



### Holometabolous (Complete Metamorphosis) Diptera; Fleas



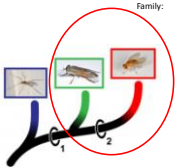
## Order: DIPTERA (FLIES)

### Suborder: NEMATOCERA

Family: **Culicidae** (*Anopheles*)  
**Culicidae** (*Aedes*, *Culex*, *Cosquillettia*, *Culiseta*, *Mansonia*, *Stegomyia*)  
**Psychodidae** (*Lutzomyia*, *Phlebotomus*, *Sergentomyia*)  
**Simuliidae** (*Austrosimulium*, *Cnephia*, *Prosimulium*, *Simulium*)  
**Ceratopogonidae** (*Austroconops*, *Culicoides*, *Forcipomazia*, *Leptoconops*)

### Suborder: BRACHYCERA (BRACHYCERA+ CYCLORAPHA)

Family: **Tabanidae** (*Chrysops*, *Haematopota*, *Heptatoma*, *Hybomitra*, *Silvius*, *Tabanus*)  
**Glossinidae** (*Glossina*)  
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**Oestridae** (*Oestrinae* (*Cephenemyia*, *Oestrus*, *Pharyngomyia*, *Rhinoestrus*)  
*Gasterophilinae* (*Gasterophilus*, *Gyrastigma*)  
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*Cuterebrinae* (*Cuterebra*, *Dermatobia*)  
**Hippoboscidae** (*Crataerina*, *Hippoboscina*, *Lipoptena*, *Melophagus*, *Neolipoptena*, *Pseudolynchia*, *Ornithomyia*, *Stenopteryx*)



## NEMATOCERA

- Dipterans with typical **antennae** (6 and more segments);
- **Slim body** (exception - Simuliidae) and **long limbs**;
- Hematophagous;



Family: **Psychodidae** (**Drain flies**.)

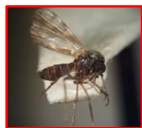
**Culicidae** (**Mosquitoes**)

**Ceratopogonidae** (**Biting midges; Culicoides**)

**Simuliidae** (**Black flies**)

## Psychodidae (Drain flies)

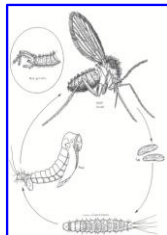
- Small - very small, double-winged, with wings thickly covered with long protruding hairs and short legs;
- Only **female sucking blood**;
- Genuses: ***Phlebotomus*** a ***Lutzomyia*** (Vectors - BUNYAVIRUS, VESICULAR STOMATITIS VIRUS, *Leishmania major*, *L. tropica*, *L. donovani*, *L. brasiliensis*, etc.)



*Phlebotomus papatasi*  
*P. serenti*

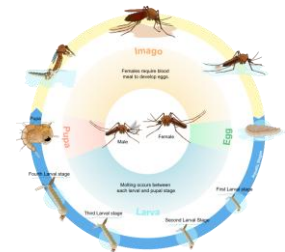


*Lutzomyia longipalpis*  
*L. intermedia*



## Culicidae (Mosquitoes)

- Small (3-6 mm) thin, double-winged, with long narrow wings, scaly, scar tissue, mammalian blood, females are blood-fed, development is bound to humid environment - standing or slightly flowing water



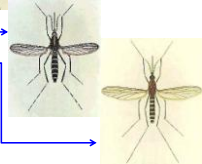
## Culicidae

> 3540 species

Family: **Culicidae**  
I. Subfamily: **Anopheleinae**  
Rod: **Anopheles**



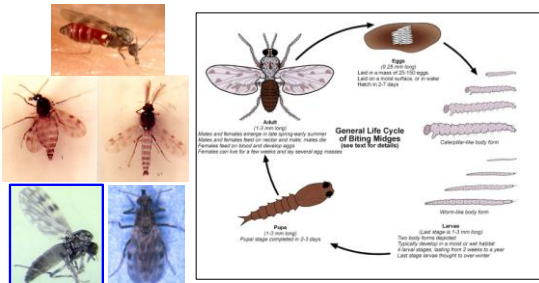
II. Subfamily: **Culicinae**  
Rody: **Aedes**  
**Coxiella**  
**Culex**  
**Culiseta**  
**Ochlerotatus**  
**Uranotaenia**



Arbovirus	Reservoir	Vector	Geographical distribution	Important vectors	
West Nile virus	Artemesia (Bryophytes)	West Nile virus	No. 1000 eggs	Northern Europe	Aedes albopictus Aedes punctor
Japanese encephalitis virus	Artemesia (Bryophytes)	Japanese encephalitis virus	No. 1000 eggs	Central Europe	Culex modestus
St Louis encephalitis virus	Artemesia (Bryophytes)	St Louis encephalitis virus	No. 1000 eggs	Northern and central Europe	Aedes albopictus Aedes punctor
Chikungunya virus	Artemesia (Bryophytes)	Chikungunya virus	No. 1000 eggs	Southern and eastern Europe	Aedes albopictus Aedes punctor
Dengue virus	Artemesia (Bryophytes)	Dengue virus	No. 1000 eggs	Mediterranean basin	Culex pipiens Culex modestus
Yellow fever virus	Artemesia (Bryophytes)	Yellow fever virus	No. 1000 eggs	West Africa, Central Africa, South America	Aedes albopictus Aedes punctor
Chikungunya virus	Artemesia (Bryophytes)	Chikungunya virus	No. 1000 eggs	West Africa, Central Africa, South America	Aedes albopictus Aedes punctor
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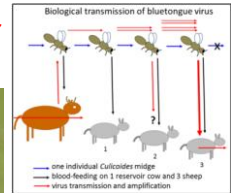
## Ceratopogonidae (Biting midges)

- > Very small two-winged (0.8-8 mm), with a short body, richly hairy, blood sucking only females, they develop in water, mud, below tree bark, etc.
- > *Culicoides obsoletus*, *C. pulicaris*; *C. imicola*, *C. nubeculosus*, ...

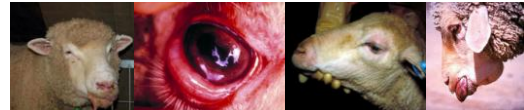


## Biting midges (Culicoides)

Vectors of **Trypanosoma**, **Haemaphysalis**, **Hepatitis**, **Leukocytosoma**; **Mansonella**, **Onchocerca**, **viruses** (BTV, Akabane, Schmallenberg, ...);

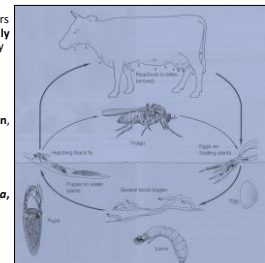


### Orbivirus (Reoviridae) – Bluetongue



## Simuliidae (Black flies)

- > Tiny (1-6 mm), developed in flowing and clear waters (larvae are demanding for oxygen in water), **painfully piercing and sucking the blood** of the female (early morning and late afternoon);
- > Worldwide 1,500 species; in Slovakia about 48 species (9 genera);
- > Due to the combined effect of **anaphylactic reaction**, **blood loss**, **inhalation of the flies** and **pulmonary oedema** - rapid death of animals, were massively attacked.
- > **SIMULIOTOXICOSIS**
- > **Vectors:** *Onchocerca volvulus*, *Onchocerca tarsicola*, *Leucocytozoon* spp., viruses of stomatitis, *Trypanosoma* spp., *Dirofilaria imiti*; ...
- > **Dermatitis** – ears, eyes, flank;
- > **Blood losses**



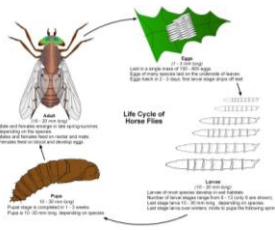
Species (former name)	Preferred breeding habitat	Water quality	Landscape type
<i>Simulium erythrogastrum</i>	vegetation rich large streams to medium rivers of alpine	medium	lowland from northern Germany to low-mountain ranges
<i>Simulium vittatum</i>	vegetation-rich streams and rivers	high	lowland to low mountain ranges, per alpine
<i>Simulium ornatum</i>	general flowing waters (ecologically very versatile species), prefers cultivated flow	low	lowland, low mountain ranges, per alpine
<i>Simulium argyreatum</i>	streams with moderate, regular flow and submerged vegetation	low	plains, low altitude and low mountain ranges



Chronic lesions of lichenification and alopecia on chest of pony with *Culicoides* hypersensitivity.

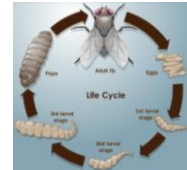
## BRACHYCERA: Tabanids (Horse Flies and Deer Flies)

- 4300 spp in 133 genera
- 3 subfamilies (one of which is not common)
  - **Tabaninae** – **Horse Flies**, livestock pests but do not often bite humans
  - **Chrysopinae** – **Deer Flies**, livestock and people biters



## Higher Dipterans (Flies)

- Six families of importance which are divided into 2 subgroups
  - **Blood sucking**
    - Family **Muscidae** (in part) - stable fly, horn fly, tsetse fly
    - Family **Hippoboscidae** - louse fly
  - **Nuisance and myiasis**
    - Family **Muscidae** (in part) - house fly, face fly
    - Family **Sarcophagidae** - flesh fly
    - Family **Calliphoridae** - bottle fly, screw worm fly



Family, subfamily and species (L: length of adults)	Occurrence	Main habitats
<b>Family Muscidae, subfamily: Muscinae</b>		
<i>Musca domestica</i> (common house fly) L: 5-8 mm	worldwide	stables, houses and environments
<i>Musca autumnalis</i> (stable fly) L: 4-7 mm	subtropics and tropics, Africa, Asia, Pacific region	houses, stables and environments
<i>Musca autumnalis</i> (black fly) L: 5-7 mm	Europe, USA	pasture land
<i>Hydrotaea irritans</i> (house fly, head fly) L: 3-6 mm	Europe	pasture land
<b>Family Muscidae, subfamily: Phoridae</b>		
<i>Phorocera irritans</i> (phorocera or stable fly) L: 5-6.5 mm	Europe, Neotropics, Pacific regions	stables, fairs, waste disposal sites
<b>Family Muscidae, subfamily: Stomoxysinae (biting horn)</b>		
<i>Stomoxys calcitrans</i> (stable fly) L: 4-7 mm	worldwide	stables, houses and environments
<i>Haemorrhoida irritans</i> (biting horn fly) L: 5-7 mm	Europe, Asia, North America	pasture land
<i>Haemorrhoida irritans</i> (biting horn fly) L: 5-7 mm	Europe, North and South America, North Africa, Middle East to East Asia	pasture land
<b>Family Fanniidae</b>		
<i>Fannia canicularis</i> (drone house fly) L: 4-7 mm	worldwide	stables, houses and environments

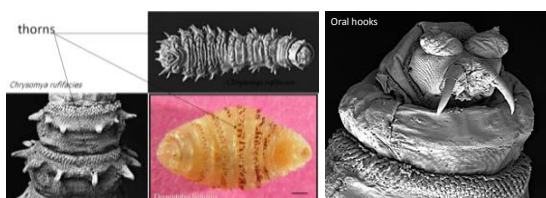


## Myiasis

The invasion of organs and tissues of humans and other vertebrate animals with **dipterous larvae**, which for at least a period **feed upon the living or dead tissue** or, in the case of intestinal myiasis, on the host's ingested food.

## Principle of Pathogenesis:

- **Mechanical damage** of tissues
  - **Proteolytic enzymes** - dissolves tissues, suffers their deep and extensive damage and strong exudate formation;
  - **Bacterial infection, inflammation**, and the animal may die.



## Types of Myiasis

- **Accidental or Pseudomyiasis**

Muscidae, Sarcophagidae

- **Facultative**

*Lucilia* spp.,  
*Phormia* regina,  
*Protaphormia terraenovae*,  
*Calliphora* spp.,  
*Sarcophaga carnaria*,  
*Cuterebra jellisoni*

- **Obligatory**

*Cochliomyia hominivorax*,  
*Cordylobia anthropophaga*,  
*Chrysomya bezziana*,  
*Wohlfahrtia magnifica*,  
*Dermatobia hominis*



## Myiasis Producing Flies

### ➤ Three Main Families:

- (1) Calliphoridae (2) Sarcophagidae
- (3) Oestridae

#### Oestridae

**Oestrinae** (*Cephenemyia*, **Oestrus**, *Pharyngomyia*, **Rhinoestrus**)

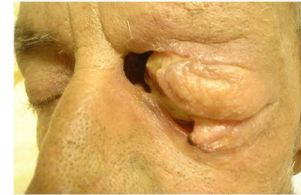
**Gasterophilinae** (**Gasterophilus**, *Gyrostigma*)

**Hypodermiinae** (**Hypoderma**, *Oedemagena*, *Przhevalskiana*)

**Cuterebrinae** (*Cuterebra*, *Dermatobia*)

### Calliphoridae: Metallic Flies /Screw worm Myiasis

*Cochliomyia hominivorax* + *Chrysoma bezziana*



### Calliphoridae: Metallic Flies

*Lucilia* spp.

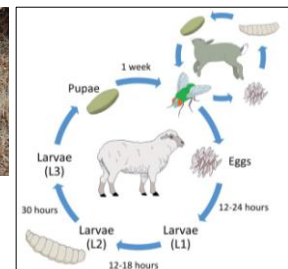


***Lucilia sericata* - Blowfly-strike**; eggs in wounds, larvae move around, destroy skin; skin inflammation, strong secretion, bact. sec. inf.; large economic loss;

*Calliphora* spp.



### WOUND MYIASIS AND CUTANEOUS MYIASIS



## Fly strike (myiasis) – dog and cats

### Cause and pathogenesis

- The flies are attracted to lay their eggs on warm wet skin, especially **urine and faecal stained areas** as well as **wounds**.



### Treatment

- Treatment of predisposing factors is important to prevent recurrence. Animal should be moved to a clean fly-free environment.
- **Clip hair from lesions and clean the area** thoroughly with an antibacterial wash, e.g. acetic acid, chlorhexidine, ethyl lactate to remove all larvae.
- **Surgical debridement** may be necessary in severe cases.
- **Insecticidal wash** or spray may be used on the rest of coat, e.g. **pyrethrin or pyrethroid** based (dogs) with care to avoid toxicity in a debilitated animal.
- **Systemic larvicidal drugs** (unlicensed) that may be of benefit include the following:
  - **Nitenpyram** 1 mg/kg po sid for 7 days.
  - **Ivermectin** 0.2–0.4 mg/kg sq on a single occasion.
  - **Antibiotics** based on culture and sensitivity if necessary.
- Prognosis is variable depending on the underlying causes and the extent of tissue damage prior to therapy.

## Botflies and Warble Flies

- Most advanced **myiasis adaptation**
  - Involves an obligatory phase
- **Adults**
  - Live only about 1 week
  - Bee-like with eyes set widely apart
  - Difficult to capture and "dart" at host to lay eggs or deposit larvae
  - **Mouthparts are non-functional - do not feed\***
- **Larvae**
  - Grub-like and stout
  - Invade various parts of host body - GI tract, skin and nose



## Botflies and Warble Flies

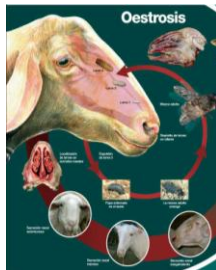
### General - Life cycle

- Eggs laid (glued) on hair of host or larva squirted into nasal passage
  - Larva **penetrate skin** or licked up
- **Long larval development period (8-10 months)**
- 3rd stage larvae leave host to pupate in ground
- Adult
  - **Highly host-specific** but may cause problems in abnormal host

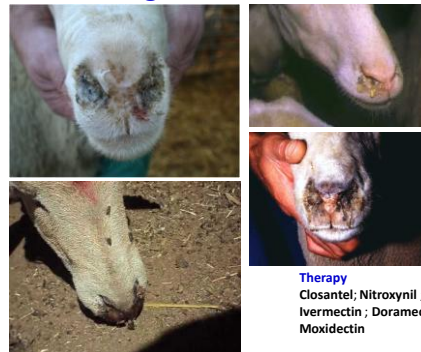
## NASAL MYIASIS / OESTROSIS

Synonyms: *Oestrus ovis*, nasal botfly

- Nasopharyngeal myiasis
- *Oestrus ovis* - Sheep bot fly (head maggot)



## Clinical signs



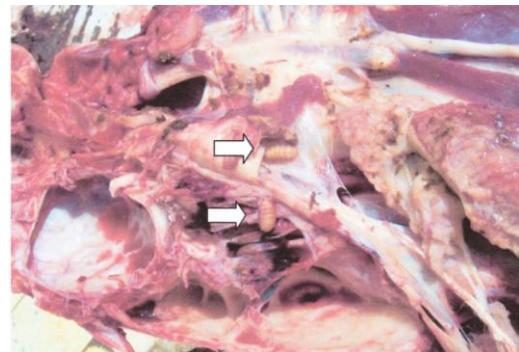
**Therapy**  
Closantel; Nitroxylin ;  
Ivermectin ; Doramectin ;  
Moxidectin

## Rhinoestrosis – horse nasal myiasis

*Rhinoestrus purpureus*; *R. usbekistanicus*



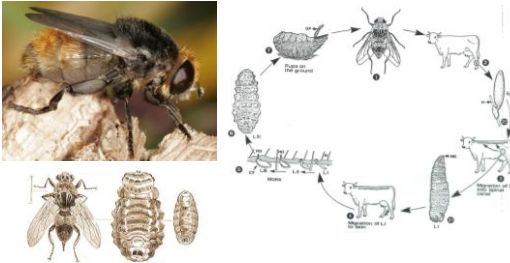
**Description:** Adult yellowish to gray-brown, and quite hairy; mouthparts are rudimentary.  
**Development:** complete metamorphosis



Dg: endoscopy

## HYPODERMOSIS synonyms: *Hypoderma* spp., Warble fly, cattle grubs

- *Hypoderma lineatum* – common cattle grub
- *Hypoderma bovis* – northern cattle grub



**Clinical symptoms** - Nodules within an opening are usually seen in the skin of the back. These cysts contain a larva. When the adult flies attack cattle, stampeding may occur.

- **Control**
  - Ivermectin, (pour-on, spot-on)
  - Avoid late fall treatment because bloat/hind end ataxia may result
    - Due to host reaction around killed larva in esophagus or spinal canal



## Control strategies

Make sure they do not conflict with each other if

Ivermectins, Dectomax, or Cydectin are being used...ie.

Don't use an endectocides during Nov.1 to Feb.1

## Gastric bots

### GASTEROPHILOSIS

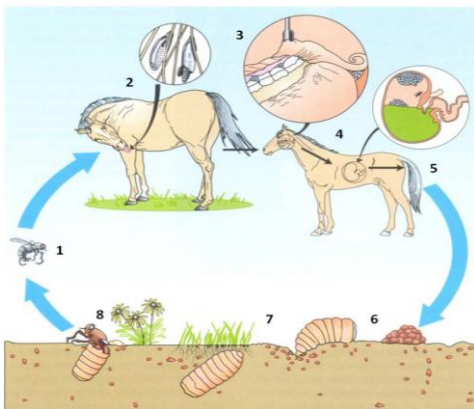
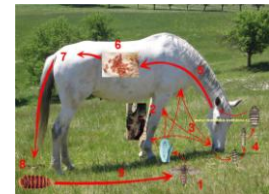
*Gasterophilus intestinalis* – (duodenum)

*G. inermis* (oesophagus, stomach)

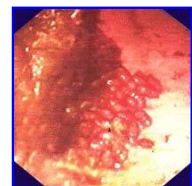
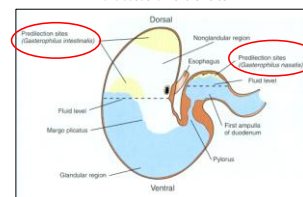
*G. nigricollis* (duodenum)

*G. haemorrhoidalis* (stomach, rectum)

*G. perocum* (stomach, rectum)



Predilection sites of *G. intestinalis* and *G. nasalis* in the stomach and duodenum of the horse.



## Family: Hippoboscidae Louse flies

### *Melophagus ovinus* - Sheep ked

- Wingless
  - Permanent ectoparasite - host specific
  - Female produces **single larvae** at a time
    - Retained inside body for 1 week at which time it pupates
    - Pupae is glued to the wool
  - Female lives about 4 months
    - Produces only 10-13 puparia
- Populations increase in winter due to longer wool
- Spread by contact



## Equine Hippoboscoidosis

- *Hippobosca equina*
- Blood-feeding
- It is a permanently **fully winged** fly, not shedding its wings on finding its host, as in some other Hippoboscidae.



## Prevention and control of infestations with louse flies

- Frequently change the bedding in stables will eliminate deposited pupae
- There is very little information on **chemical control** of louse flies. The reason is that no insecticide approved for use on horses or livestock includes a claim for louse fly control.
- They contain mainly **synthetic pyrethroids** (e.g. cypermethrin, deltamethrin, permethrin, etc.) or mixtures.

To our knowledge **no macrocyclic lactones** (mainly ivermectin and moxidectin) is approved for louse fly control and there are no reports that they would be effective against louse flies at the usual therapeutic dose of 0.2 mg/kg.

There are also no **repellents** to prevent louse fly infestations.

## SUCKING AND BITING LICE

- Lice are insects belonging to the order PHTHIRAPTERA, includes four suborders. **Anoplura** are **sucking lice** which feed on blood and **Amblycera** and **Ischnocera** are **biting or chewing** lice (previously known as Mallophaga) which feed on keratin.
- Lice are **highly adapted to parasitic life**
- Lice are the **permanent** ectoparasites, they are highly **specific to one** or a few animals
- They are all small in size (0.5-8 mm), are **dorso-ventrally flattened**, have no wings but strong legs with one or two terminal claws. They live attached to the hair of their host. They feed either on skin debris, sebaceous secretions or blood.

## Order: PHTHIRAPTERA (LICE)

**Suborder: AMBLYCERA** (*Gliricola*, *Gyropus*, *Hohorstiella*, *Menacanthus*, *Menopon*, *Trimenopon*, *Trinoton*)

**Suborder: ISCHNOCERA** (*Anaticola*, *Anatoecus*, *Bovicola*, *Campanulotes*, *Chelopistes*, *Columbicola*, *Cuclotogaster*, *Felicola*, *Gonicotes*, *Goniodes*, *Lipeurus*, *Trichodectes*)

**Suborder: ANOPLURA**

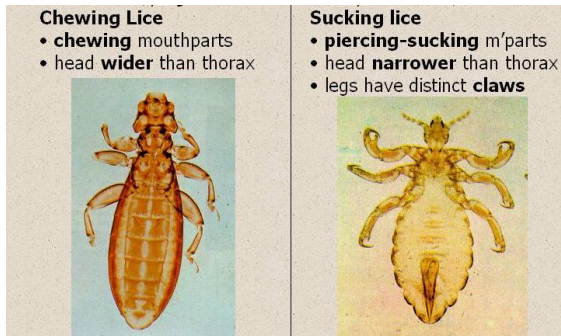
Family: **Pediculidae** (*Pediculus*, *Phtirus*)

**Haematopinidae** (*Haematopinus*)

**Linognathidae** (*Linognathus*, *Solenopotes*)

**Hoplopleuridae** (*Haemodipsus*, *Polyplax*)



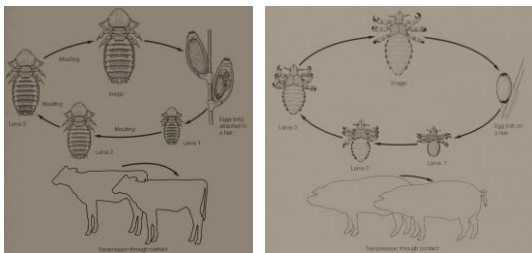


## Lice (Pediculosis)

- Order *Anoplura* - **Sucking lice**
  - Parasites of mammals only
  - Dorso-ventrally flattened and wingless
  - Head usually elongated and pointed
  - Mouthparts **stylet-like** for sucking
  - Legs adapted for **clinging to hair/fur**
  - Strong legs end with a **single claw** projecting from the tarsus
- Not very mobile
- Host specific
  - Transfer by contact with maximum populations in winter



## Incomplete metamorphosis



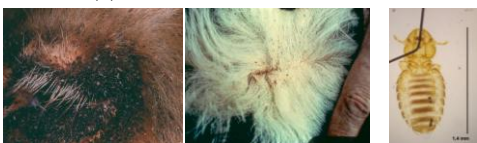
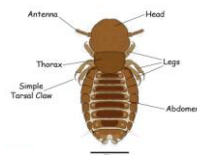
## Ruminants + pigs

Host species	LICE	
	Chewing lice	Sucking lice
Cattle	<i>Damalinea (Bovicola) bovis</i>	<i>Haematopinus eurysternus</i>
		<i>Linognathus vituli</i>
		<i>Solenopotes capillatus</i>
		<i>Linognathus ovillus</i>
Sheep	<i>Damalinea (Bovicola) ovis</i>	<i>Linognathus pedalis</i>
Goat	<i>Damalinea (Bovicola) caprae</i>	<i>Linognathus stenopsis</i>
Pig	-	<i>Haematopinus suis</i>

- **Cattle** – on the top of the head, the neck, shoulders, base of the tail, back and rump. Heavy infections, which often reduced productivity are responsible for scratching, hair loss, excoriations and self-inflicted trauma.
  - In cattle and sheep, an hypersensitivity reaction to allergens present in the faeces and/or saliva of lice could be responsible for these clinical signs. Heavy infections by sucking lice are responsible for anaemia.
- **Sheep** – effect on wool production, is responsible for wool losses.
  - Fly strike is a frequent complication.
  - are responsible for itching, alopecia and excoriations.
- **Pigs** – ears, neck – predilection sites; itching, skin lesions; survive off its host for up to three days

## Chewing lice

- Dorso-ventrally flattened and wingless
- Head not pointed (somewhat broadened)
- Mouthparts **not stylet-like**
- Adapted for **chewing**
- Very active - scurry about
  - Mostly scavengers of detritus for food
  - Patchy alopecia
- Thorax segmented
- **Legs not adapted for clinging**
- Host specific - transfer by contact
- Maximum populations in winter



## Control

The drugs used to treat mange infections are usually active against lice.

- **Pyrethroids**
- **Tretmet must be repeated after approximately 10 days !**
- **Pour-on formulations** – deltamethrin, cypermethrin, lambdacyhalothrin, eprinomectin;
- **Avermectins/milbemycins** – ivermectin, doramectin, moxidectin – injectable formulations are highly active against biting lice;

## LICE – Pediculosis - dogs, cats

Lice tend to be host specific.

Two suborders:

**Mallophaga – biting lice:**

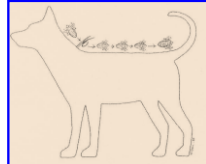
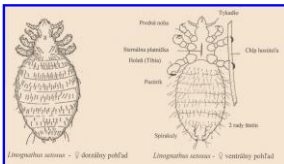
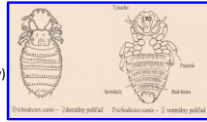
*Trichodectes canis* (dog)

*Heterodoxus spiniger* (dog) (warm climates only)

*Felicola subrostratus* (cat)

**Anoplura – sucking lice:**

*Linognathus setosus* (dog)



### Clinical signs

Pruritus may be variable; some animals can be asymptomatic carriers, other present with seborrhea.



Eosinophilic granuloma secondary to lice infestation.

### Differential diagnosis

- Flea allergic dermatitis
- Cheyletiellosis
- Scabies
- Dermatophytosis
- Allergy especially atopy, food

### Diagnosis

- History and clinical signs.
- Microscopy to identify:
  - Lice by either acetate tapes or superficial skin scrapings:
  - Sucking lice – slow moving, easy to catch.
  - Biting lice – active, move rapidly.
  - Eggs (nits) stuck to hairs identified by hair pluckings or acetate tape of hairs.
- Biopsy reveals non-specific and nondiagnostic signs of superficial perivascular dermatitis often with eosinophilic component.

### Treatment

#### Animal treatment:

- Clip coat to **remove thick crusts** and mats to allow penetration of treatment.
- **Insecticidal shampoo** or leave on **dips** may be used on 3 occasions at 14 day intervals. Suitable products contain **selenium sulphide 1%, lime sulphur 2%, permethrin 1%** (dogs).
- **Licensed topical insecticide spot on** containing
  - fipronil, imidacloprid, pyriprole, metaflumizole, and selamectin have good activity against lice.
- Insecticidal sprays include fipronil 0.25% used at a dose of 6 mg/kg every 14 days for 3 applications.
- **Systemic therapy with ivermectin** constitutes an extra-label use at 0.2 mg/kg po or sq every 14 days for 3 applications.

**Note :** Humans cannot get lice from pets. The pet cannot get lice from humans. Remember, **SPECIES SPECIFIC!!**

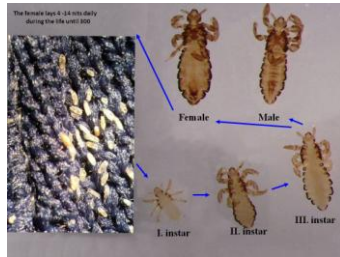
## LICE (PHTHIRAPTERA)

VECTOR		PATHOGEN	DISEASE
GENUS	SPECIES		
PEDICULUS	<i>P. capitis</i>	<i>Salmonella typhi</i>	Salmonellosis
	<i>P. humanus</i>	<i>Rickettsia prowazekii</i>	Typhoid fever
	<i>Phthirus pubis</i>	-	-



***Pediculus humanus*** - clothing and underwear;  
***Ptirius pubis*** - the hair in the genital as well as under the arms and chest;  
***Pediculus capitis*** - lives in the scalp, but also eyebrows, chin and moustache;

➤ They feed on blood and suck every 2-3 hours.



## Lice of birds

- **Philopteridae**
- **Lipeuridae;**
- **Gonioididae;**
- Limbs ending with two claws
- **Most pathogenic: *Lipeurus* and *Menacanthus***
- ***Lipeurus caponis* (wing louse)**
- ***Menacanthus stramineus* (body lice)**
- ***Menopon gallinae* (quill lice)**
- ***Goniocotes gallinae* (very small)**
- ***Goniodes gigas* (bighen lice),**
- ***Columbicola columbae***



(A) Chicken body louse, *Menacanthus stramineus*; (B) *Menacanthus cornutus*; (C) Shaft louse, *Menopon gallinae*; (D) Fluff louse, *Goniocotes gallinae*; (E) Wing louse, *Lipeurus caponis*; and (F) Chicken head louse, *Cuculigaster heterographus*.



(A) *Columbicola columbae*; (B) *Lipeurus caponis*; (C) *Oryzipeurus spp.*; (D) *Menacanthus stramineus*; (E) *Chelopistes meleagridis*; (F) *Menopon gallinae*; (G) *Goniodes dissimilis*; (H) *Goniocotes gallinae*. Magnification: 100x.

### Pathogenicity and clinical signs:

- Picking of the feather, it is broken;
- Damage, dropping and pulling of feathers;
- Reduction of the tooth;
- Weight loss;
- Anemia;
- Young birds may die;

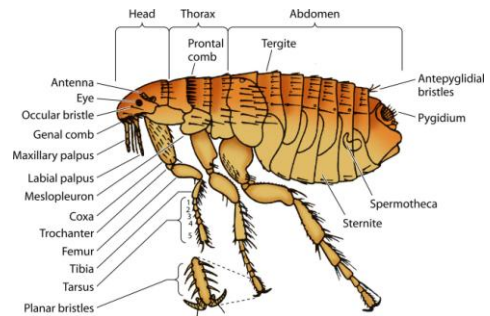


### Control

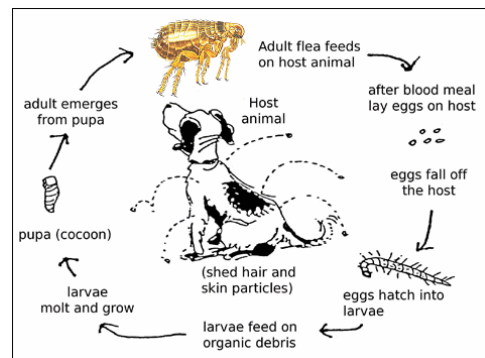
- Like mammals;
- Preparations based on cypermethrin, permethrin;
- We repeat after 14 days;



## Siphonaptera (fleas)



### Life Cycle – complete metamorphosis



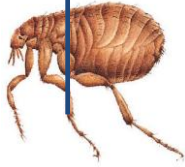
Species	Hosts	Main transmitted pathogens
<i>Ctenocephalides canis</i>	Dogs, humans	Larvae of tape worms <i>Dipylidium</i> and <i>Hymenolepis</i>
<i>Ctenocephalides felis</i>	Cats, humans	Larvae of tape worms – <i>Dipylidium</i> and <i>Hymenolepis</i>
<i>Pulex irritans</i>	Humans, domestic animals	<i>Yersinia pestis</i> , larvae of tape worms
<i>Ceratophyllus gallinae</i>	Chickens, turkeys, humans	Mechanically many pathogens
<i>Echinophaga gallinacea</i>	Chickens, dogs, humans	Bacteria
<i>Leptopyllus segnis</i>	Mice	Mechanically many pathogens
<i>Nosophyllus segnis</i>	Rats, humans	<i>Yersinia pestis</i> , other bacteria, erysipeloid
<i>Spilopsyllus cuniculi</i>	Rabbits, humans	Myxomatosis virus, <i>Francisella tularensis</i>
<i>Xenopsylla cheopis</i>	Rats, rodents, humans	<i>Yersinia pestis</i> , Rickettsiae, larvae of tape worms
<i>Tunga penetrans</i>	Humans, many animals	Penetrate skin



The unfed flea is able to live for **months without a blood meal** but during that time it is aggressively using all its powers to locate a host. Once it finds a host, it will never purposely leave the host.

**Non-allergic animals tolerate fleas and develop minimal clinical signs.**

Homeless & Hungry!  
Need a Hairy Dog



## Flea allergy dermatitis (FAD)

- A repeated flea infestation can sensitise the host to allergens in flea saliva; leading to a **flea allergy dermatitis (FAD)**, the most common skin disease of dogs;
- **Miliary dermatitis in cats;**

- Non-flea allergic animals may have fleas but show no dermatological signs.



## Clinical signs

### Dogs:

#### Non-flea allergic animals:

- May have fleas but show no dermatological signs;
- **anaemia**, mild skin irritation, tape worms, acute moist dermatitis (hot spots).



Anaemia in a puppy with severe flea infestation



Dorsal lichenification and hyperpigmentation with secondary alopecia in the flea allergic dog.



Non-flea allergic puppy with numerous adult fleas.

#### Flea allergic animals:

- Most commonly 3–5 years of age.
- Acutely pruritic crusted papules with erythema, areas of acute moist dermatitis.



Fibropuritic nodules on the dorsum

### Cats:

#### Non-flea allergic animals:

- May have fleas but show no clinical signs.
- May show any one of a range of anaemia, mild skin irritation, tape worms, acute moist dermatitis (hot spots).

#### Flea allergic animals:

- No age incidence.

- Can present with many different clinical signs including the following:

- Papulocrustous reaction especially on the dorsum – **Miliary dermatitis**
- Self-induced symmetrical alopecia on ventrum or flanks.
- Eosinophilic granuloma complex.
- Facial pruritus.



Miliary dermatitis caused by flea allergic dermatitis.



Ventral abdominal alopecia caused by flea allergy.



Indolent ulcer secondary to flea allergic dermatitis.

### Diagnosis

- History and clinical signs.
- Identification of fleas or flea 'dirt'.
- Human lesions pruritic papules usually on lower legs.
- Intradermal allergy or in vitro allergy testing with flea antigens.
- Biopsy reveals signs of a non-specific pattern of superficial to deep usually eosinophil-rich perivascular to interstitial dermatitis.
- Response to strict flea control programme.

### Differential diagnosis

- Allergy especially food, atopy
- Pediculosis
- Cheyletiellosis
- Malassezia dermatitis
- Dermatophytosis
- Superficial pyoderma
- Demodicosis
- Psychogenic alopecia (cat)

## The basic control program has three objectives which consist of:

- **Minimize flea infestation** of all animals in the household;
- **Break the flea life cycle** in the indoor environment and the kennel;
- **Control the allergic reaction** of the flea bite.
- **Reduction of flea infestation** on the pet can be achieved and maintained in two modes, by using mechanical approach and chemical treatment with insecticides.



**Animal:**

- **Topical spot on or spray therapy**
- Examples of adulticides include the following:
- **Sprays** – fipronil.
- **Systemic** – nitenpyram.
- **Spot-on** – fipronil (cat and dog), imidacloprid (cat and dog), metaflumizole (dog), pyriprole (dog), selamectin (cat and dog).



Spot-on application of adulticide to tomcat (Orig. photo A. Kočíšová)

**Anti-inflammatories:**

- **Glucocorticoid** may be given to help control pruritus in the early stages of therapy, but if flea treatment is used as a therapeutic trial this may make interpretation of results difficult:
- **Prednisolone 0.5–1 mg/kg po sid** (dogs) 1–2 mg/kg po sid (cats) for 7– 10 days then tapering to lowest possible alternate day dosage. Only short courses should be required if flea control is rigorous.
- **Methylprednisolone acetate (cat only)** 20 mg/cat or 4 mg/kg sq or im on two occasions 2–3 weeks apart. Prolonged use of this drug should be avoided.
- **Antihistamines** – limited usage.
- **Antibiotics** should be given for secondary pyoderma for 3–4 weeks. If pyoderma is present then glucocorticoids should not be given.