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An important clinical case of *Spirocerca lupi* in dog, and the way of treatment with the use of ivermectin. Presentation of the nematodes parasite *Spirocerca lupi* and also the drug, Ivermectin

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Clinical case: Roky, a 5,5 years old, cross-breed, male, 28kgs,dog, guard in a farm at the area of Thermi, Perfecture of Thessaloniki, Greece, was been carried to my surgery with, dysphagia, coughing,dyspnea, (mainly while eating), and vomiting.

During clinical examination, at auscultation (by stethoscope) nothing was found in lungs. At palpation no sensitivity was found at the belly, and no enlarged lymphonodes were normal. The celiac cavity hadn't any problem by searching. There wasn't temperature. At palpating of the neck area, dyspnea appeared.

The dog hadn't fever. X-rays in chest showed elements of megaesofagus.

At scoping of esophagus, elements of esophagitis was found, and a blockage of a granuloma was revealed too at the tracheal part of esophagus, which blocked it approximately 60%.

In feaces a lot of Spirocerca lupi eggs were found.

For treatment I suggested ivermectin at 0,3 mg/kg/once a week for 3 months.

Then, same dose ivermectin, but once every month.

Supportly (for esophagitis), ranitidine was used too, and creamy food at a higher place (than the ground) to avoid stooping.

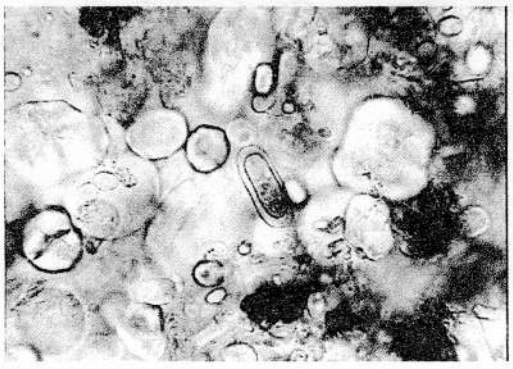
Examination in feces (by flotation method) every month, was positive for eggs the first month, but became negative the second month.

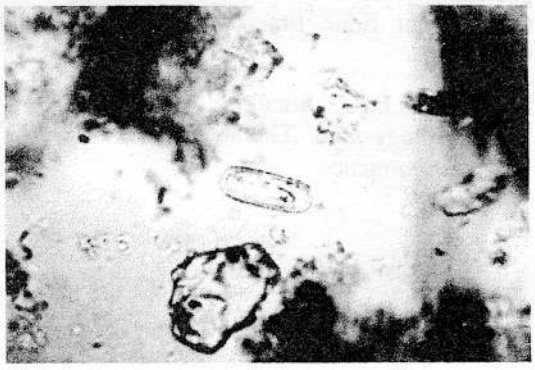
At the latest scoping after two years (from the time of first examination) , esophagus was found normal.

Below are present some information about parasite Spirocerca lupi and ivermectin.

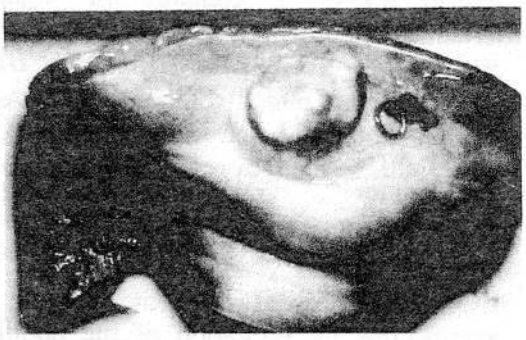
Class: Nematoda. Order: Spirurida. Family: Thelaziidae. Genus: Spirocerca. Species: lupi.

Adult worms measure 40 mm (male) to 80 mm(female) long. Reddish, coiled when alive. Larvated, thic-shelled, 30-38 μm x 11-15 μm.





Definitive: Canids, wild felids. Intermediate: Coprophaguous beetles. Paratenic: Rodents, birds, lizards.



Adults reside in nodules, eggs containing infective L1 (first stage larva), pass through fistulous tracts and out with the feces.

Eggs are ingested by intermediate host (beetles). The larva hatch to the infective L3 (third stage larva) in the beetle (1).

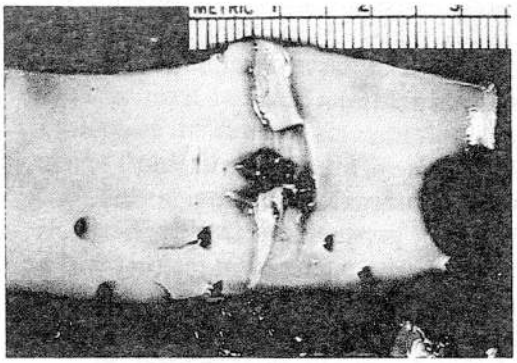
If a paratenic host eat the beetle the larva will encyst in some organ of this host.

When the dog eat the beetle or paratenic host, the larva penetrate tkrough the stomach wall, and migrate in the walls of the gastric and gastroepiploic arteries. Eventually reaching the thoracic aorta in about 3 weeks, via celiac artery (2).

After 10-12 weeks in the aorta the larva will migrate to the esophagus where it forms a cystic nodule, which is connected by a fistula to the lumen of the esophagus.

Here it develops to the adult stage (3).

Side where the parasite is found, is in cysts connected to the esophagus and stomach.



Eggs are laid in the cyst, pass out to the lumen of the esophagus and pass out with the feces.

The prepatent period is 5-6 months.

SITES OF INFECTION: Esophagus, stomach – adults. Thoracic aorta – larvae. Other organs – ectopic (3). Migration in the arteries and aorta may cause hemorrhage, granulomas, stenosis or aneurysm and possible rupture (4).

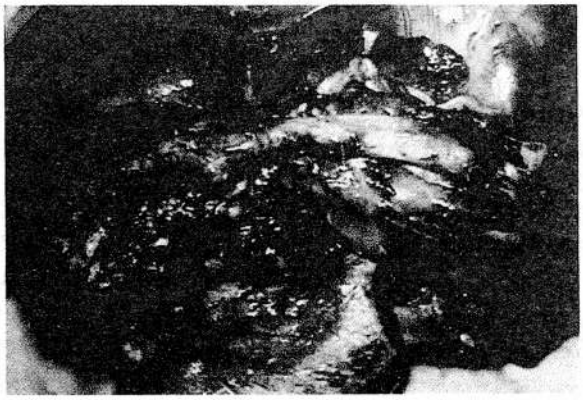
Adults cause formation of nodules (up to 4 cm) in the esophagus.

Cause obstruction, hemorrhage.

As a space-occupying lesion, may induse hypertrophic pulmonary osteopathy (5).

May become neoplastic-osteo-or fibrosarcomas in 10% of infected dogs.

Spondylitis of the adjacent thoracic vertebrae may occur.



CLINICAL SIGNS: Dysphagia. Vomiting. Esophageal neoplasia. Aortic aneurism or rupture. Secondary pulmonary osteoarthropathia. Hematemesis-hemoptysis (6, 7).

DIAGNOSTIC TEST: Fecal float To find thick walled egg with a larva inside it. The egg measures 34µm x 13µm.

CONTROL. In highly endemic areas, confinement of dogs may provide the only certain means of preventing infection. Certainly, any dog with an active interest in hunting will be at risk of infection. However, little would be accomplished if the dogs so confined were fed uncooked meat, especially chicken offal (8).

EPIDEMIOLOGY. Tropics, warm temperate areas.

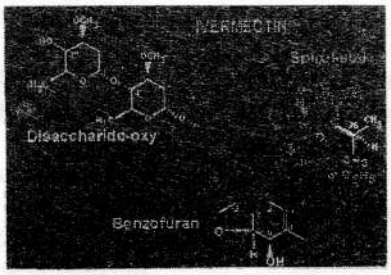
TREATMENT FEBENDAZOLE: Dose: 50mg/kg PO SID for 3 days. IVERMECTIN: Dose: 0,2 mg/kg PO.

The avermectins are a group of chemically related macrocyclic lactones produced by fermentation of the actinomycete Streptomyces *avermectilis*.

Avermectin is a complex of eight such fermentation products. Four of these are major components (avermectin A1a, A2a, B1a, and B2a) and four minor components recovered in smaller amounts (avermectin A1b, A2b, B 1b, B2b) Of these the B1a component is recovered in greatest amount along with its B1b minor homologue.

Ivermectin, derived from the mixture of B1 avermectins by saturation of the double bond between C-22 and C-23, consists of not less than 80% 22,23-dihydroavermectinB1a and not more than 20% 22,23-dihydroavermctin B1b.

Ivermectin is an off-white powder that is highly lipophilic and hydrophobic.



It has the mode of action of macrocyclic lactones (9).

Ivermectin is open chloride channels, in invertebrates, binding the glutamate-gated channels in site, near GABA-gated site, which may be also potentiated. Chloride ions cause a slight hyperpolarization of the resting potential postsynaptic cells.

Ivermectin enhances the release of gamma aminobutiric acid at presynaptic neurons. GABA acts as an inhibitory neurotransmitter and blocks the post-synaptic stimulation of the adjacent neuron in nematodes or the muscle fiber of the arthropods.

By stimulating the release of GABA, ivermectin causes paralysis of the parasite and eventual the death (10, 11).

SPECTRUM OF ACTIVITY. In dogs ivermectin is used as a preventative for heartworm, also used as microfilariocide, ectoparasiticide and endoparasiticide (9).

TARGET PARASITES: *Toxocara canis*, Toxascaris leonine, *Ancylostoma caninum*, *Uncinaria stenocephala*, *Trichuris vulpis*, *Capillaria aerophila*.

Filaroides osleri, *Strongyloides stercoralis*, Arthropods *Dirofilaria immitis* larvae.

Experimental studies indicate that when the drug is used at higher doses it has a wide spectrum of activity. Both 4th- stage and adult parasites are eliminated by single SC doses of 0,05 mg/kg *(Ancylostoma caninum*, *Uncinaria stenocephala)*, 0,1 mg/kg (*Trichuris vulpis*), or 0,2 mg/kg (*Toxocara canis)* SC administration of

0,2 mg/kg is only 69% effective for *Toxascaris leonina*, oral administration at the same dose improves the efficacy to above 95%.

100% reduction in prenatal and transmammary transmission of *Toxocara canis* and *Ancylostoma caninum* from mother to her puppies can be achieved by treating the mothers 10 days before and 10 days after whelping with 0,5mg ivermectin /kg SC each time.

Oral or SC administration at 0,2mg/kg twice, 2 weeks apart, is reported to be 95-100% effective against intestinal stages (but not 3rd –stage parenteral larvae) of *Strongyloides stercoralis.*(12).

DOSE: As endoparasiticide. For roundworms, hookworms, or whipworms: 200 μg/kg PO once. Do not use in Collies (13).

For treatment of parasitic lung disease (*Capillaria* spp): 0,2mg/kg PO once (14).

In dogs, symptoms of toxicity rarely occur at a single dosage of 2 mg/kg or less. At 2,5 mg/kg mydriasis occurs, and at 5 mg/kg tremors occur. At doses of 10 mg/kg, severe tremors and ataxia are seen.

Deaths occurred when dosages exceeded 40 mg/kg, but the LD50 is 80 mg/kg.

Dogs receiving 0,5 mg/kg PO for 14 weeks developed no signs of toxicity, but at 1-2 mg/kg for the same time period, developed mydriasis and had some weight decreases.

Half of the dogs receiving 2 mg/kg/day for 14 weeks developed symptoms of depression, tremors, ataxia, anorexian and dehydration (4).

The Collie breed appears to be more sensitive to the toxic effects of ivermectin than the other canine breeds. This may be due to a more permeable blood-brain barrier to the drug or drug accumulation in the CNS of this breed.

The manufactures recommends that ivermectin not be used in foals less than 4 months old, as safety of the drug in animals this young has not been firmly established. However, foals less than 30 days of age have tolerated doses as high as 1mg/kg without symptoms of toxicity.

In dogs up to 95% absorbed after oral administration (12).

While there is a greater bioavailability after SC administration, absorption after oral dosing is more rapid than SC.

Ivermectin is well distributed to most tissues, but does not readily penetrate into the CNS, thereby minimizing its toxicity. Collie breeds apparently allow more ivermectin into CNS than other breeds/species.

Ivermectin has a long terminal half-life in dogs, 2 days.

It is metabolized in the liver via oxidative pathways and is primarily excrated in feces. Less than 5% of the drug as parent compound or metabolites is excreted in the urine.

There was no teratogenesis when ivermectin was administered to pregnant animals at four times the recommended dose (12).

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