IMPORTANCE OF ANTIPARASITICS AND LACK OF EFFECTIVE DRUGS FOR PARASITIC DISEASES IN ANIMAL HEALTH AND PRODUCTION

OIE LEBANON 7-9 November

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Les maladies parasitaires
Parasitic diseases

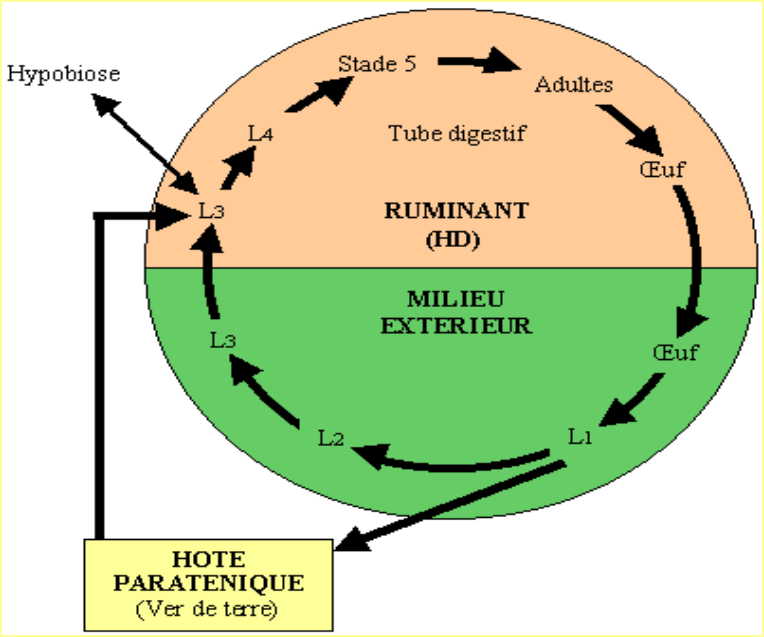
- Identification des maladies parasitaires
- Parasitic diseases identification
- Leur importance sur la santé et la production animale
- Importance for health and animal production
- La prophylaxie médicale et traitements chimiques appliqués
- Medical prophylaxis and applied chemical treatments
- Problèmes liés à l'usage intensif des vermifuges
- Problems related to the intensive use of anthelmintics

Les maladies parasitaires communes aux bovins , ovins , caprins, équidés et porcins
Parasitic diseases common to cattle, sheep, goats, equines and pigs
A- Appareil digestif
A- Digestive apparatus

A.1. La Bunostomose

A1.1. Bunostomosis

Nématodes (Strongylidés)
du genre *Bunostomum B. phlebotomum*
Nematods (Strongyles)
of the genus *Bunostomum B. phlebotomum*
(« hookworm »)
Similaire à celui du genre *Ancylostoma*
***Similar to Genus** Ancylostoma*



Voie orale : peu importante.

Oral route: not important

Voie transcutanée : la plus importante

Transcutaneous way: most important

anémie, anemia

hypoalbuminémie, Hypoalbuminemia

amaigrissement, emaciation

diarrhée éventuelle, possible diarrhea

A.2.La Strongyloïdose

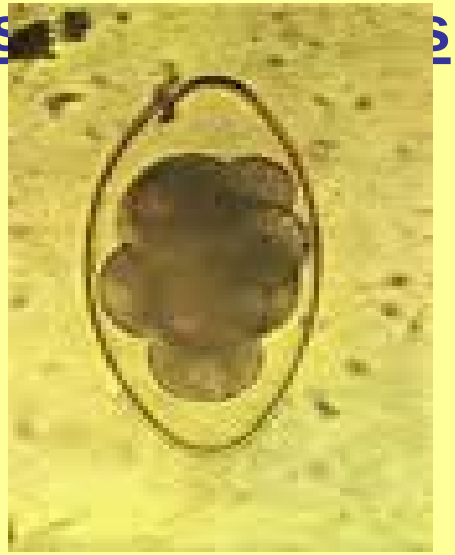
A.2. strongyloidosis

Strongyloïdes papillosus : Nematodes

Strongyloides papillosus
adult

en es lés s
on

Strongyloides papillosus
Immature egg



Strongyloides
papillosus
Mature egg

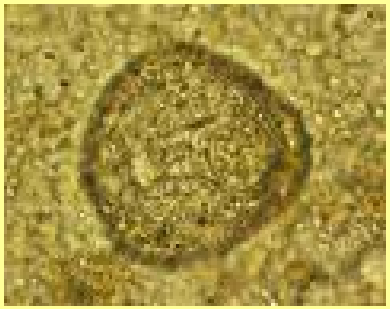
A.3. Monieziosis

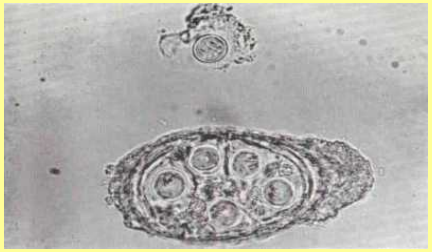
Moniezia (Anoplocephalidae).

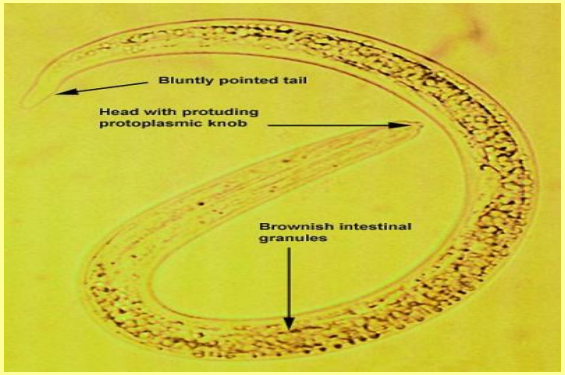
Cestodes very common in the small intestin,3 à 5 mètres .

M. benedeni (especially in cattle) and *M. expansa* especially in small ruminants

cysticercoid larvae: in the Oribatidae, small mites







- Spoliator action: Vitamin B12 deficiency, methionine, calcium
- Mechanical action: obstruction of the digestive tract
- Irritating action: inflammation of the digestive mucosa

A.4. trichuriasis

Trichuris globulosa (cattle) , *T ovis* (sheep). **« Whip Worm »**

Nematode in the large intestine, 5 cm long. bloodsucking

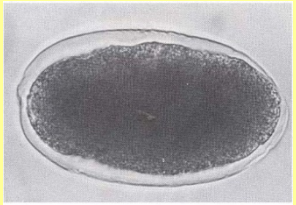
Traumatic and inoculant action of germs

Spoliator and allergenic action

Synergistic effect of other verminosis: trichostrongylosis, ascariasis ....

AT 5. Oesophagostomosis ("Nodular worm")

Infestation with strongyles of the large intestine belonging to the genus Oesophagostomum .
In cattle, it is Oe. radiatum.
1-2 cm thick worm without well developed oral capsule.



- **Severe enteritis** during nodule rupture.
- **Anemia and hypoalbuminemia**
- **diarrhea,**
- **Edema,**
- **emaciation.**

A.6 Gastrointestinal verminosis

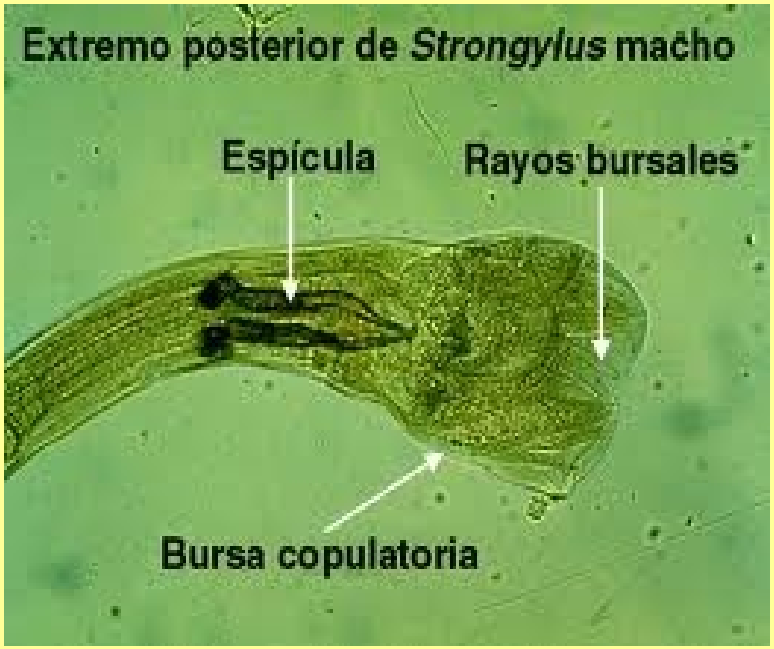
1) Gastrointestinal verminosis of cattle is the main parasitic problem in young cattle with grass

2) They are essentially related to the development in the intestine of **nematodes of the family of Trichostrongylidae.**

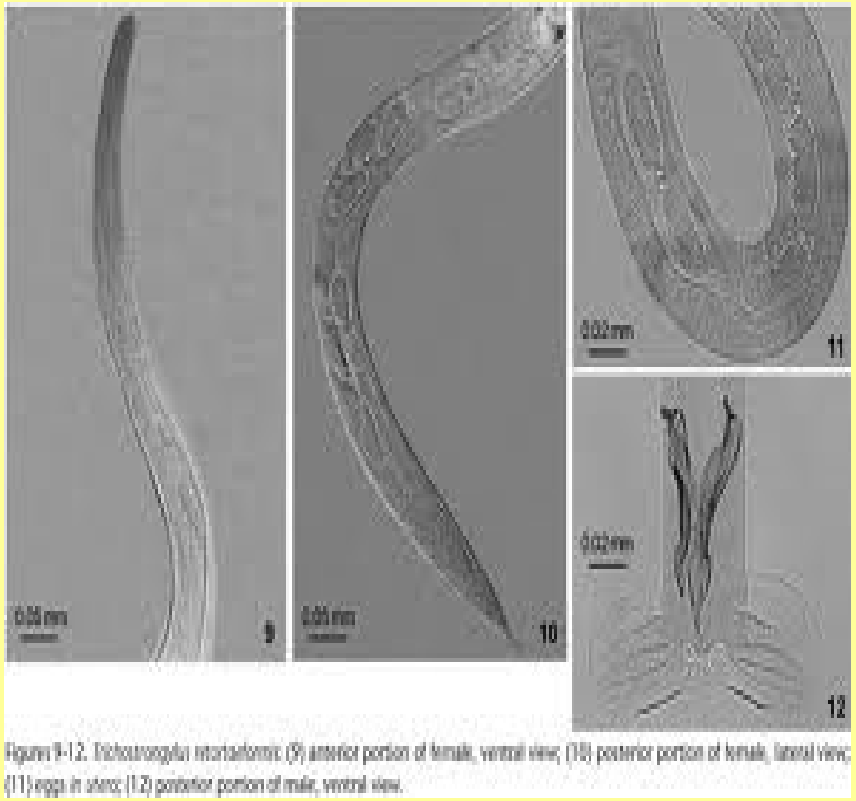
3) They manifest themselves by a syndrome:
weight loss and diarrhea

The family Trichostrongylidae

Nematodes often small (hair-like), with caudal purse, parasites of the digestive tract of ruminants



Trichostrongyloidea; Trichostrongyloidae;



the only exception is **Dictyocaulus viviparus**, the agent of verminous bronchitis that parasitizes the respiratory tract

Dictyocaulus viviparus, the cattle lungworm

Egg of Dictyocaulus viviparus

The main gastrointestinal trichostrongs:

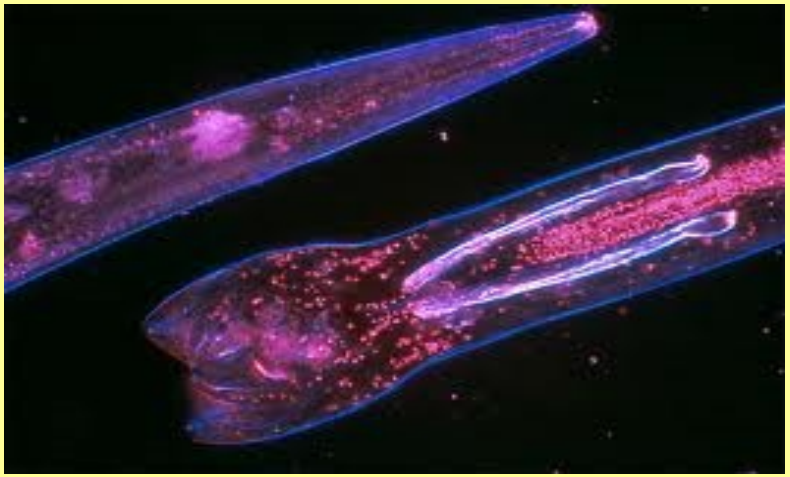
Maw

Ostertagia ostertagi

Ostertagia leptospicularis

Ostertagia lyrata

egg of Ostertagia

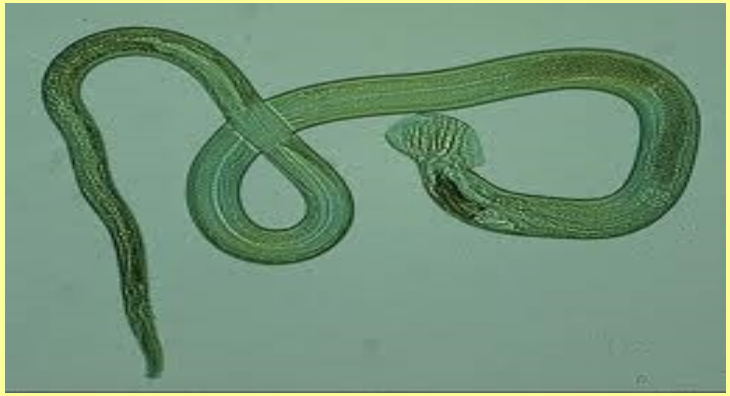


Anterior end of Male **Ostertagia ostertagi** (Roundworm)

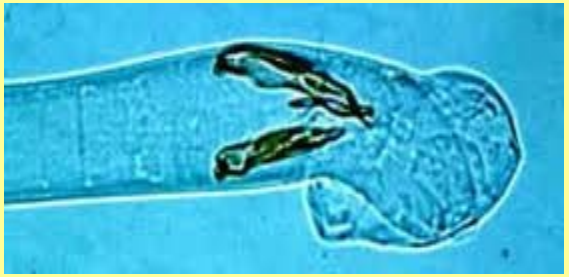
Ostertagia ostertagi

Maw

Trichostrongylus axei

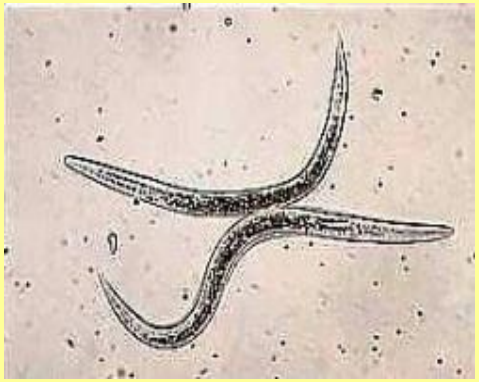


Trichostrongylus axei



Trichostrongylus axei.

Trichostrongylus axei; **Trichostrongylus** colubriformis **...eggs**



Trichostrongylus colubriformis. Females

Small intestine

Nematodirus helvetianus ; *N. battus*

Nematodirus helvetianus (end)

Nematodirus helvetianus egg

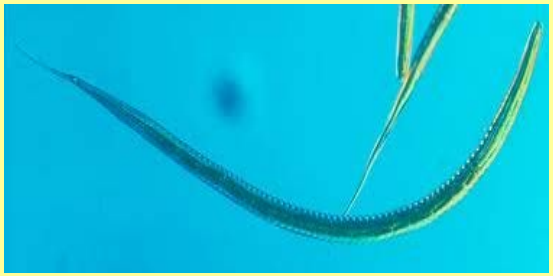
Small intestine

Cooperia oncophora

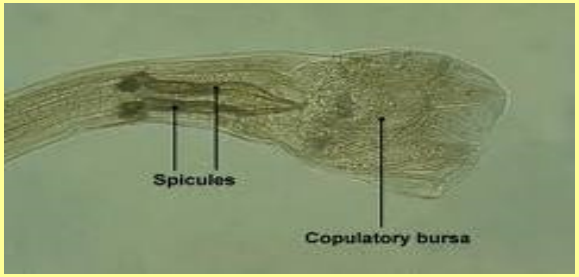
Cooperia punctata

Cooperia pectinata

Cooperia surnabada

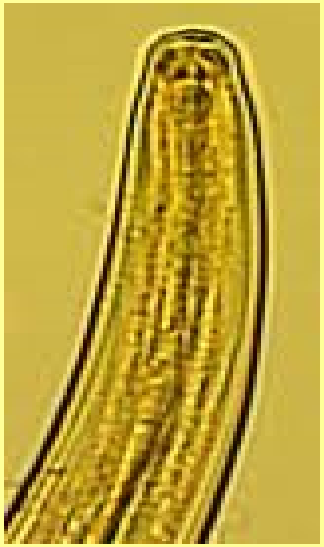


Cooperia oncophora



C. oncophora (end)

Egg of Trichostrongylus colubriformis



C. oncophora (head)

Egg of *Cooperia oncophora*

Pathogenesis and pathology

The main symptoms are:

1. **Fall in productivity**

2. Anorexia

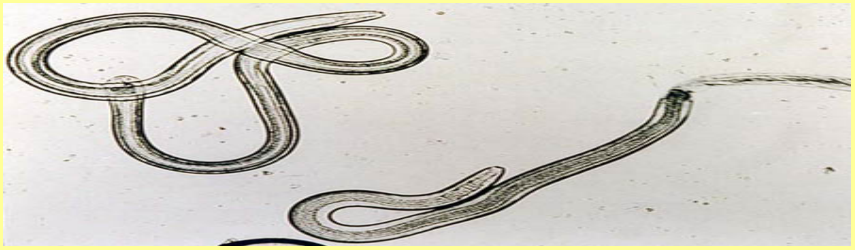
3. Diarrhea

4. Edema

B- Skin

B.1. Onchocerciasis

Nematodes of the family Filariidae (filarial). These are vector-borne diseases.



- Adults: ligamentous and intermuscular fibrous tissues.
  2-6 cm rolled in a fibrous nodule.
- Microfilariae: in the dermis, particularly at the level of the belly (white line); about 200 microns

Clinical signs

Inflammatory reactions of allergic nature in the belly

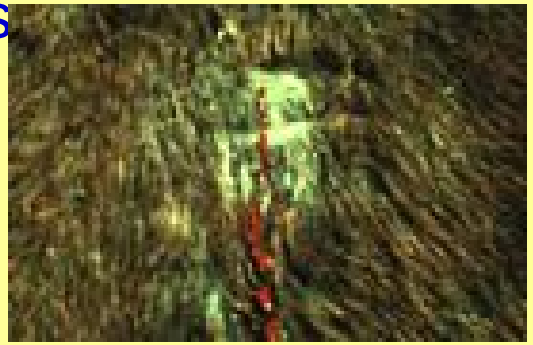
B.2. Parafilariasis

Parafilaria bovicola a primitive wick located in the subcutaneous connective tissue. *vector disease*.

- Embryonic eggs emitted in the skin, cont microfilaria (L1) 200 microns long.

Clinical signs

- Mature females create a den to lay their eggs



- this results in a sero-hemorrhagic exudate which attracts flies

- Preferred location: back and shoulders

B.3. Infestations by hard ticks *Ixodes ricinus*

Ixodes ricinus: tick
exophilic tick with three polytropic hosts

Vector role:

- *Borrelia burgdorferi*: Lyme disease

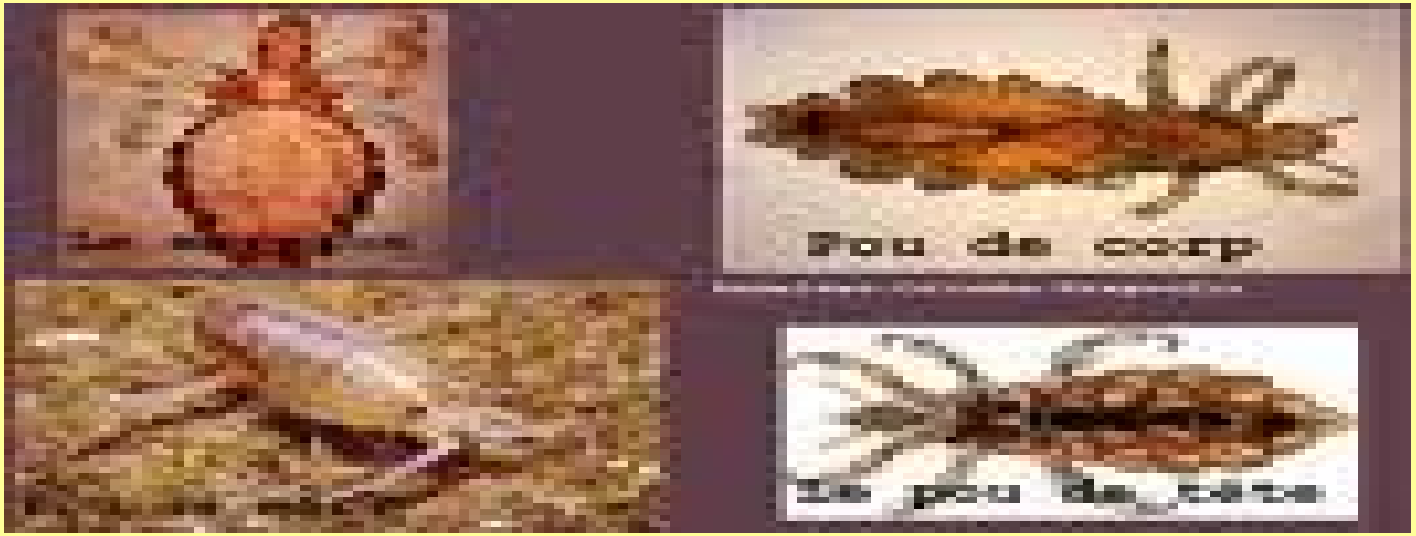
- *E. cytophagophila*: bovine ehrlichiosis

- *Babesia divergens*:

B.4. Infestations by lice

- **Stinging lice**: not very mobile, stuck in the skin, Anemia
  - *Haematopinus eurysternus* ++
  - *Linognathus vituli* +++
  - *Solenopotes capitatus* +

- **Grinding lice**: very mobile, light beige: Pruritus
  - ***Damalinia bovis*** ++++



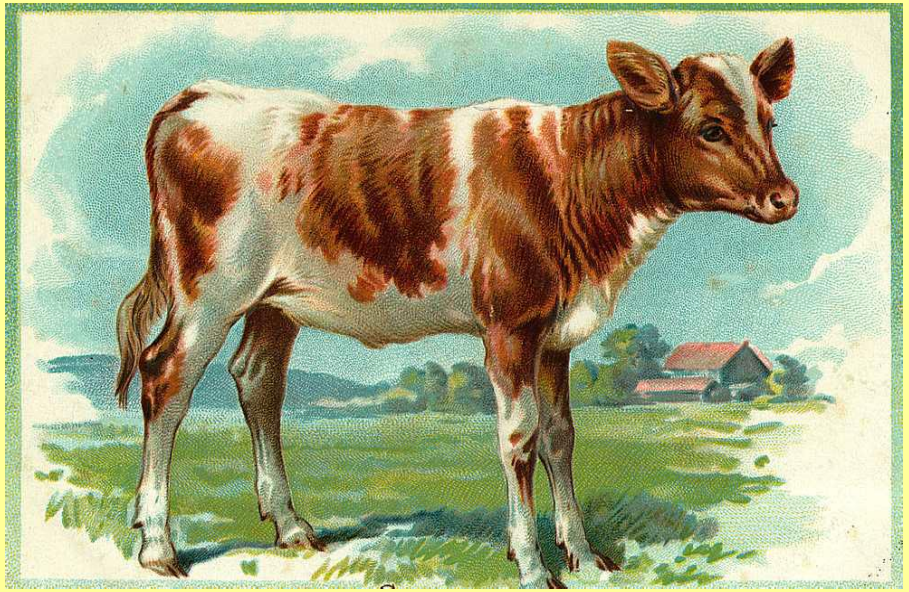
B.5 - Hypodermosis or infestation with warble("ox warbles", "cattle grubs")

The genus *Hypoderma* belongs to the family Oestridae

H. lineatum: migration through the connective tissue and then stay at the peri oesophageal level

H. bovis: Migration via large nerve trunks to the spinal cord to stay near the spinal cord

Clinical Signs and Economic Impact

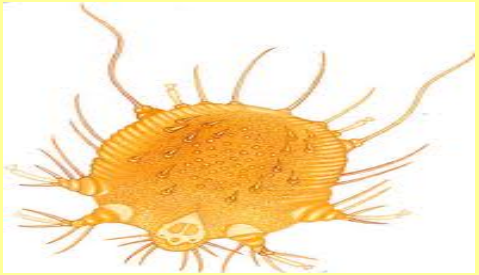


- Loss of leather
- Carcass losses ("butcher jelly")
- Zootechnical losses
- Accidents due to panic ("gadding")
- Side effects related to the massive and late destruction of larvae (1 / 15,000) (paresis: *H. bovis, meteorism / H. lineatum)*

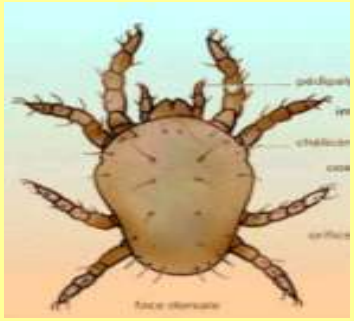
B.6 BOVINE GALES

Contagious skin diseases related to the multiplication of parasitic mites belonging to two distinct families:

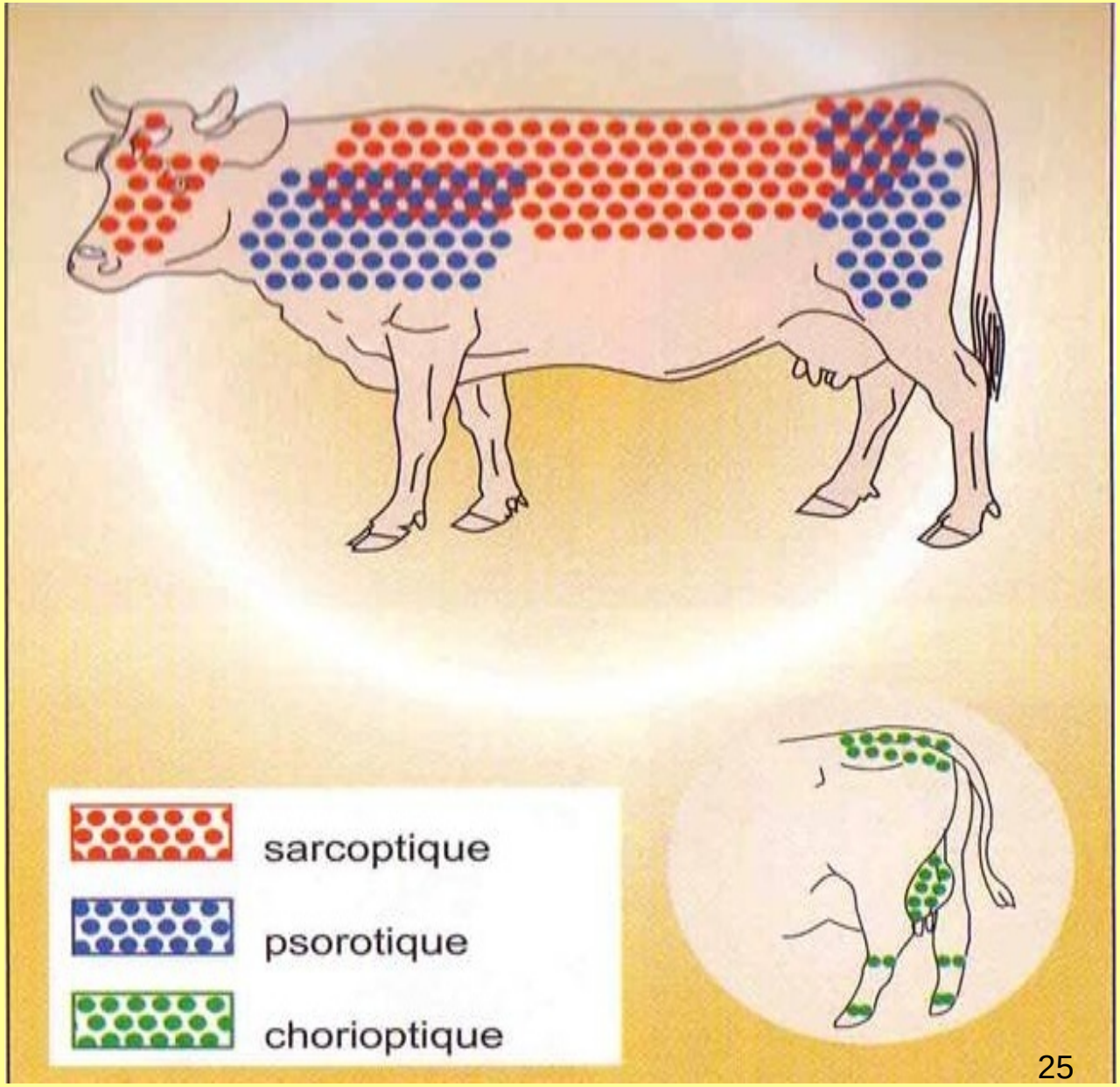
- Sarcoptidae: mites that dig intraepidermal galleries
  - **Genus Sarcoptes**



- Psoroptidae: mites that live on the surface of the skin
  - **Gender *Psoroptes***
  - **Genus *Chorioptes***



Preferential localizations of the three types of scabies in cattle



B.7. Nuisance flies
Muscids

- Permanent annoyance of animals

- Hematophagous action for certain species

- Vector role
- General hygiene of the operation

1- *Musca* Genus

- *Musca domestica*: **(House fly)**
- *Musca automnalis*: **(Face fly**)

Non-hematophagous flies, type licker-sucker

Genus Musca - Pathological Importance

- ***Musca domestica***
  - Bacterial transmission: anthrax, conjunctivitis, mastitis

- ***Musca automnalis***
  - Interference with grazing (annoyance)
  - Transmission of bacteria: Moxarella bovis (infectious keratoconjunctivitis)
  - Transmission of parasites: Thelazia (parasitic nematode of the eye); *Parafilaria bovicola* (cattle parafilariosis)

2- Genus *Hydrotaea*

- Non-haematophagous fly, type licker-sucker

  - *Hydrotaea irritans* is a common species

Pathological significance- *Hydrotaea irritans*

- **Irritating action at the level of wounds**: at the base of the horns in the concerned breeds of sheep (during the rut)

- Main vector of summer mastitis
  (Steptococcus dysgalactiae),
  (Corynebacterium pyogenes.

3- Stomoxis genus (stable fly)

- **hematophagous**,

Pathological significance

- **Painful sting** with strong animal irritation and significant drop in production (especially in milk)

- **Transmission of protozoa**: different trypanosomes in tropical regions.

Stomoxis

4- *Haematobia* genus (horn fly)

- Small fly (4mm) hematophage; very common on pasture.
- Haematobia irritans

Pathological significance:

- Very strong irritative action and loss of productivity.

The horn fly, **Haematobia**

5- Other genera: - *Tabanus* (horseflies) and *Simulium*

- ***Tabanus* (horseflies):**

. big hematophagous insects,

. **Very painful sting.**

- ***Simulium:***

. insects of fast streams; multiplication in aquatic environment.

. **Hemolytic shock due to saliva.**

. **Vector of different helminthes** (nematodes of Filarid family (filarial) (Onchocerciasis).

B.8. Tinea or bovine dermatophytosis

Trichophyton verrucosum Skin condition very common especially in winter.

Zoonotic aspect

Contagious to humans

Inflammatory lesion type kerion very inflammatory

Especially on the face (beard), scalp, forearm

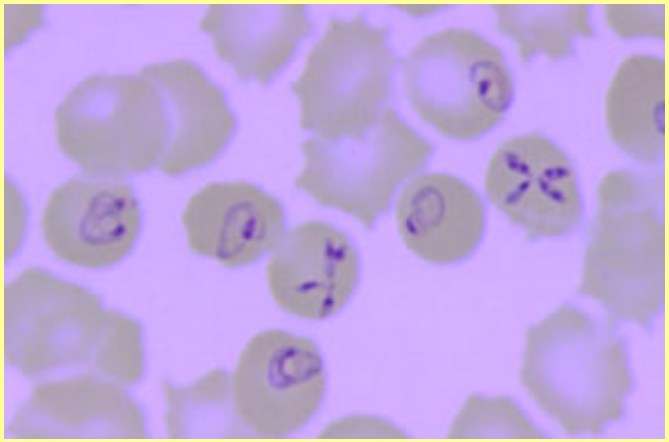
Long and difficult treatment

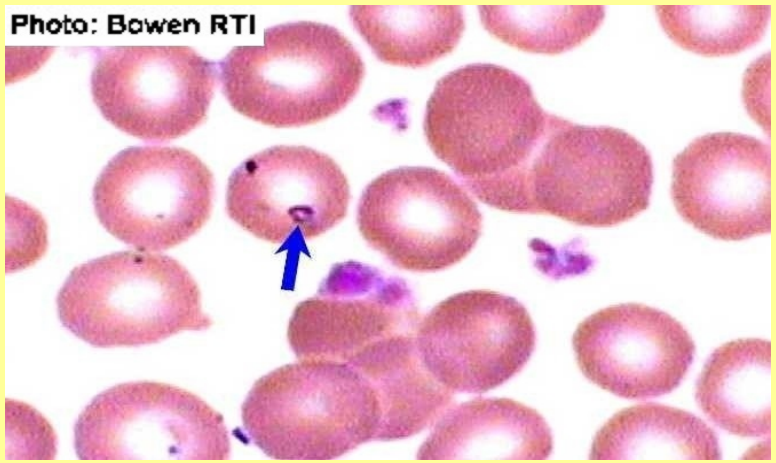
C- Blood

C.1. Babesiosis (*Babesia divergens*)

Piroplasmosis: *Babesia divergens* and *Babesia major*.

parasites of red blood cells, responsible for a hemolytic and febrile syndrome.



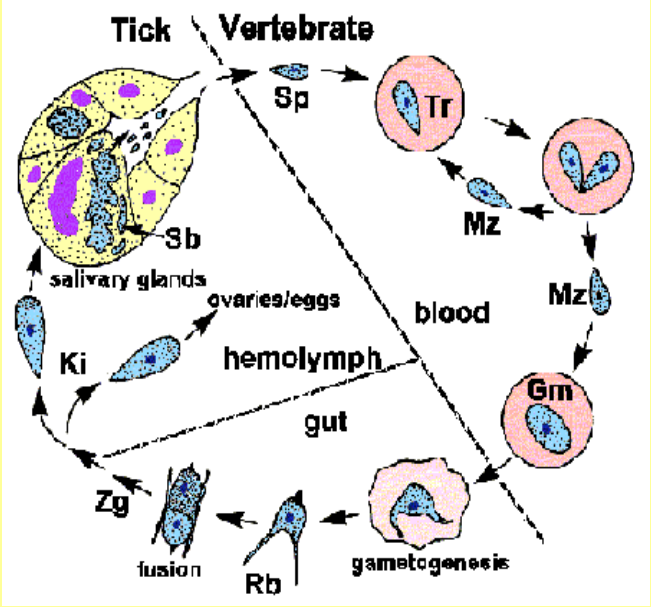


Vector disease with compulsory intervention of a hard tick, ***Ixodes ricinus***.

Transstadial and transovarian transmission

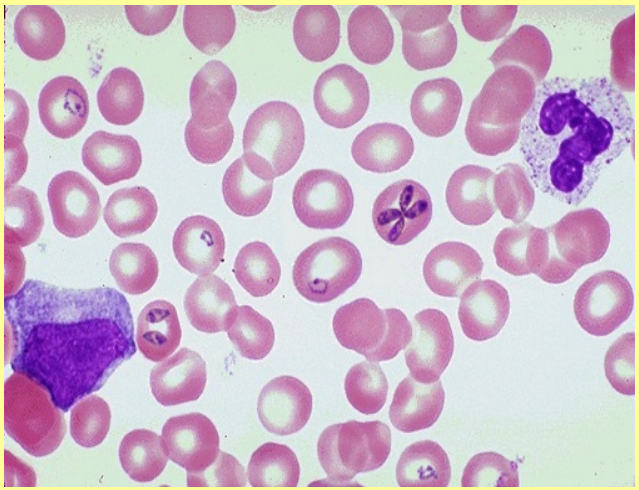
Pathogenesis: it is linked to the destruction of red blood cells.

- Hypoglobulia, hypoxia and acidosis
- variable hemoglobinemia, liver damage, jaundice
- Hemoglobinuria



Lesions

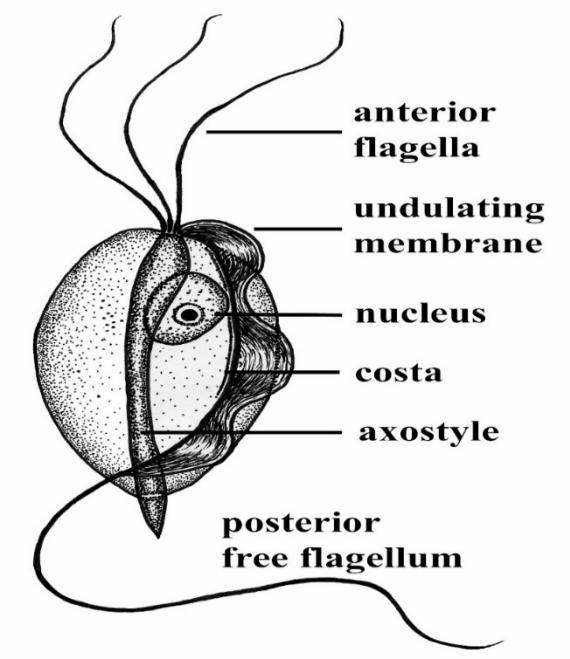
- jaundice
- Anemia; clear blood and yellowish serum
- Diffuse haemorrhage
- Hepato and splenomegaly
- Renal and hepatic impairment
- Hemoglobinuria



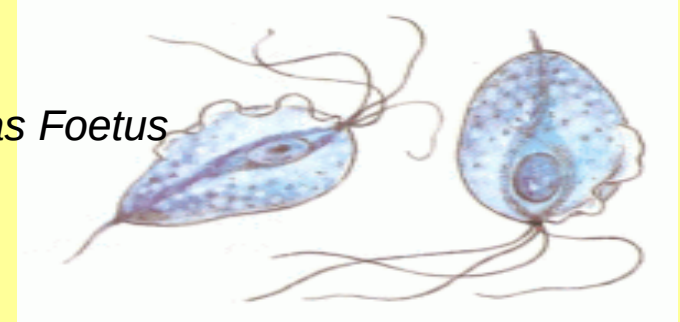
D- Genital system

D.1. Trichomoniasis *(Tritrichomonas foetus)*

No cystic stage; about 20 microns



Tritrichomonas Foetus



Pathogenesis and clinical signs

- **Bull**: often asymptomatic

(sometimes mucous discharge)

- **Cow**: abortion,
  sometimes followed by placental retention, persistence of the corpus luteum (anoestrus), pyometra

D.2. NEOSPOROSIS

Neospora caninum

a transplacental passage is then suspected.

The organism is antigenically different from *T.gondii*.

a major abortion agent

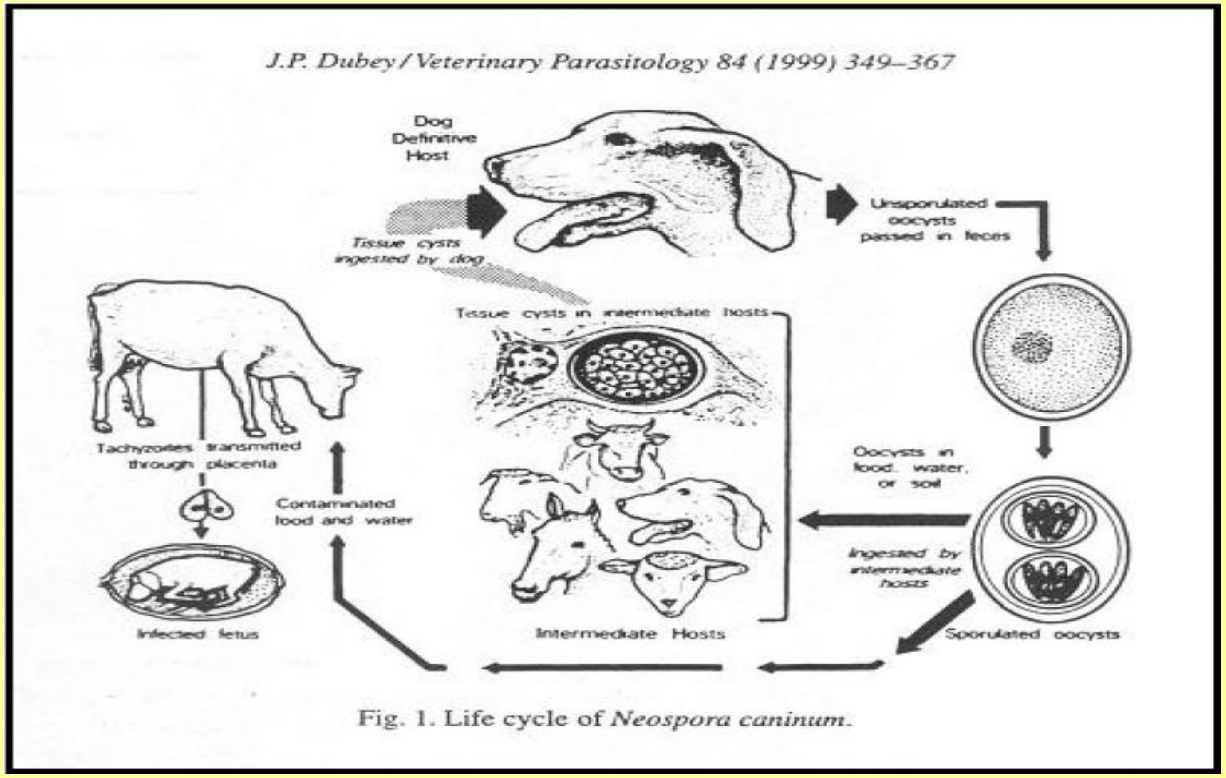


Fig. 1. Life cycle of *Neospora caninum*.

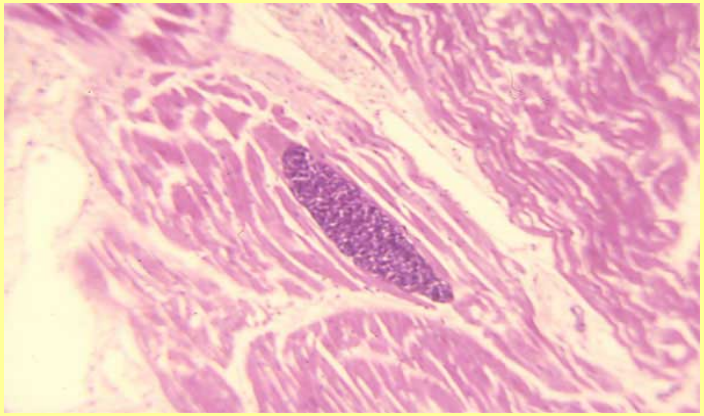
E- Muscles

•E.1. Sarcosporidioses

- Parasitic infections of vascular endothelial cells and striated muscle tissue.
- **Sarcosporidiosis affects intermediate hosts:**

  oedemas, petechiae, ganglionic hypertrophies, abortion.
- **The definitive hosts are affected by digestive coccidiosis.**

  Missing clinical signs.

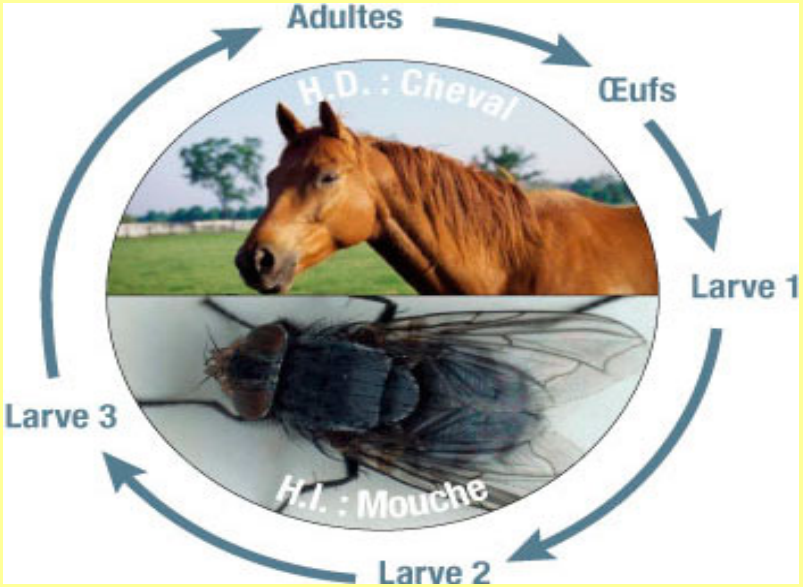


- Striated muscle formations are an economic problem; partial or total seizure of the carcass

F- Eye

Thelaziosis

infestation of the ocular apparatus by a nematode of the family Spiruridae (Thelazia gulosa).



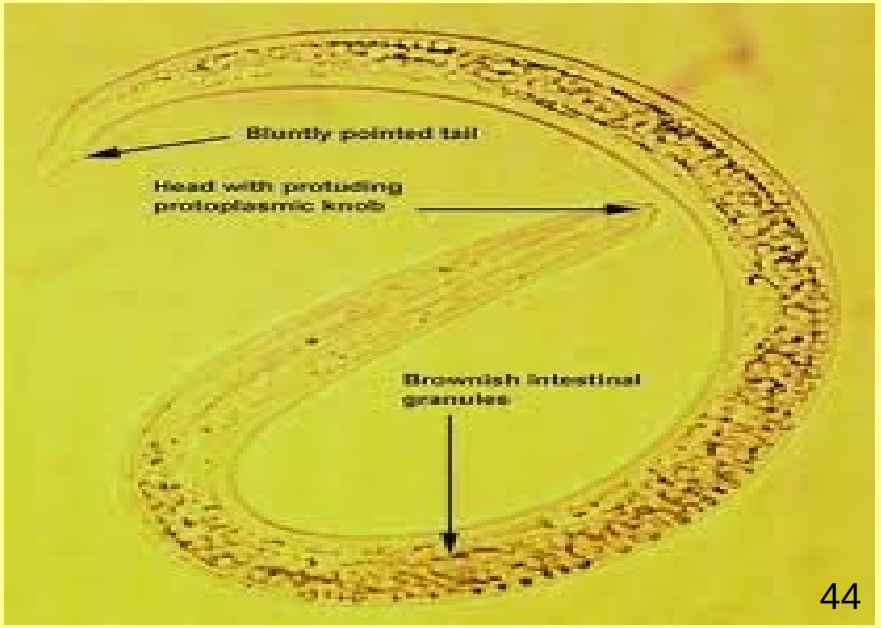
Musca

A consequence of keratitis

G -Lungs

VERMINOUS BRONCHITIS *Dictyocaulus viviparus*, the agent of verminous bronchitis that parasitizes the respiratory tract

Egg Dictyocaulus viviparous



Dictyocaulus viviparus the cattle lungworm

H. Trematode Parasitosis - Liver & Intestines

I- Fasciolosis (*Fasciola hepatica*)

Genus *Fasciola* : ***Fasciola hepatica*** (temperate regions)

Fasciola gigantica (tropical regions)

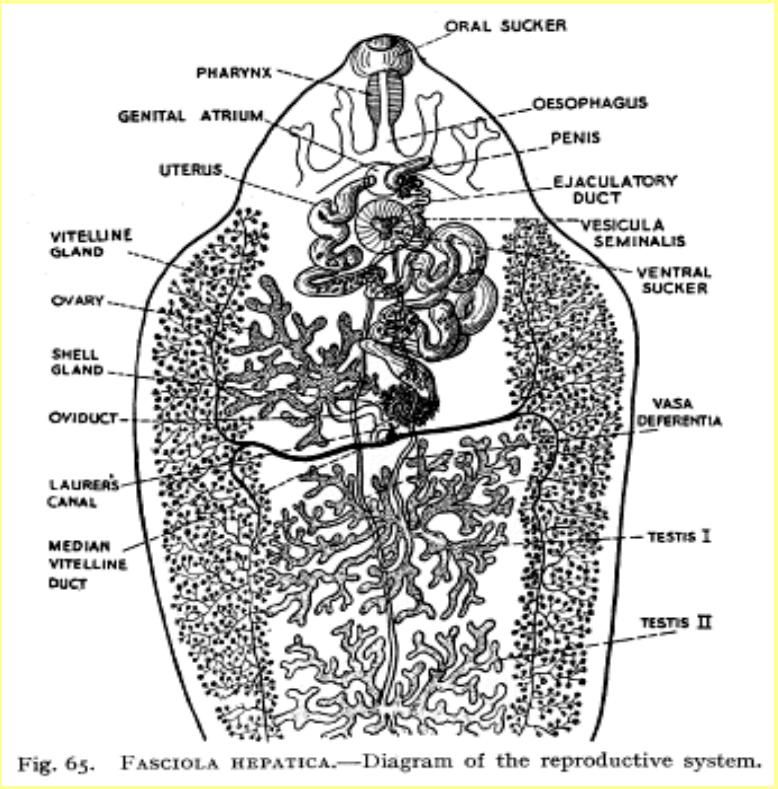
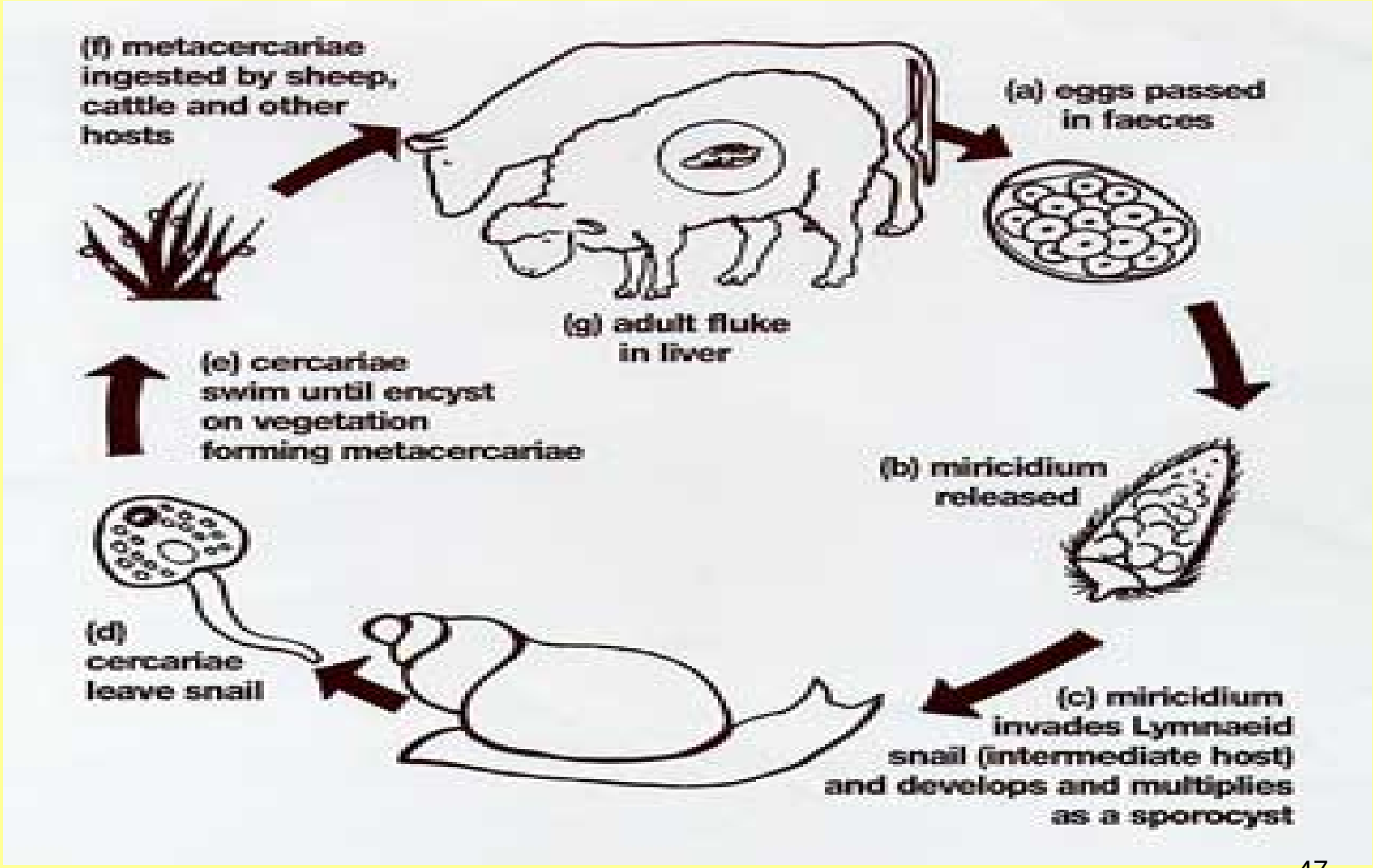


Fig. 65. FASCIOLA HEPATICA.—Diagram of the reproductive system.

Life Cycle of *Fasciola Hepatica*



Pathogenesis and pathology

Linked to the two phases of the endogenous cycle

A- INTRAHEPATIC MIGRATION

- Potential peritonitis during massive infestations

- HEMORRHAGIC and NECROSANT HEPATITIS, possibly accompanied by ANEMIA (well tolerated in cattle, often fatal in sheep)

B- STAY OF THE DOUVES ADULTS IN THE BILIARY CHANNELS

Hyperplastic ANGIOCHOLITIS

FIBROSE monolobular (fibrous tissue that joins together the centrilobular veins

ANEMIA and HYPOALBUMINEMIA

Clinical signs

Decrease in productivity

- Decreased **weight gain** in growing animals
- Decrease in **milk production** (insidious but very marked effect)
- Decreased **Fertility** (interference with the production of steroids active on the uterus or with that prostaglandins)

Other clinical signs: they are related to the parasite load

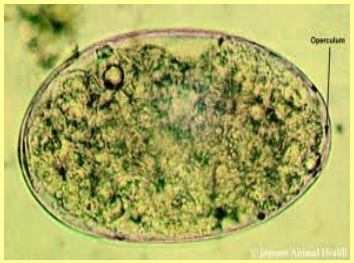
Acute phase:

- Especially marked in small ruminants
- Linked to hepatic migration
- Anorexia, abdominal distension, difficulty moving, sometimes **sudden death**

II. The genus Paramphistomum and paramphistomosis

Definition: Paramphistomum daubneyi

Paramphistomes are mainly trematode parasites of stomachs (rumen and network) of ruminants

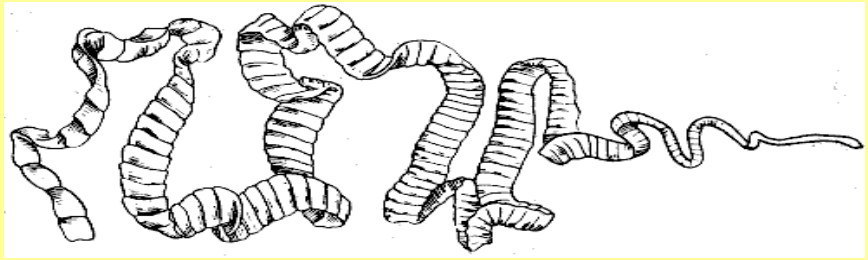


Parasitic diseases specific to Small Ruminants

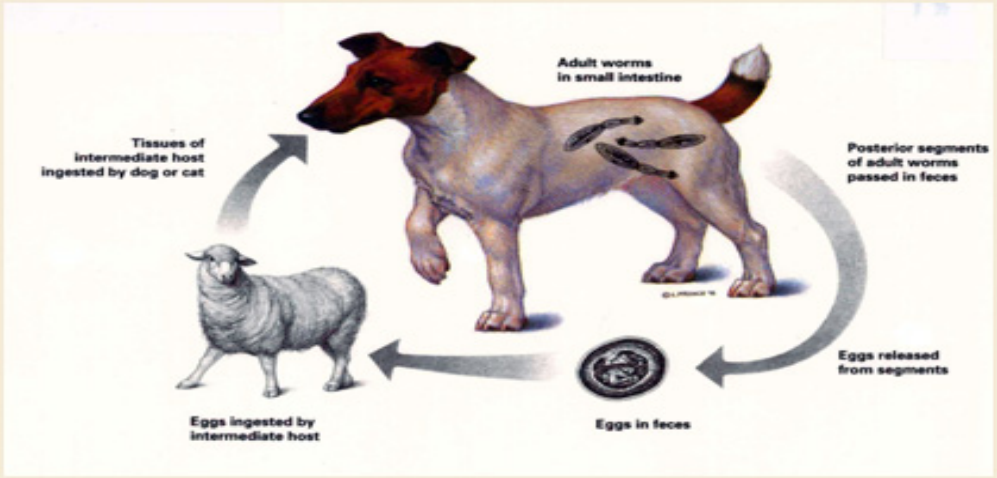
A- Digestive system

A.1 Cysticercosis with *Cysticercus tenuicollis*

Development at the posterior surface of the liver and the epiplon of caterpillars of cestode*Taenia hydatigena*



Large parasite (5 meters) of the dog's small intestine.

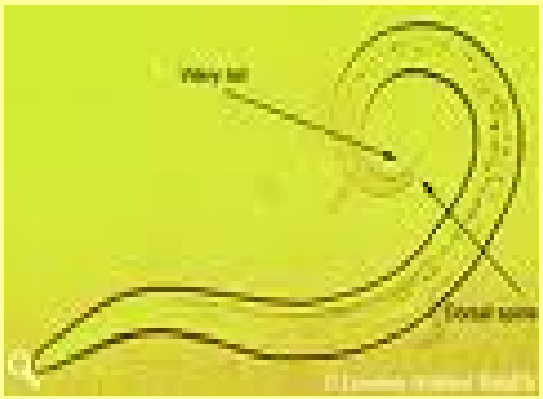


B- Cardio-Respiratory System

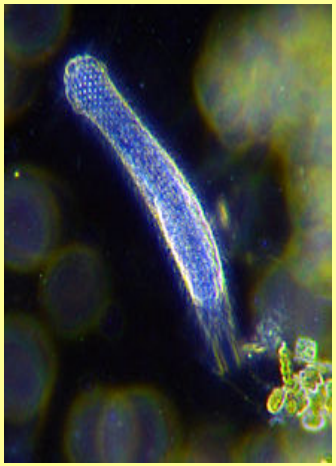
B.1. The Muelleriose and neighboring entities

Infestation of the respiratory system (lungs, bronchioles) by different species of nematodes of the family Metastrongylidae

Muellerius capillaris	+++	alveoli	snails, slugs
Protostrongylus sp	+	small bronchioles	snails (many sp)



Muellerius capillaris



Protostrongylus sp

Other minor genera : *Neostrongylus*, *Cystocaulus*, *Spiculocaulus*.

B.2. The oestrose

Infestation of sheep and goats by Oestrus ovis, a dipteran of the family Oestridae ..

➔ The larva develops in **the nasal cavities and frontal sinuses** of the host.

C- Skin

Infestation with *Melophagus ovinus* (false sheep lice).

Clinical signs

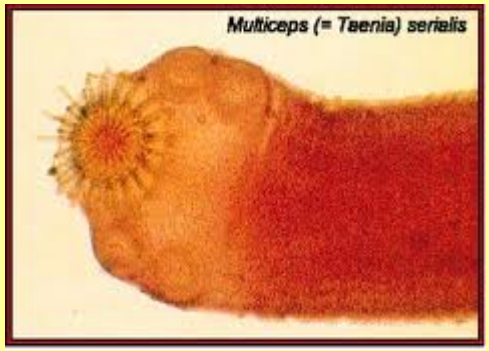
pruritus and loss of wool; possible anemia in the lamb.
Can sting humans

.

Melophagus ovinus

D- The nervous system

D.1. Coenurosis



Infestation of sheep and goats by the **larva of *Taenia multiceps* *(Coenurus cerebralis),*** a dog tapeworm and wild canids.

Clinical signs

Cyst in the brain or spinal cord after **about 8 months of infestation**.

progressive compression of the nervous system: paresis, movements in circles (tournis), abnormal posture, hyperesthesia.

There is no treatment except surgical in some cases.

D.2.Myiases due to *Lucilia serricata* and related species *(Calliphora, Phormia)*

Very frequent species; **the maggots are found only at the level of the previously injured encysted zones**

* either by trauma (bites, barbed wire ...)

* or as a result of local macerations:

➔ importance of contributing factors

. fleece not mown,

. diarrhea,

. rain and heat,

. racial factors,

. dermatophilosis

. "Fleece rot" by *Pseudomonas aeruginosa* ....

Parasitic diseases of birds

A- Digestive system

I. Cestodoses of the digestive tract

These cestodes belong to the family Davaineidae. The larva is a cysticercoid.

Davainea proglottina, pathogen of chicken and pigeon.

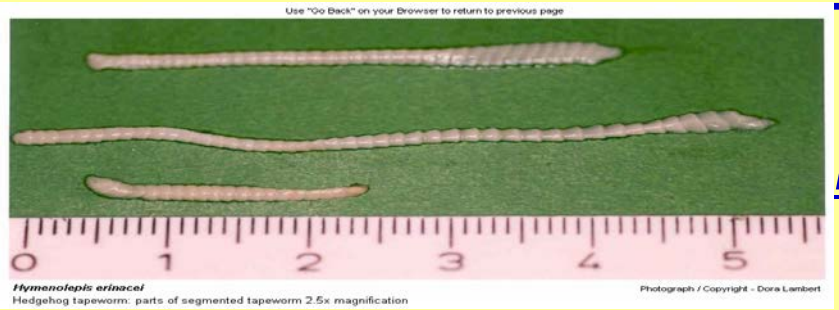
The larva develops in slugs and snails.

It is a cestode of 4 mm.

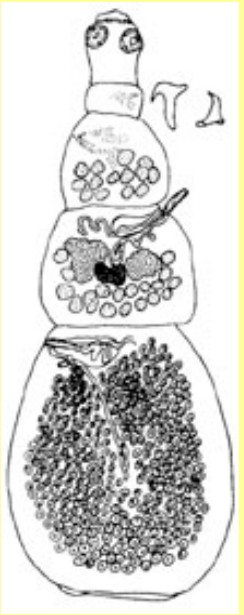
Infestations give **haemorrhagic enteritis**.

Raillietina spp.

The larva is formed in a **beetle or an ant**.



Raillietina spp



Prophylaxis is based on the destruction of vectors.

II. Coccidiosis of the hen

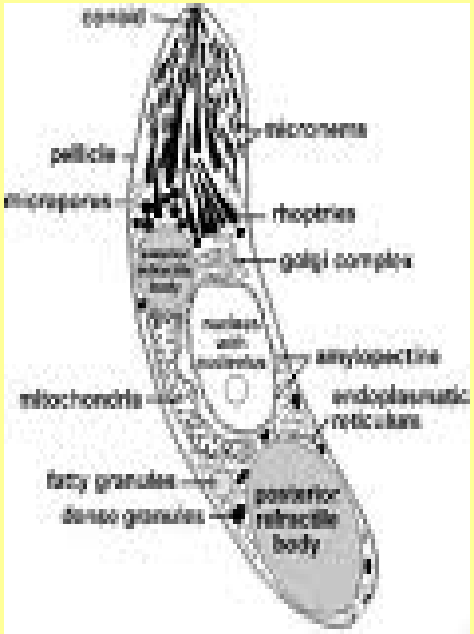
Cosmopolitan parasites: major economic effect

9 species described:

E. tenella; E. necatrix; E. brunetti; E. acervulina; E. praecox; E. maxima; E. mitis; E. mivati; E. hagani

Some species are very pathogenic,

We distinguish: intestinal coccidiosis
caecal coccidiosis



E. tenella

III. Avian trichomoniasis

Flagellated parasites of the digestive tract

hosts

Essentially the domestic pigeon and other colombiformes; turkeys and hens are often asymptomatic carriers

Mouth, pharynx, esophagus, crop; most of adult pigeons are carrier

Clinical signs

High mortality. Diarrhea, respiratory disorders (sinusitis)

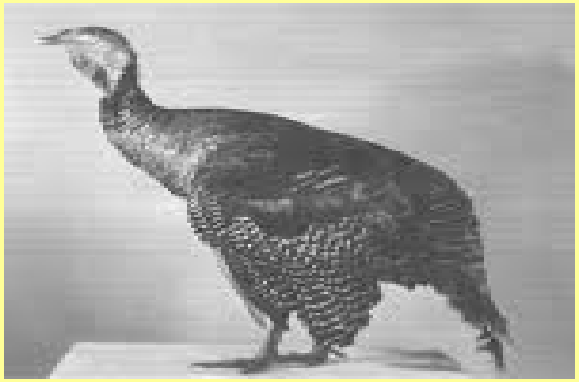
IV. histomoniasis

Histomonas meleagridis is the only species described in this genus

It parasitizes the cecums and the liver of the gallinaceous (hen, pheasants, turkeys)

Agent of **black head disease** in turkeys;

H. meleagridis does not form cysts in the external environment

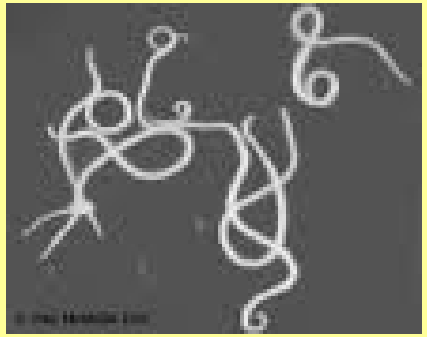


V. Ascariasis

The genus *Ascaridia* is common in poultry; this genus does not migrate outside the small intestine where it stays

Ascaridia galli: hen, turkey, duck and goose

Ascaridia columbae: pigeon

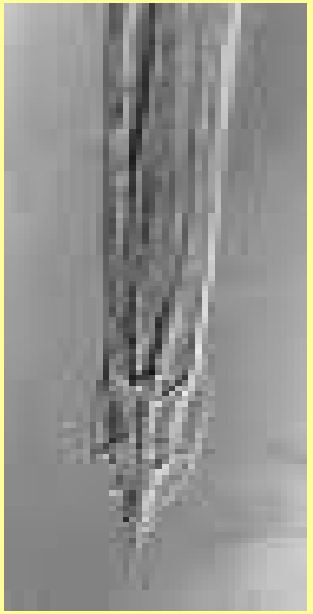


VI- Heteracidosis

Very frequent parasites of domestic and wild birds

- ***H. gallinarum*** in hen and turkey;
- ***H. isolonche*** at the pheasant

- Location in the caecums; ovoid egg close to that
  Of Ascaridia



VII. The capillariasis

There are numerous species of the genus *Capillaria*.

They are very fine worms invisible to the naked eye

- ***C. obsignata***: small intestine of hen, turkey, pigeon
- ***C. caudinflata***: small intestine of hen and turkey; the cycle requires a worm
- ***C. contorta***: parasite of the esophagus and hen, turkey, duck and wild birds. The cycle requires an earthworm

C. caudinflata

B- Skin

B.1. Infestations by *Dermanyssus* and *Ornithonyssus*

Dermanysses and related species are strictly ***hematophagous*** mites of poultry.

Dermanyssus gallinae: wild and domestic birds; cosmopolitan

Ornithonyssus sylviarum: in temperate regions only

Dermanyssus gallinae

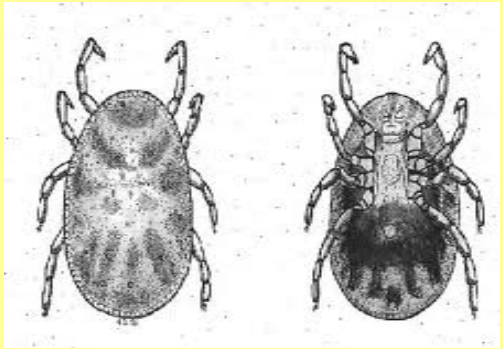
Irritation, nervousness, severe anemia; can attack the man, the horse, the dog ...

B.2. Infestations by soft ticks

Argas persicus and *Argas reflexus* are soft ticks that live in crevices at the walls.

These ticks feed on blood once a month.

They induce anemia and can transmit certain pathogens (*Borrelia anserina* - chicken spirochetosis) and *Aegyptianella pullorum* (a rickettsiosis).



Argas persicus

Irritation, mechanical lesions, mutilation, loss of appetite

.

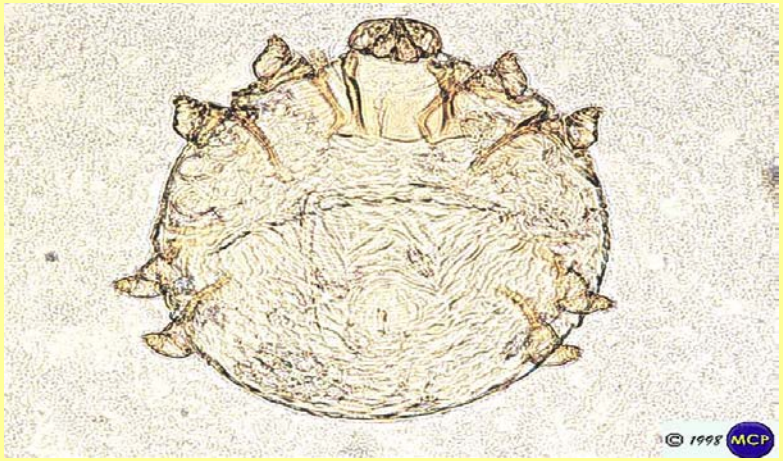
B.3 Scabies

- Paws Scabies: lifting of scales, formation of thick crusts, deformation of limbs, possible lameness.

- Body Scabies : pruritus, wrenching of feathers, possible mortality.

- Scabies of the bill and paws (in aviary birds): formation of crusts in the beak, head, eyelids, paws, rump.

- Morphology: classic sarcoptid



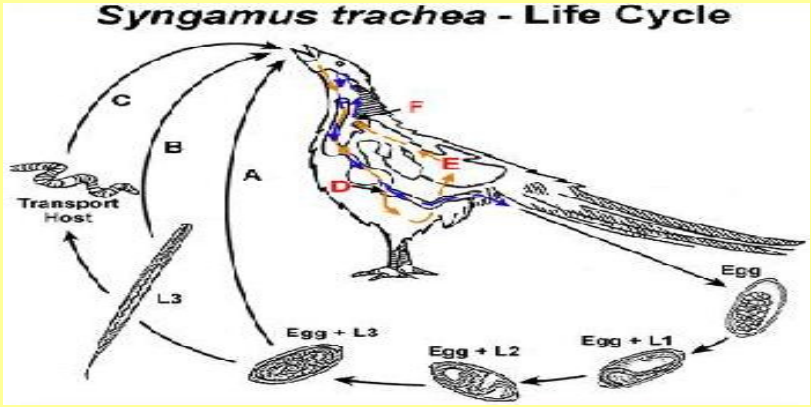
The scabies of birds are due to the genus *Cnemidocoptes (Sarcoptidae)*

C. mutans		gallinae	Leg scabies
C. laevis		gallinae, pigeon, Finches, parakeets	plucking mange
C. pilae		wavy parakeet, other psittacine, canary	Scabies of beak and paws

C. Respiratory System

Syngasmosis

Syngamus trachealis is a strongle of the respiratory system. It has a worldwide distribution



Hemorrhagic tracheitis

- Hypersecretion of mucus with suffocation and eventual mortality
- Pneumonia in case of very heavy infestations

suffocation, sneezing, shaking of the head, open beak after excitement of the animal ("gape worm" "gasping disease")

Specific parasitic diseases of Equidae

A- Digestive system

A.1. The pinworm

Pinworms (Nematodes) parasitize the colon, the cecum and the rectum.

They have a direct cycle. ("Pin worm")

Oxyurus equi is a frequent and low pathogen parasite of horses and donkeys

.

A.2. Habronemiasis and draschiosis

The genera *Habronema* and *Draschia* belong to the family Spiruridae: nematodes whose cycle is indirect with an arthropod like H.I.

Habronema: low pathogenic parasite in the adult state of the equine stomach (*H. muscae, H. microstoma*)

Draschia: causes the formation of large fibrous nodules in the stomach *(D. megastoma)*

H.I. are flies of the family Muscidae.

Agents responsible for cutaneous habronemiasis or summer sores

Habronema

Draschia

A3. Anoplocephalosis of the horse

Anoplocephala

- *Anoplocephala magna*: about 20 cm; small intestine; quite rare
- *A. perfoliate*: 4-8 cm; ileum-caecal valve; very common
- *Paranoplocephala mamilana*: 2-3 cm; large intestine ; rare

Grazing infestation: ingestion of H.I. (Oribatidae)
High frequency associated with certain grasslands (moisture, richness of mosses)

Anoplocephala magna

A. perfoliata

Parasitic diseases specific to pigs and rabbits

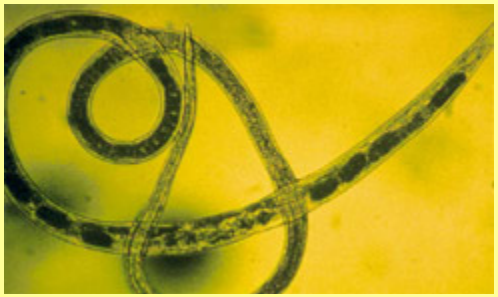
Pigs parasitic diseases

A- Digestive system

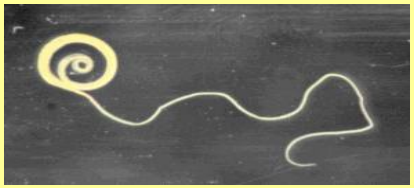
A.1. Fasciolosis

Infestations by *Fasciola hepatica* are in the pig pasture.

A.2. Strongyloidosis:



S. ransomi is reported in pigs;
Parasites of the small intestine (mucous and submucosa), blood-sucking
General signs, cutaneous and digestive



A3. Trichuriosis:

T. suis is quite common; "Whip Worm".
Traumatic action, spoliator, allergenic and inoculatrice

B- Cardio-respiratory apparatus

B.1. Metastrongyloidoidea

infestation with *Metastrongylus elongatus* and *M. pudendotectus*.
These parasites have a worldwide distribution.

green whitish, fine, measuring up to **6 cm**.

They are found in the **fine bronchial divisions**.

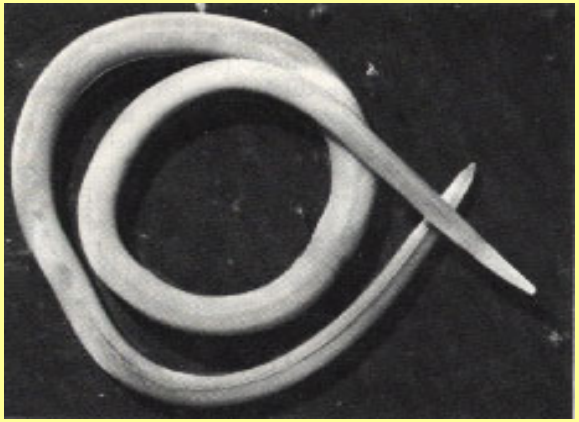
The egg has a very thick and rough wall and contains a larva on the emission

Metastrongylus elongatus

B.2. Ascariasis

Ascaris suum is a very common parasite of pork all over the world

Large whitish worm that can reach **40 cm**;
located in the anterior part of the small intestine
The egg is brownish, rounded and its hull is strongly mammillated



Parasitic diseases of the rabbit

1- Coccidiosis

9 species of coccidia are described *in rabbits*; very frequent affections including in industrial breeding

Eimeria stiedae: **liver coccidiosis**

Eimeria intestinalis, E. flavescens*; E. coecicola; E. magna; E. irrsidua; E. media; E. perforans; E. pisiformis:* *intestinal coccidiosis*

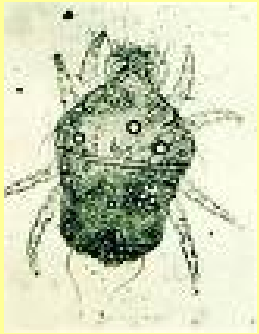
Diseases of young rabbits especially at weaning

E. intestinalis

2- Cheyletiellosis

Cheyletiella parasitivorax is a **pseudo-scab agent in rabbits**

It is a small mite of the coat that wins the skin to feed.
2 weeks cycle
Very contagious disease that is especially evident on the dorsal line ("walking dandruffs"). Pruritus variable according to individuals



Medical prophylaxis and chemical treatments

Treatment of intestinal parasitic diseases:

- Bunostomosis
- Strongyloidosis
- Monieziosis
- Trichuriasis
- Oesophagostomiasis
- Gastrointestinal verminosis: Trichostrongyloides
  - Ostertagia,
  - Cooperia,
  - Trichostrongylus,
  - Nematodirus,
  - Dictyocolus viviparus

1- **Benzimidazoles**: Albendazole (Valbazen) 20 mg / kg

Oxfendazole (Synanthic) 5mg / kg

Fenbendazole (Panacur) 5 mg / kg

Mebendazole (Ovitelmin) 5 mg / kg

Netobimin (Hapadex) 20 mg / kg

Praziquantel (Droncit) 2.5 mg / kg

Niclosamide (Yomesan) 50 mg / kg

Newer products: **Probenzimidazoles**

- 2- **Avermectins and milbemycins**, Fermentation products of:

  Streptomyces avermitilis

  - ivermectin
  - abamectin
  - doramectin
  - eprinomectin

  Streptomyces cyanogriseus

  - moxidectin

Toxicity:

Ivermectin and doramectin: very safe for use in cattle

Abamectin: toxic in young animals (<16 weeks)

4- **Levamisole** (to avoid toxic in horses)

5- **Pyrantel / Morantel**) Similar to Levamisole, low toxicity

.

Onchocerciasis treatment: avermectins

Parafilariasis treatment

- **Ivermectin** (one dose)

- **Nitroxynil** (2 x 3 days apart), inactive on immature forms.

- **Levamisole** (one dose) (lactating cattle); inactive on immature forms.

Treatment against scabies

1- ORGANOCHLORINES

- Neurotoxic poisons
- Strong accumulation in fat, high stability
- All are now strictly prohibited
- Ex: lindane

2- ORGANO-PHOSPHORES

- Acetyl cholinesterase inhibitors
- Fat-soluble products that act quickly by contact
- Relatively slow-moving products that are eliminated fairly quickly (short waiting times)
- Some act systemically after transcutaneous resorption
- Ex: Phoxim (Sarnacuran)

3- THE AMIDINES

- One molecule commonly used: amitraz (Taktic)
- This molecule is essentially acaricide
- Liposoluble; rapidly degraded, it accumulates little in the tissues
- Waiting time of 1 day for milk and 14 days for meat

4- PYRETHRINOIDES

- Synthetic products derived from pyrethrin
- Neurotoxic for arthropods; act quickly by contact
- Do not pass the skin barrier ➔ no systemic effect
- Often associated with piperonyl butoxide (synergistic agent)
- Rapidly metabolized, they accumulate little in the body; low or no waiting time. Ex: flumethrin (Bayticol)

5- THE AVERMECTINS AND MILBEMYCINS

Streptomyces avermitilis:

Ivermectin: Ivomec, Ivomec F, Ecomectin, Noromectin, Abamectin (Enzec - withdrawn), Doramectin: Dectomax

Streptomyces cyanofriscosa: Moxidectin: Cydectin

- **Tick control**

- **Bayticol (flumethrin)** at 1 mg / kg in Pour-on gives a protection of 15 days.

- **Amitraz (Taktic)** is toxic in horses

- **Ivomec** Pour-on is usable against D. equi.

- **Avermectins** in oral form (Equest, Eqvalan) are active on biting lice.

  the products to be sprayed are inactive on the nits: it is therefore necessary to repeat the treatments

Treatment and prophylaxis of lice

- **Amitraz: Taktic and Phoxim (Sarnacuran)**

- **Pyrethroids**

- **Injectable Ivermectin** and other endectocides very active on biting lice but not very active on *Damalinia bovis*.

- Against Damalinia bovis, use the formulations pour-on

Name	Active ingredient	Posology
Coopertix	cyhalothrin	10 ml
Butox Pour-on	deltamethrin	<400 kg: 10 ml >400 kg: 20 ml
Sputop Spot-on	deltamethrin	10 ml

Curative treatments of hypodermosis and myases

- Macrocyclic lactones; absolute efficacy on all subcutaneous stages

(Ivermectin)

Control of flies:

1 .Insecticides for use on farms

- **Pyréthroids** with little remanence +butoxide of piperonyl : bioresmethrin, bioallethrin

  - Advantages: little risk of resistance

- **Neporex (Novartis: Cyromazine):** Inhibitor of chitin synthesis

  - To spread at the nesting sites; very little toxic, no resistance reported ..

- **Active insecticides by ingestion by the insect:**
  - Golden Muscamone,
  - Alfacron (Novartis / Alfametifos),
  - Tugon (Bayer / Trichlorfon).
    - Apply it in thin strips
    - Active on licking insects.

2. Insecticides for use in meadow

- Synthetic lipophilic resin and pyrethroid ear loops (flucythrinate, cypermethrin, permethrin)

  - Duration of action from 3 to 5 months; frequent induction of resistance; a loop at each ear is necessary.

- <u>Sprays with remanent activity:</u>

  - works for 6 weeks (2 to 3 applications per grazing season)

Treatment of ringworm

- Topical
- Iodized: tincture of iodine, iodized alcohol
  application every 2 days
- **Imidazothiazoles: Ivamerol (diluting powder**)
  repeat treatment 3-4 x at 3-4 day intervals
- Systemic: Griseofulvin

Treatment of babesiosis

symptomatological:

- mild diuretics ($NaHCO_3$)
- cardiotonic: caffeine, coramine
- blood transfusion (4 liters per 250 kg)
- iron intake ($FeSO_4$ 5 to 1 gr per day)

Etiological:

- **Imidocarb (Carbesia):** - Curative and prophylactic
- 1 to 3 mg / kg SC or IM - Persistent residues
- Low toxicity (lethal dose from 15 mg / kg)

Hygienic: fight against the vector, landscaping of pastures

Chemical: Imidocarb 2 mg / kg protection for 6 to 8 weeks

Vaccinal: A killed vaccine is under development at Intervet.

Treatment of fasciolosis and paramphystomosis

Salycilanilides: Oxyclozanide (Zanil), Closantel (Flukiver)

- Active on moats at least 5 weeks old
- Zanil is widely used in dairy cows

Halogenated monophenolic derivatives: nitroxynil (Dovenix)

- Active on the moat adults (8 weeks and more)

Sulphonamides: Clorsulon (Ivomec F or D)

- Active on the moat adults (8 weeks and more)

Benzimidazoles:

Albendazole (Valbazen), the spectrum is wide

Netobimin (Hapadex) is limited to adult stages

Triclabendazole (Fasinex) is the most effective douvicide

Treatment of cysticercosis and muelleriosis:

quite difficult.

- **Ivermectin and neighboring molecules**: twice at one month intervals

- **Oxfendazole (Systamex**) 5 mg / kg 3 consecutive times at 48 hour intervals

- **Netobimin (Hapadex)** 10 mg / kg 3 days in a row.

Treatment of oestrose

- Target L1 rather than L2 or L3 (late treatment is often accompanied by bacterial complications)

➔ Treat in autumn.

- **Nitroxynil (Dovenix)** 20 mg / kg
- **Closantel (Flukiver)** 5 mg / kg
- **Ivermectin, doramectin, moxidectin** 0.2 mg / kg

Treatment of of avians and rabbits coccidiosis

Must be early

Curative:

Sulfamidae in drinking water (2 periods of 3 days separated by an interval of 2 days) Ex: Sulfaquinoxaline with or without diaveridine or sulphamezathine

Amprolium-Ethopabate, benzenic acetonils, Toltrazuril (Baycox), Clazuril, Diclazuril are active in all intracellular stages and can be used in curative

Problems related to the intensive use of dewormers

- **Problems related to the intensive use of dewormers**
- **Resistance**
- **Environmental action: residues in water, degradation of dung, non-target organisms**
- **Residues in foodstuffs**
- **Interaction with the establishment of immunity**

Resistance

Its induction is related to three main factors:

- Frequency of anthelmintic treatments
- The moment when we will use the anthelmintic
- The dosage according to the weight of the animal

In general, resistance develops more slowly in nematodes than in insects:

- Many dewormers are not persistent and quickly eliminated

Detection of resistance is quite difficult

Detection of resistance:

- OPG reduction technique
- Inhibition of egg hatching (in vitro)

How to avoid resistances:

- **Correct dosage according to weight**
- **Change pharmacological classes on an annual basis**
- **Alternative methods (rotation, dilution ...)**
- **Genetic selection?**