Spirocerca Lupi

The life cycle, pathogenesis, symptoms, diagnosis, prophylaxis and treatment for the esophageal worm of the dog.

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Spirocerca lupi is commonly known as the esophageal worm of the dog. It occurs in the walls of the esophagus and larger arteries of the dog, fox, wolf and jackal. It is very common throughout the South, particularly in Alabama, Georgia, Florida, Mississippi and probably other states, constituting a formidable menace to the dog.

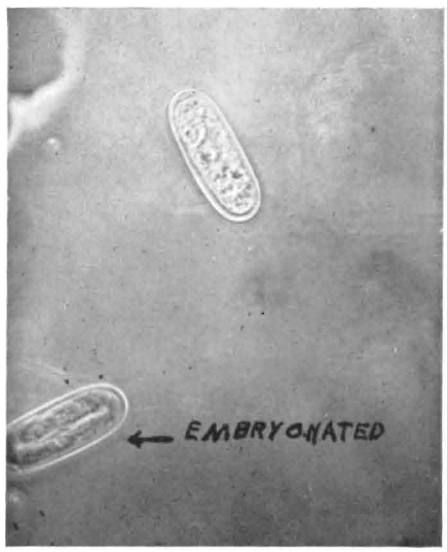
The adult worm is blood red in color and is usually coiled in a spiral within the cavity of the tumor formation. The female is approximately 60-80 mm. long, the male 40-50 mm. long. The uterus of the female is filled with eggs.

The eggs are cylindrical in shape and have a thick shell. They measure approximately 22-30 by 10-12 microns. In the early stages, the cytoplasm is granular but in later stages, within the uterus, the egg contains a U-shaped embryo. Because of their shape and size, they are not readily confused with the eggs of intestinal nematodes.

Life Cycle

The life cycle of *Spirocerca lupi,* as it has been gradually understood, is largely the work of Faust (1), Hu (2), and Hoeppli and Ono (3). The eggs are passed in the feces of the host and hatch after being ingested by one of several species of beetle, in which they become encysted. If such beetles are swallowed by unsuitable hosts —amphibia, birds and small mammals— the larvae become encysted again in the esophagus and other organs. If beetles or the aberrant intermediate hosts, in which encysted forms occur, are eaten by the definite host the larvae are liberated in the stomach, penetrate the stomach wall and reach the arteries. They migrate in the walls of the arteries, reaching the thoracic aorta in about three weeks. They are thought to reach the esophagus *via* the blood stream.

There are several stages in the life-cycle which are not clear. We have never found *Spirocerca lupi* eggs in the feces of dogs in our routine examinations. On post mortem examination part of these animals were found to have been infected with *Spirocerca lupi.* The author has carefully examined the contents of the tumor cavities of several animals and has consistently failed to find any eggs unless a female



Eggs of *Spirocerca Lupi*

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worm has been broken in the dissection. One dog reported by Mundhenk and Greene (4) was examined at regular intervals for several months during which time it was blood larvae positive. These larvae, while similar to *Dirofilaria immitis,* were not morphologically identical. At autopsy no adult *Dirofilaria immitis* were found in spite of a most careful search. A large *Spirocerca lupi* tumor was found in the wall of the esophagus, but none were found in the blood vessels. If the larvae in the blood stream during this period were not *Spirocerca lupi* what were they? If they were *Spirocerca lupi*, how did they get there? It may have been a case of continued *Spirocerca lupi* reinfection, but if so there should have been many more adult parasites present at autopsy. What happens to the eggs or larvae of adult parasites in the tumors found in the walls of the blood vessels? We are only asking these questions, not answering them. Jerstad states that the adult esophageal worm is a spirurid parasite in the wall of the digestive tract of the dog and does not produce microfilariae. This statement is apparently based on a review of the literature and not on actual experience with the parasite in its natural habitat. We have observed several dogs which were blood larvae positive at antemortem examination, but at autopsy were found free of adult *Dirofilaria immitis* and positive for *Spirocerca lupi.* This is presumptive evidence that *Spirocerca lupi* produces microfilariae. The possibility of coexistent *Dirofilaria immitis* and *Spirocerca lupi* in the blood stream is confusing to the clinician. It is apparent from the foregoing that more investigational work is needed on the life-cycle of this parasite.

Pathogenesis

Little positive information is known as to the extent of the damage done by the migrating larvae. It may be considerable, but transient. The adult parasites, however, produce serious damage through the formation of tumors of variable size in the walls of the esophagus and larger arteries of the body. Tumors in the esophagus may

Esophageal Lesion

be 60-70 mm. in diameter, in the aorta 10-20 mm. in diameter. As the result of the continued irritation from the presence of of the parasite a hard, fibrous tumor is formed at the site of the invasion. The center of the tumor is cyst-like, the cavity being filled with a flaky exudate and cellular debris. The adult parasites remain within the cavity, presumably depositing their eggs there. One or more fistulous tracts lead from the tumor cavities to the lumen of the esophagus. There may be a single tumor or several which become confluent, forming a large irregular growth, which protrude into the lumen of the organ, partially or completely occluding it and preventing the passage of solid food into the stomach.

In addition to obstructing the lumen of the esophagus, the tumor mass apparently exerts pressure on the lower trachea resulting in some flattening and a mild tracheitis. This accounts for the chronic cough frequently observed.

Tumors in the walls of the arteries occur most commonly as single tumors in the aorta posterior to the aortic arch. In one dog we observed a tumor with enclosed parasites in the wall of a branch of the pulmonary artery. It appeared at first to be in the lung proper but careful dissection disclosed that it was in the wall

of the artery. It was doing no apparent harm other than the local reaction.

Another dog which had complete posterior paralysis of undetermined etiology remained in the clinic several days for observation. At necropsy it was found that an aneurism had developed on the dorsal aspect of the aorta in connection with a tumor containing several adult *Spirocerca lupi* parasites. The body of the adjacent vertebra was undergoing necrosis resulting in narrowing of the spinal canal and compression of the spinal cord at that point with consequent posterior paralysis. The adjacent tissues showed extensive bloody infiltration and necrosis.

Monnig (5) states that the tumors may be present in the wall of the stomach but the author has never observed any in that organ.

Symptoms

In a great majority of cases dogs infected with *Spirocerca lupi* show no symptoms suggestive of the infection. Any symptoms shown are dependant entirely upon the size and location of the tumor masses. Esophageal tumors may cause occlusion of the esophagus, retention of solid food in the esophagus and persistent vomiting. This is followed by progressive emaciation, dehydration, coma and death. A persistant cough, which fails to respond to treatment and is accentuated with exercise, is not uncommon. Evidence of infection in the arteries is not observed during life. Death in these cases is usually sudden, due to hemorrhage from a ruptured aneurism.

Diagnosis

Retention of food in the esophagus is suggestive of esophageal tumors. This can be confirmed in many cases by examination of the esophagus for the tumor masses in the lumen or the cyst apertures in the wall by means of a gastroscope and diagnostic light. The dog should be under general anaesthesia.

Fecal examination is valueless. In hundreds of fecal examinations we have never observed the presence of the eggs. However, we have observed the eggs many times in the intact uterus of the female and would certainly recognize them. We have never seen a larva that was known without question to be *Spirocerca lupi*, so an error with respect to the larvae might be expected. Until more is known concerning the life cycle, blood examination for the presence of larvae is of questionable value.

Prophylaxis and Treatment

Very little can be done in the way of prevention other than to prevent the animals from eating beetles, insects and small animals which may carry the encysted larvae. Obviously this is very unsatisfactory.

Operative procedure is impractical and unsatisfactory because of the location of the parasites in the thoracic cavity. Vermicides given by the customary routes are of questionable value. Injection of carbon tetrachloride directly into the cysts through the openings in esophageal wall, while the gastroscope is in position, might be possible.

Summary

Spirocerca lupi is a parasite of major importance in dogs in the South. The adult parasites are found in the walls of the esophagus and large arteries. Certain stages in the life-cycle, as it is generally understood, is at variance with observation of recent investigators. The apparent absence of eggs in the feces of known infected animals and continued presence of a larva in the blood system in animals positive at autopsy for *Spirocerca lupi* and negative for *Dirofilaria immitis* strongly suggests that *Spirocerca lupi* produces microfilariae. The presence or absence of microfilariae should be definitely established by further research.

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