



# PARASITIC DISEASES

EL-Shaymaa N. EL-NAHASS



# Parasitic diseases

I- Parasitic affections of the skin

II- Parasitic affections of the upper respiratory tract

III- Parasitic affections of the lung

**IV- Parasitic affections of GIT**

V- Parasitic affections of liver

VI- Parasitic affections of muscles

# IV- Parasitic diseases of GIT

## Parasites of GIT

### Nematodes

- 1- Ascaris.
- 2- Strongyloides.
- 3- Trichostrongylus.
- 4- Hook worm

### Protozoa

- 1- Coccidia spp.
- 2- Cryptosporidia spp.

# IV- Parasitic diseases of GIT (General Pathology)

- Grossly:
  - Hyperemia.
  - The GIT lumens are filled with greenish or dark brown fluids.
  - Presence of delicate greyish white fibrino-necrotic film which formed of fibrin, albumin and exo-foliated cells on the villous surface.

# IV- Parasitic diseases of GIT (General Pathology)

## ■ Microscopically:

- Irregularity of mucosal height and thickness.
- The villi are atrophied, reduced or fused.
- The villous epithelium develop hyperplastic changes with mitotic figures.
- In chronic stages, the crypts are hyperplastic , deeper than normal.
- The lamina propria is densely infiltrated with inflammatory cells especially lymphocytes, plasma cells and esinophils.
- Erosive changes may be developed.

# 1- Ascaris

- *A. suum* in pigs.
- *Parascaris equorum*.
- *T. canis* in dogs.
- *T. felis (cati)* in cats.
- *T. lumbricoides* in man.

# 1- Ascaris (Pathogenesis)

\* The worm resides in the upper part of S.I, the infective larvae penetrate the intestinal wall to liver through portal circulation



\* From the liver, they may reach lung through vena cava.



\* From the lung, they developed and coughed up to trachea.



\* They are re-swallowed and pass to the intestine to develop the mature stage

# 1- Ascaris (Lesions)

- The larvae of ascaris spp. produce eosinophilic gastro-enteritis.
- Eosinophilic granuloma of mesenteric lymph nodes.
- During the larval migration, they produced ch.ch gross lesions in liver which called milk spots, which resulted from eosinophilic tracts, granulomas, periportal infiltrates.
- Sometime obstructive inflammation in the bile and pancreatic ducts.



## 2- Trichostrongylus spp.

- The worms parasitize the duodenum and jejunum.

### \* **Microscopically:**

- The parasites are found in shallow epithelial tunnels inside the intestinal villi.

## 3- Hook worms.

- The hook worms include:

1- Ancylostoma caninum of dogs.

2- Bunostomum spp. in ruminants

### \* Grossly:

- In small intestine lacerations 1-2 mm in diameter.
- In the colon, cecum and rectum, lacerations with hemorrhages 2-3 mm in diameter on the mucosal linings.

## 3- Hook worms.

### \* Grossly:

- Also, the lacerations are frequently seen along the edges of ileocecal valves.
- In hook worm infestation, the points of attachment may be seen grossly as focal hemorrhages or ulcerations (as a results of biting of the mouth parts)

## 3- Hook worms.

### \* Microscopically:

- Increasing in the inflammatory cell numbers especially lymphocytes and eosinophils the vicinity of the worm in the mucosa.
- Hyperplastic changes in the mucosal linings.
- The wounds left by hook still bleeds for 30 min long as a result of anticoagulant which produced by worms.
- Lecucocytic infiltrations in the submucosa.

## 4- Coccidiosis.

- Coccidia spp. are protozoa of two genera, Eimeria spp. and Isospora.
- They reside in a very specific segments of intestine and they are host specific.
- Most of coccidia parasitize:
  - 1- Villous or crypt epithelial cells.
  - 2- Endothelial cells of lacteals.
  - 3- Lamina propria.
  - 4- Regional lymph nodes.

## 4- Coccidiosis.

### \* Grossly:

- Hyperemia of the affected segments, usually distal parts of small intestine, cecum and colon.
- The distended parts are filled with fluids.
- Pinpoint white foci on the mucosal and serosal surfaces.
- Raised convoluted hyperplastic patches with or without fibrino-necrotic pseudomembranes.
- Erosions especially of large intestine and bleedings.

## 4- Coccidiosis.

### \* **Microscopically:**

- Dissociation of villous or crypts epithelial lining.
- Hyperplasia of mucosal linings.
- Mild inflammatory cells in the submucosa mainly lymphocytes, plasma cells and eosinophils.
- Present of the schizont stages within the lining epithelium which are oval basophilic structure, filled with bannana shaped merozoites.
- The loss of epithelial cells may resulted in villous atrophy.

# 5- Cryptosporidiosis.

- The cryptosporidia are protozoa of class sporozoa.
- They can infects:
  - \* calves,
  - \* lambs,
  - \* horse,
  - \* rabbits,
  - \* chicken,
  - \* monkeys,
  - \* g.pigs, hamsters,
  - \* mice,
  - \* dog, cat
  - \* man



# 5- Cryptosporidiosis.

## \* Microscopically:

- The parasites are attached to lining epithelium of stomach, small intestine and colon.
- Leaving severe degenerative changes and necrosis.
- Microgametes, macrogametes, schizonts, trophozoites and oocysts could be detected.



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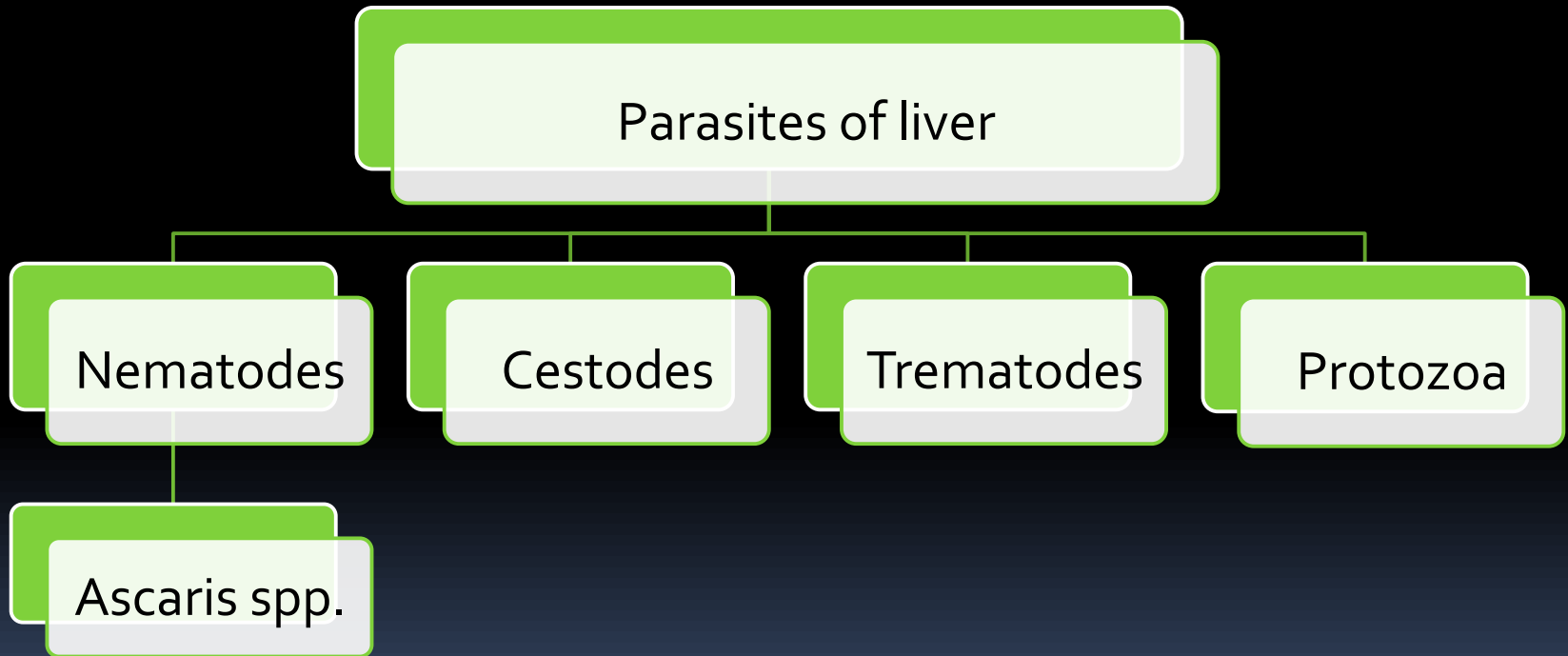
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VI- Parasitic affections of muscles

# II- Parasitic diseases of liver



# 1- Nematodes (General Pathology) (Ascaris spp.)

## ▪ Grossly:

- Nematodal larvae produce focal tracts of hepatocellular necrosis and inflammation.
- These tracts after while replaced by fibrous connective tissues and scars which represent by present of pale areas.
- In the liver these lesions defined as Milk spotted liver.
- That is may be followed by secondary bacterial infection and abscess formation.
- Granulomatous reaction could also detected.

## 2- Cestodes (echinococcosis)

- **Grossly:**

- The lesions consist of cysts 1-10 cm in diameter which filled with clear fluids.
- The cysts are normally spherical but they can mold its shape according to local tissue pressure.
- Daughter cyst, external to the mother cyst could also detected.
- As a result of these daughter cyst formation, the organ on incision has a honeycomb appearance

## 2- Cestodes (echinococcosis)

- **Microscopically:**

- The cyst is composed of fairly thick, external laminated cuticle.
- Within this external layer there is a germinal layer which produce the fluid of the cyst as well as the broad capsules.
- Each broad capsule may contain 1-40 invaginated scoleces which are attached to broad capsule by a narrow stalk.

## 2- Cestodes (echinococcosis)

- **Microscopically:**

- Each hexacanth scolex is capable of producing a new cyst.
- Many of broad capsules become detached from the cyst wall and float freely in the hydatid fluid producing hydatid sands.



# 3- Trematodes

- **Examples:**

- 1- Fasciola hepatica.
- 2- Fasciola gigantica.
- 3- Fasciola magna.
- 4- Dicricoelium dentriticum.

# 3- Trematodes (Fascioliosis)

## \* Grossly:

- Hemorrhagic and necrotic tunnels.
- In acute stages, these tracts appeared reddish brown.
- In chronic stages, the lesions extended to affect bile ducts and produce, chronic cholangitis.
- Proliferation of fibrous connective tissues occurred resulted in cirrhosis.

\* The disease is caused by *Fasciola gigantica*, or *Dicrocoelium lanceatum*.

\* It found in cattle, buffalo, sheep and goats.

### **Pathogenesis:**

1- The egg of the mature flukes are passed out with the feaces to water, The embryo penetrates through the snail after leaving the egg and undergo further development into Radia and Cercaria.

2- The cercaria become encysted after leaving the snail, and the cyst is taken by the animal with infested green food. The membrane of the cyst is dissolved in the stomach.

3- The parasite perforate the intestinal wall and reaches the liver by penetrating the hepatic capsule.

4- The cercaria bore into the liver, and gradually penetrate deeper along the bile ducts.

### **Lesion induced by immature flukes:**

While the young flukes migrate around in the liver searching for the bile ducts, necrotic and haemorrhagic tracts (or "tunnels") are produced.

### **Grossly:**

- \* The surface of the liver is studded with small haemorrhages.
- \* It may be covered with a thin fibrinous deposits.
- \* The hepatic capsule show here and there small, round, sharply defined openings.

## \* Microscopically:

- Haemorrhagic tunnels contain necrotic hepatic cells, erythrocytes, and a large number of infiltrating eosinophils.
- Around the tunnels there is a narrow zone of cells showing coagulative necrosis .
- The zone of necrosis is demarcated by a thin zone of neutrophils.
- Old lesion appears as parasitic cirrhosis.

## \* Lesions due to adult flukes (chronic cholangitis):

- Adult flukes live in the bile ducts and produce injury.
- As a result of:
  - 1- Mechanical irritation by the spines.
  - 2- Attachment with the suckers.
  - 3- Toxic products and excretion of the fluke, a chronic inflammation is found in bile duct walls.
- The toxic products of the parasite induce its effect not only on the wall of the bile ducts but also on the liver tissue after having been absorbed by the lymph stream.

## Grossly:

- \* Palpation of the affected liver reveals hard cords.
- \* On section, these cords are found to be dilated bile ducts with thickened and rigid walls.
- \* Pressure causes dirty, yellowish-brown (presence of haemoporphyrin pigment) bile to exude contains flukes in variable numbers.
- \* In severe cases there is, moreover, ascites as well as general wasting and anaemia.

## Microscopically:

- \* There is an excessive fibrosis around the bile ducts in the portal triads.
- \* Lymphocytic infiltration and histiocytic reaction also occur.
- \* Marked hyperplasia of the wall of the bile ducts. The lumen of the bile ducts may be occluded by cellular exudate and dead flukes.
- \* These may be mineralized.
- \* There is, moreover, degeneration of the periportal hepatic cells.





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# VI- Parasitic affections of muscles

- 1- Toxoplasmosis.
- 2- Sarcocystosis.
- 3- Trypanosomiasis.
- 4- Trichinosis.
- 5- Visceral larval migrans.

# 1- Toxoplasmosis

- The muscular lesions consist of multifocal necrotizing myositis.
- The necrotized muscle reach 10 um.
- Infiltration of lymphocytes, plasma cells and neutrophils takes place.
- Cysts containing bradyzoites could be detected

## 2- Sarcocystosis

- Sarcosporidia are sporozoa located in the skeletal and cardiac muscles of cattle, sheep, horse, and pig.
- There is no gross lesions.

### \* Microscopically:

- The sarcocysts are surrounded by a clear wall, their contents are filled with fusiform spores.
- The cysts displace the contents of the muscle fibers but there is no reaction either in the affected cells or the neighboring area.
- Sarcosporidia contain a strong neurotoxin (sarcocystin) which cause depression, paralysis, and death when experimentally injected in laboratory animals.

# 3- Trypanosomiasis

- Mononuclear cell infiltrations found not only in the muscles but also in other affected parts.
- Lesions may be found in skeletal muscles and cardiac muscles

## 4- Cysticercosis

- It is caused by infestation with larvae of *Taenia saginata* in cattle and *Taenia solium* in swines.
- In the myocardium, the larvae appear as a white cysts measuring up to 1 cm in diameter.

## 5- Visceral larval migrans

- It is resulted from invasion of tissues of man by infective stages (egg containing L2) of *Toxocara canis*.
- In this case the life cycle doesn't completely takes place and infective larvae stay dormant in tissues.
- If this lesion occur in muscle a focal granulomatous myositis with larvae and granuloma lying between myofibrils.





# PARASITIC DISEASES

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# 1- Parasitic affections of the skin

## \* Arthropodes producing diseases:

1- Mites

A- *Sarcoptes spp.*

B- *Demodex spp.*

C- *Notoderes spp.*

D- *Otodectes spp.*

E- *Psorptes spp.*

F- *Chorioptes spp.*

G- *Cheyleties spp.*

H- *Psoregates spp.*

2- Ticks.

3- Lice.

4- Fleas.

5- Myiasis.

## \* Helminths producing diseases:

1- *Habronema spp.*

2- Filial species.

## \* Protozoan producing diseases:

1- *Leishmaina spp.*

# 1- Mites (General Pathology)

- **Grossly:**
  - Cutaneous thickening.
  - Erythematous macules.
  - Focal or multifocal papules.
  - Crust formation.
  - Alopecia due to folliculitis.
  - Secondary pyoderma



# SKIN LESIONS

## Terminology

## The Primary Lesions

Primary lesions are physical changes in the skin considered to be caused directly by the disease process.

### 1. MACULE

A macule is a change in the color of the skin. A macule greater than 1 cm. may be referred to as a *patch*.

### 2. PAPULE

A papule is a solid raised lesion that has distinct borders and is less than 1 cm in diameter.

Papules have a variety different f shapes (domed, flat-topped)

### 3. NODULE

A nodule is a raised solid lesion more than 1 cm. and may be in the epidermis, dermis, or subcutaneous tissue.

### 4. TUMOR

A tumor is a solid mass of the skin or subcutaneous tissue; it is larger than a nodule. (not at all mean that the lesion is a neoplasm.)

## 5. VESICLE

Vesicles are raised lesions less than 1 cm. in diameter that are filled with clear fluid.

## 6. BULLAE

Bullae are circumscribed fluid-filled lesions that are greater than 1 cm. in diameter.

## 7. PUSTULE

Pustules are circumscribed elevated lesions that contain pus. They are most commonly infected (as in folliculitis) but may be sterile (as in pustular psoriasis)

## 8. BURROW

Burrows are linear lesions produced by infestation of the skin and formation of tunnels (e.g., with infestation by the scabitic mite or by cutaneous larva migrans).

## 11. TELANGIECTASIA

Telangiectasia are the permanent dilatation of superficial blood vessels in the skin and may occur as isolated phenomena or as part of a generalized disorder.

## The Secondary Lesions

Secondary lesions may evolve from primary lesions, or may be caused by external forces such as scratching, trauma, infection, or the healing process.

### 1. SCALE

Scale consists of flakes or plates that represent compacted desquamated layers of stratum corneum.

### 2. CRUST

Crusting is the result of the drying of plasma or exudate on the skin.

### 3. ATROPHY

Atrophy is thinning or absence of the epidermis or subcutaneous fat.

### 4. EROSION

Erosions are slightly depressed areas of skin in which part of the epidermis has been lost.

### 5. ULCERATION

Ulcerations occur when there is necrosis of the epidermis and dermis and sometimes of the underlying subcutaneous tissue.



## The Secondary Lesions

### 6. SCAR

Scars are the permanent fibrotic changes that occur on the skin following damage to the dermis.

### 7. KELOIDS

Keloids are an exaggerated connective tissue response of injured skin that extend beyond the edges of the original wound.

### 8. PETECHIAE, PURPURA, AND ECCHYMOSES

Three terms that refer to bleeding that occurs in the skin are petechiae, purpura, and ecchymoses.

"petechiae" refers to smaller lesions.

"Purpura" and "ecchymoses" are terms that refer to larger lesions.

In all situations, petechiae, ecchymoses, and purpura do not blanch when pressed.

# 1- Mites (General Pathology)

- Microscopically:

## A) Epidermis:

- Marked hyperkeratosis.
- Epidermal hyperplasia.
- Focal necrosis of epidermis.

## B) Dermis:

- Dermal edema and hyperemia.
- Dermatitis and perivascultis.
- Perifollicultis and folliculitis.

(The follicles are filled with mites, debris and inflammatory cells)

# 1- Mites (A- *Sarcoptes spp.*) (Burrowing mites)

- Serious diseases in camels.
- Common in pigs and dogs.
- Uncommon in cattle and goats.

## **\* lesions:**

- The mites burrow through keratinized layers causing severe pruritis and hypersensitivity.
- Lesions mainly started in ears, head and neck then it become generalized

# 1- Mites (B- *Demodex spp.*)

- A major problems in dogs.
- Uncommon in cattle, goats, horses and pigs.

## \* lesions:

- Localized lesions may occur in face and fore leg.
- Then the lesions become generalized with enlargement of lymph nodes.

# 1- Mites (C- *Notoderes spp.*)

- A major problems in rabbits and cats.
- Uncommon in cattle, goats, horses and pigs.

## \* lesions:

- Lesions are generalized in young animals.

# 1- Mites (D- *Otodectes spp.*)

- A common problems in dogs and cats.

## \* lesions:

- Lesions are found in the external ears causing otitis externa that is may be spread to reach middle or internal ears.
- Also extension of lesions in severe cases may be found in brain and meninges.

# 1- Mites (E- *Psorptes spp.*)

- A common problems in cattle, sheep, goat, rabbit, horses and other animals.

## \* lesions:

- Lesions are found in the external canal of rabbits, sheep, goats and horses.
- Lesions are found in the base of tail.

## 1- Mites (*F-Chorioptes spp.*)

- A common problems in cattle, sheep, goat and horses.

### \* lesions:

- Mites are found externally on the skin

## 1- Mites (*G- Cheyletielles spp*)

- Contagious problem in rabbit man and carnivores.

### \* lesions:

- Mites are found externally on the skin



# 1- Mites (H- Psoregtes spp.)

- A common problems found in sheep.

## \* lesions:

- Lesions mainly in the form of dermatitis.

## 2- Ticks (A- *Hyalomma spp.*)

- *Hyalomma spp.* causes Sweating disease in calves.

### \* lesions:

- Hyperemia of skin and m.m.
- Patchy to generalized dermatitis.
- Coronary band areas become hyperemic and painful.
- Distended lymphatics.

## 2- Ticks (A- *Hyalomma spp.*)

- *Hyalomma spp.* causes Sweating disease in calves.
- **lesions:**
- Hemorrhagic to mucopurulent exudates from nostrils.
- Diphtheritic membranes in the nasal cavity, larynx, pharynx, oesophagus and omasum.
- Pulmonary edema, hydrothorax and hydrpericardium may be found.
- Secondary pneumonia and myiasis may developed

## 2- Ticks (B- *Soft ticks*)

- Infest the external ear canal of all domestic animals and may lead to secondary bacterial otitis or myiasis.

## 2- Ticks (C- *Hard ticks*)

- Infest the dog, man and birds.
- It transmits protozoal or rickettsial infections

## 3- Lice (Pediculosis)

### \* lesions:

- Anemia, weakness, damage of hair and wool.
- Most lesions are secondary infection.

## 4- Fleas:

### • lesions:

- Severe skin irritations due to frequent biting.
- Multiple red papules are frequently seen.
- Cat fleas can transmit *Dipylidium caninum*

# 5- Myiasis

## \* Examples:

- The larvae of *dipterous* spp. which can produced myiasis are:
  - 1- Screw worm.
  - 2- Hypoderma spp.

# 5- Myiasis

## 1- Screw worms myiasis:

- Screw worm myiasis caused by *cochliomyia* spp. and *chrysomyia* spp.
- This is important disease of domestic animals.
- Death occurred due to septicemia and toxemia in untreated animals.

# 5- Myiasis

## \* Lesions:

\* Screw worm deposited eggs on the wounds near to the mucocutaneous junctions.



\* The larvae penetrate and feed on the living tissues.



\* Cutaneous myiasis caused by other flies



# 5- Myiasis

## 1- *Hypoderma spp.* myiasis:

### \* Lesions:

- Larvae of *hypoderma bovis* or *H. lineatum* penetrate skin



- In order to get the subcutis of back.



- There the larvae produce subcutaneous nodules with an opening for respiration causing hide damage.

## \* Helminths producing diseases:

1- Habronema spp. 2- Filial species.

1- Habronema spp. (cutaneous habronemiasis)

### \* Grossly:

- Single or multiple, proliferative, ulcerative, red to brown tumor masses.
- On section, small yellow to white grey foci are seen.

## **\* Helminths producing diseases:**

**1- Habronema spp. 2- Filarial species.**

**1- Habronema spp. (cutaneous habronemiasis)**

### **\* Microscopically:**

- Granulation tissue formation with eosinophils infiltrations.
- Areas of coagulative necrosis which surrounded by eosinophils and histocytes which may contain larvae.

## \* Helminths producing diseases:

1- Habronema spp. 2- Filarial species.

2- Filarial infection

### \* Grossly:

- Patchy to diffuse alopecia, erythema, scaling, crusting and pigmentary changes.
- Secondary infection may also occurred.
- Keratitis, conjunctivitis may be developed.

**\* Helminths producing diseases:**

**1- Habronema spp. 2- Filial species.**

**2- Filarial infection**

**\* Microscopically:**

- **Eosinophilic to lymphocytic perivascular dermatitis.**

# **\* Protozoa producing diseases:**

## **\* Leishmaniasis**

- This disease can occur in three forms:

1- cutaneous

2- mucocutaneous

3- visceral forms.

### **\* Grossly:**

- Cutaneous lesions consist of alopecia, nodules, ulcers or fistules.

### **\* Microscopically:**

- Perivascular granulomatous to pyogranulomatous ulcerative dermatitis

## \* Protozoa producing diseases:

\* Leishmaniasis

\* **Microscopically:**

- Perivascular granulomatous to pyogranulomatous ulcerative dermatitis



# PARASITIC DISEASES

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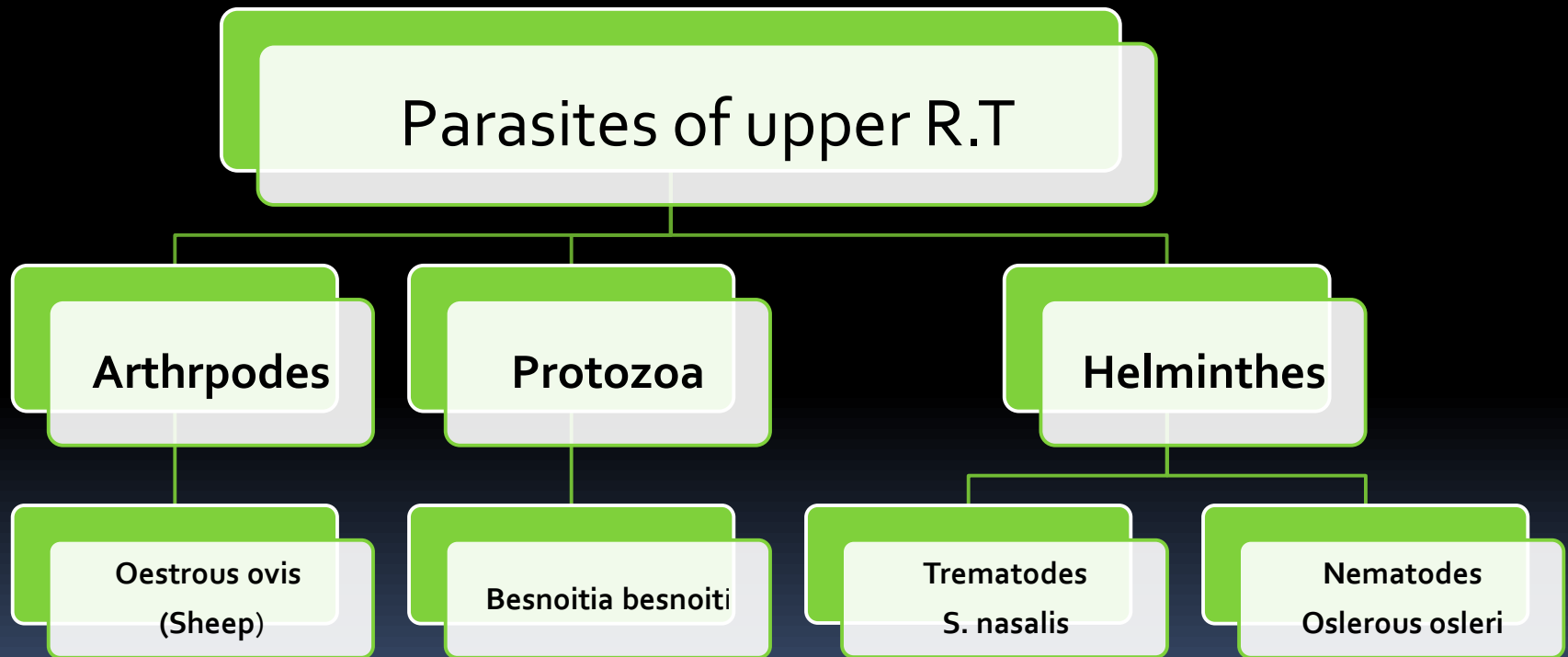
III- Parasitic affections of the lung

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# II- Parasitic diseases of upper reparatory tract



# \* Parasites of upper respiratory tracts:

## \* Pathological lesions:

- Lesions induced by parasites in upper respiratory tract are:

1- Laryngitis.

2- Rhinitis. (mainly granulomatous one)

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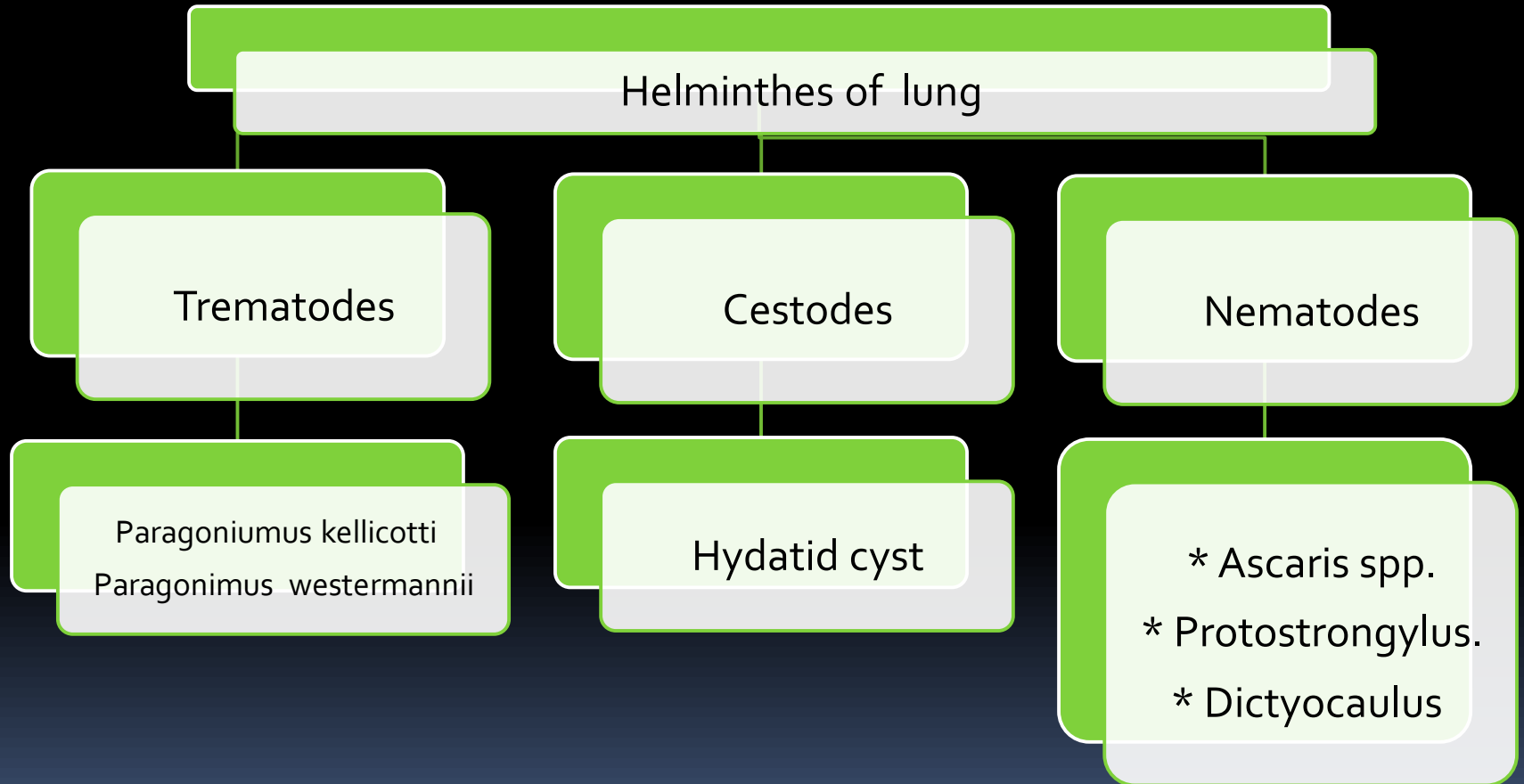
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# II- Parasitic diseases of upper respiratory tract



## **\* Parasites of lung:**

### **\* Pathological lesions:**

- Lesions induced by parasites in lung mainly is parasitic pneumonia followed by suppurative pneumonia as a secondary bacterial infection.

### **\* Grossly:**

- Presence of areas of lobular and sublobular areas of atelectasis.
- Presence of interlobular areas of edema and emphysema.

# \* Parasites of lung:

- **Microscopically:**
- Early changes consist of blockage of many respiratory bronchioles with parasitic larvae and inflammatory cell (eosinophils).
- Later adult parasites found in bronchi and trachea.
- Severe degenerative changes and necrosis in epithelial lining of alveoli.
- Interstitial thickening which attributes to inflammatory cell infiltration and edema.
- Hyperplastic changes in bronchi and bronchioles.
- Peribroncheal lymphoid hyperplasia.
- Eosinophilic granuloma around dead larvae or parasites