GSD

federation of sa

SPIROCERCA LUPI

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What is *Spirocerca Lupi*?

Spirocerca Lupi (S. Lupi) is a roundworm that affects the oesophagus and aorta

It results in gastrointestinal, respiratory and circulatory problems

The most common symptoms of infection are:

- Regurgitating and/or vomiting
- Difficulty breathing

What is *Spirocerca Lupi*?

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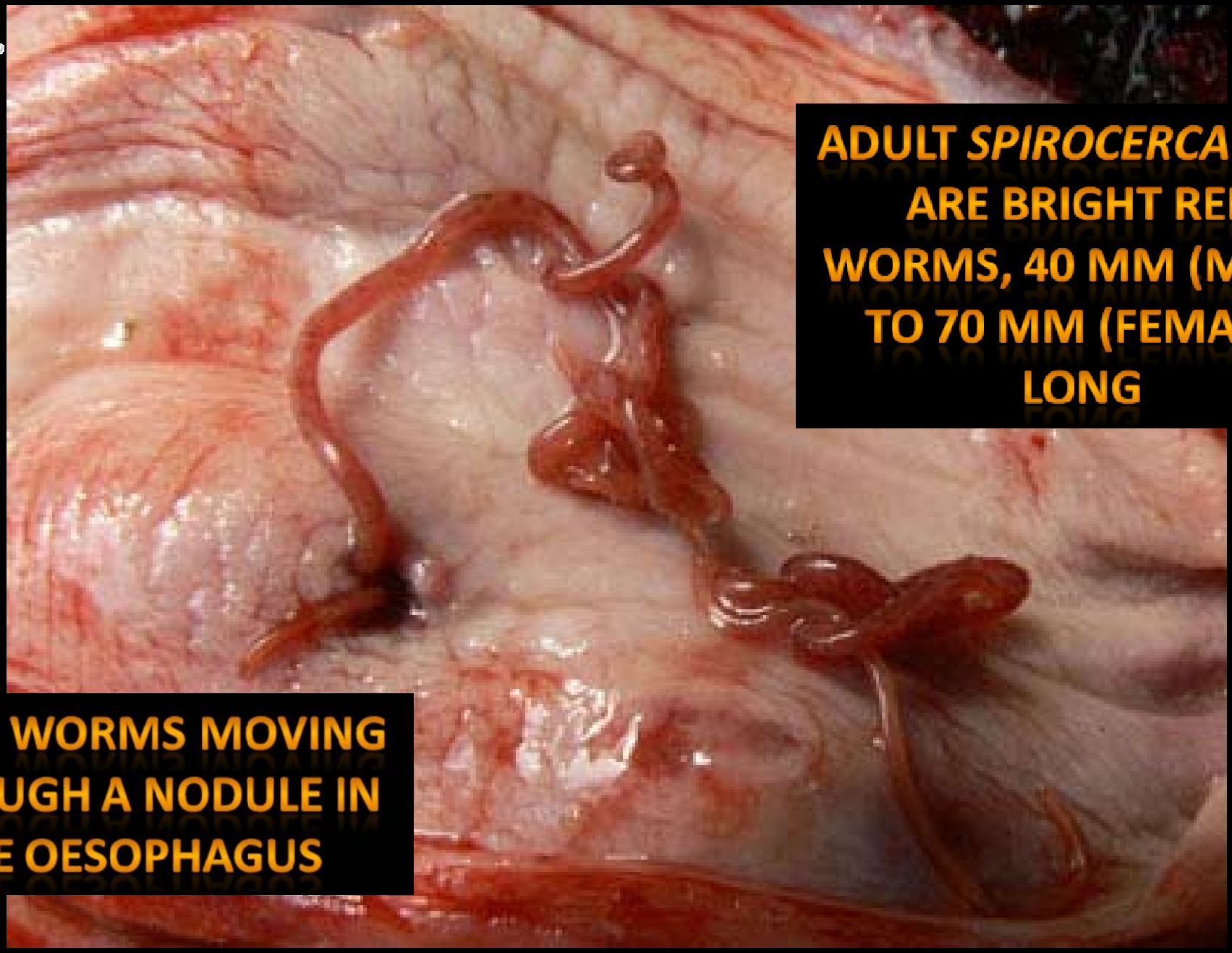


ADULT *SPIROCERCA LUPI* ARE BRIGHT RED WORMS, 40 MM (MALE) TO 70 MM (FEMALE) LONG

S.LUPI WORMS MOVING THROUGH A NODULE IN THE OESOPHAGUS

What is *Spirocerca Lupi*?

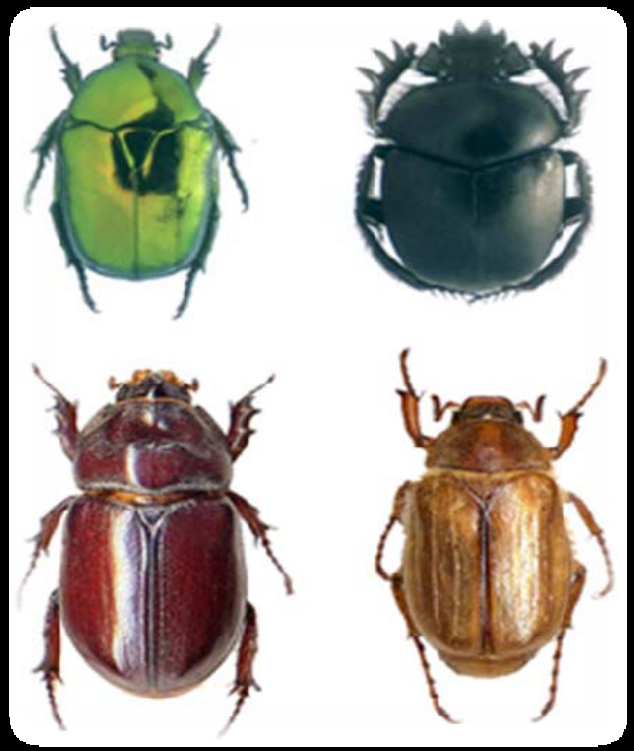
2

ADULT *SPIROCERCA LUPI* WORMS REMOVED FROM A DOG'S BODY

Lifecycle

S.Lupi needs several hosts to complete its lifecycle

PRIMARY HOST:	INTERMEDIATE HOST:	TRANSPORT HOST:
Dog	Dung Beetle	Birds. Lizards, rodents



Lifecycle

PRIMARY HOST:

Dog

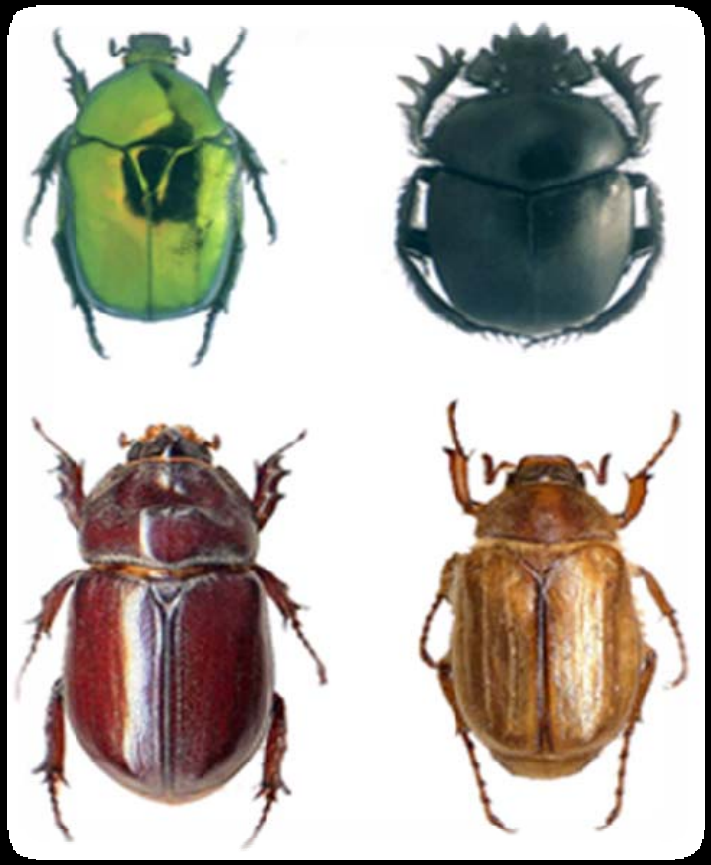
Adult worms live in nodules in a dog's oesophagus. *S. Lupi* Eggs are passed in the faeces and vomit of infected dogs

S.Lupi enters the dog's body through the ingestion of either an intermediate or transport host

Lifecycle

INTERMEDIATE HOST:

Dung Beetle



Dung beetles ingest S. Lupi eggs from dog faeces. The larvae hatch and develop to infectivity inside the beetle

Lifecycle

TRANSPORT HOST:

Birds. Lizards, rodents

Transport hosts ingest the infected dung beetle.
The larvae then lodge into the bodily tissue of the transport host

Lifecycle in Dog

INGESTION

Once the dog has eaten a beetle or other host carrying larvae of *Spirocerca lupi*, the larvae are released within the dog's stomach during the digestive process. The larvae penetrates through the stomach wall, and migrates in the arteries to the aorta (the main artery in body)

Timeframe: 10 days

Lifecycle in Dog

LARVAE MATURATION

The larvae stay in the aorta and mature into immature adult worms. When ready the worms burrow through the wall of the aorta into the oesophagus

Timeframe: 10-12 weeks post ingestion

Lifecycle in Dog

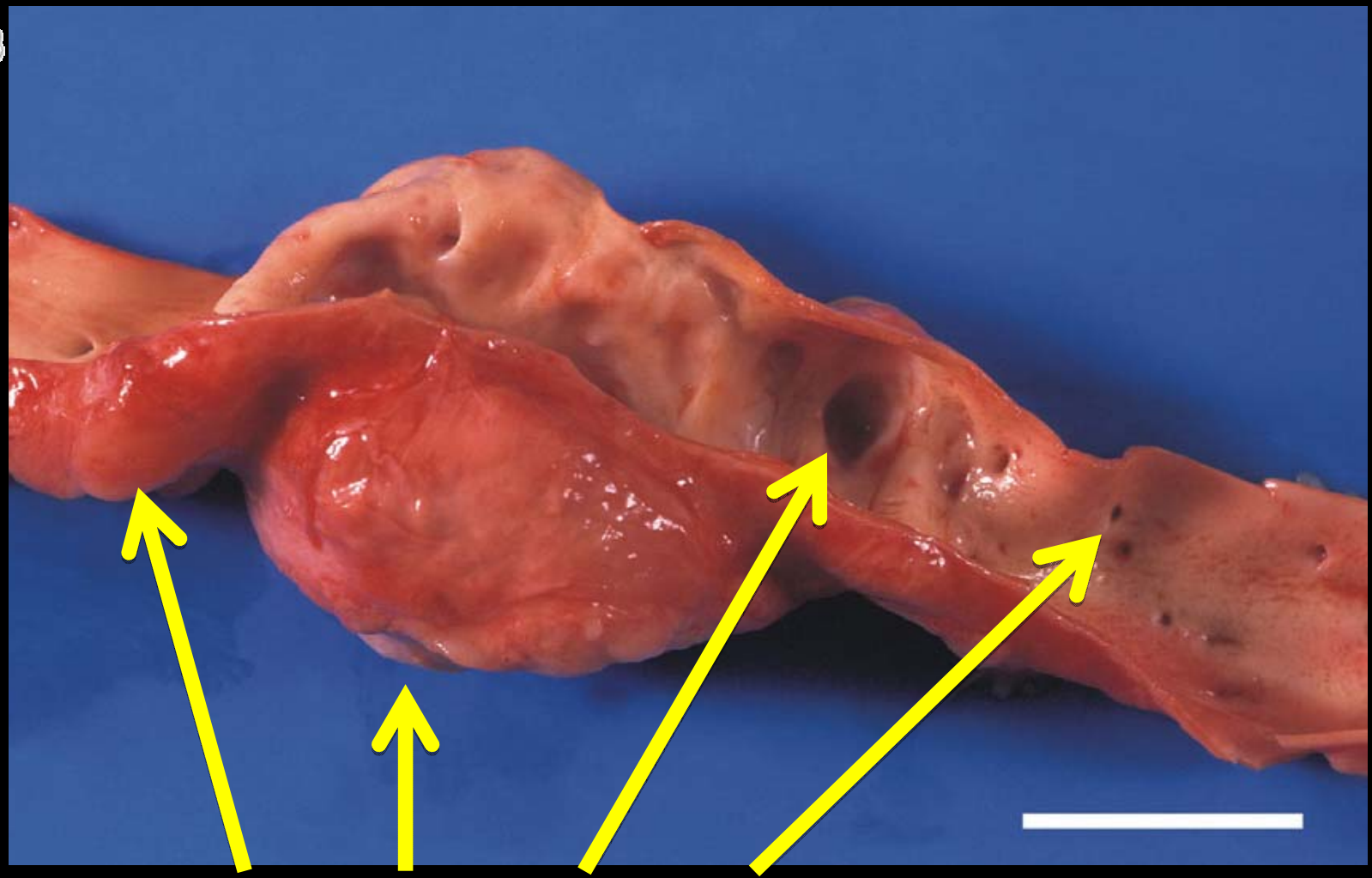
How do larvae move through the body?

The larvae are small and have strong muscles which enable them to move. Larvae also secrete enzymes which make tissues easier to penetrate

This combination of powerful movement and enzymes allows *S.Lupi* to move through cells with ease!

Lifecycle in Dog

This is a photo of a dissected canine aorta



Notice the widespread scars. These are caused by *S.Lupi* burrowing through the aorta into the oesophagus

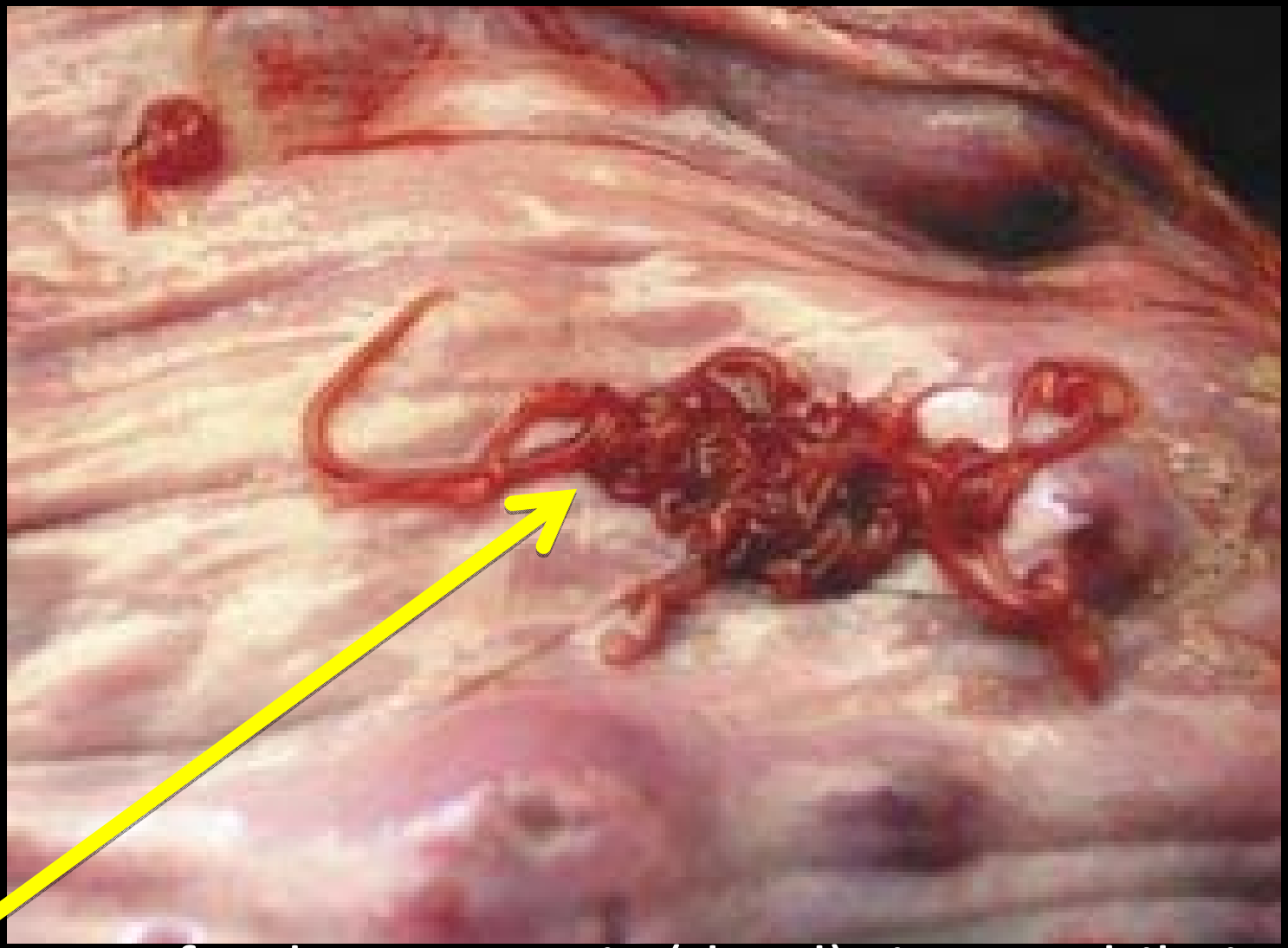
Lifecycle in Dog

SEXUAL MATURITY

In the oesophagus the worm forms a nodule around itself to protect it from the dog's immune system. Worms live, mature and differentiate sexually in these nodules. Once mature female worms lay eggs which are fertilised by male worms

Timeframe: 3-9 months post ingestion

Lifecycle in Dog



Adult worms feed on necrotic (dead) tissue while inside the nodule. They also feed on blood, hence their red colour

Lifecycle in Dog

EGG RELEASE

Females perforate the nodule to create an opening into the oesophagus. Eggs are passed through this opening and move through the digestive tract and are excreted in vomit or feaces

Timeframe: An adult worm can remain in the oesophagus for up to 2 years and produce up to 3 MILLION eggs per day

Aberrant Migration

Only 47% of *S.Lupi* larvae ingested complete their lifecycle from the stomach, into the aorta and finally into the oesophagus.

The other 53% of the larvae migrate randomly into other parts of the body

This random migration may cause various complications! These will be explored later…

Transmission

As mentioned *S.Lupi* is transmitted by dogs ingesting either dung beetles and other transport hosts such as birds

A possible transmission route is through the consumption of raw meat, especially chicken! Chickens can serve as transport hosts for *S.Lupi*

Transmission

S.Lupi is **NOT TRANSMITTED** by direct ingestion of faeces or faecally contaminated water

Given the complex lifecycle of *S. Lupi*, direct faecal transmission is not possible

Transmission

S.Lupi is **NOT CONTAGIOUS**

to humans!

Spirocercosis

Spirocercosis is a term for the infection and resulting symptoms caused of by *S. Lupi*

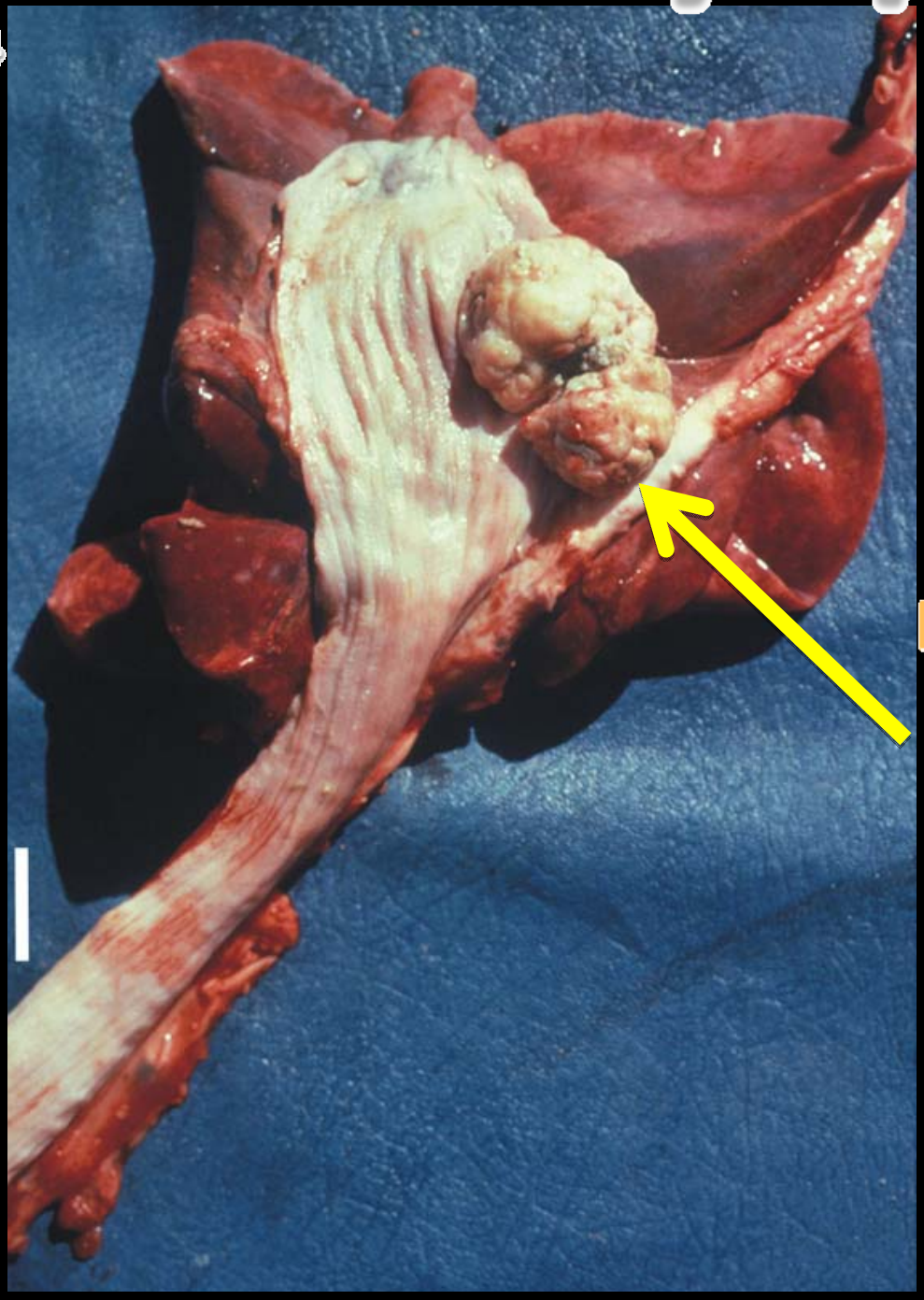
Symptoms

The nodules formed by *S.Lupi* in the oesophagus grow and obstruct the path of food and air.

This results in:

- **DIFFICULTY BREATHING AND SWALLOWING**
- **VOMITING**
- **REGURGITATION**
- **EXCESSIVE SALIVATION**

Symptoms



Canine oesophagus infected by *S.Lupi*

Notice the cauliflower like mass attached to the oesophagus

This is a *S.Lupi* nodule called a

GRANULOMA

Complications

Several **medical complications** may arise as a result of *S.Lupi* infection

Complications

Often the granulomas formed by *S.Lupi* degenerate into a variety of malignant cancerous masses:

- **OSTEOSARCOMA**
- **FIBROSARCOMA**
- **SQUAMOUS-CELL CARCINOMA**

Complications

Close up of a canine oesophagus infected by *S.Lupi*

5

The bulging mass is an advanced sarcoma which developed from a *S.Lupi* granuloma

Complications

When immature worms move from the aorta into the oesophagus they cause damage to the wall of the aorta

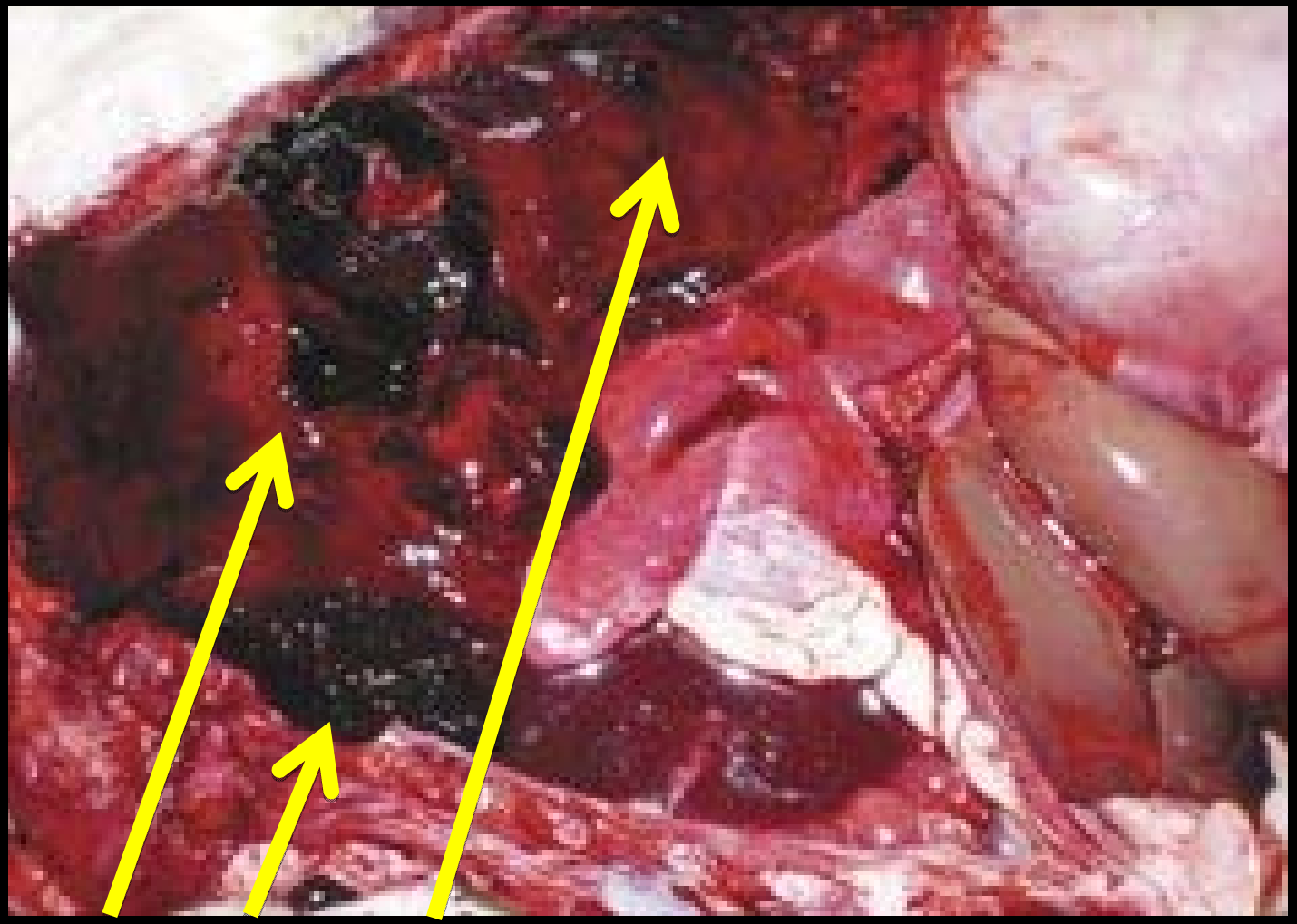
This damage may result in the **aorta rupturing** causing

MASSIVE INTERNAL BLOOD LOSS AND SUDDEN DEATH!

Complications

Close up view of an opened canine chest cavity

6

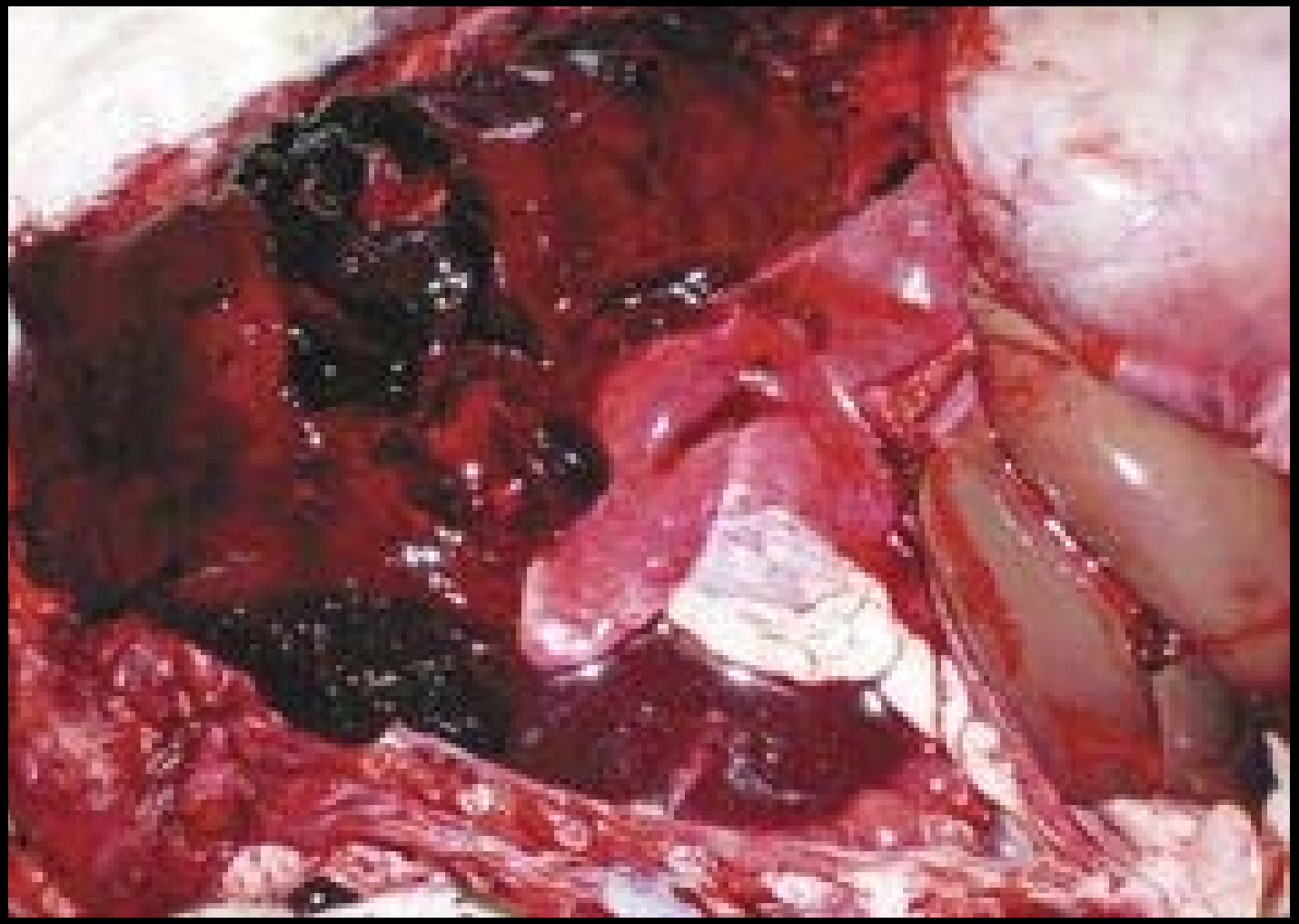


Notice the large amount of free lying clotted blood.

This is due to a ruptured aorta, caused by *S.Lupi* migration

Complications

Close up view of an opened canine chest cavity



Alarmingly a ruptured aorta can occur BEFORE any other symptoms of *S.Lupi* infection!

Complications

S.LUPI INFECTION ALSO PUTS DOG'S AT GREATER RISK OF CONTRACTING SECONDARY BACTERIAL INFECTIONS

Aberrant Migration

As mentioned earlier the random migration of *S.Lupi* larvae may result in medical complications.

These will be elaborated upon now...

Aberrant Migration

SPONDYLITIS IS AN INFLAMMATION OF THE VERTEBRAE AND VERTEBRAL DISCS

It can result in lameness and lethargy. It may even lead to irreparable spinal damage

If *S.Lupi* migrates into the spine it may bring about this condition

Aberrant Migration

Close up view of a canine thoracic (mid-back) vertebrae affected by *Spondylitis*

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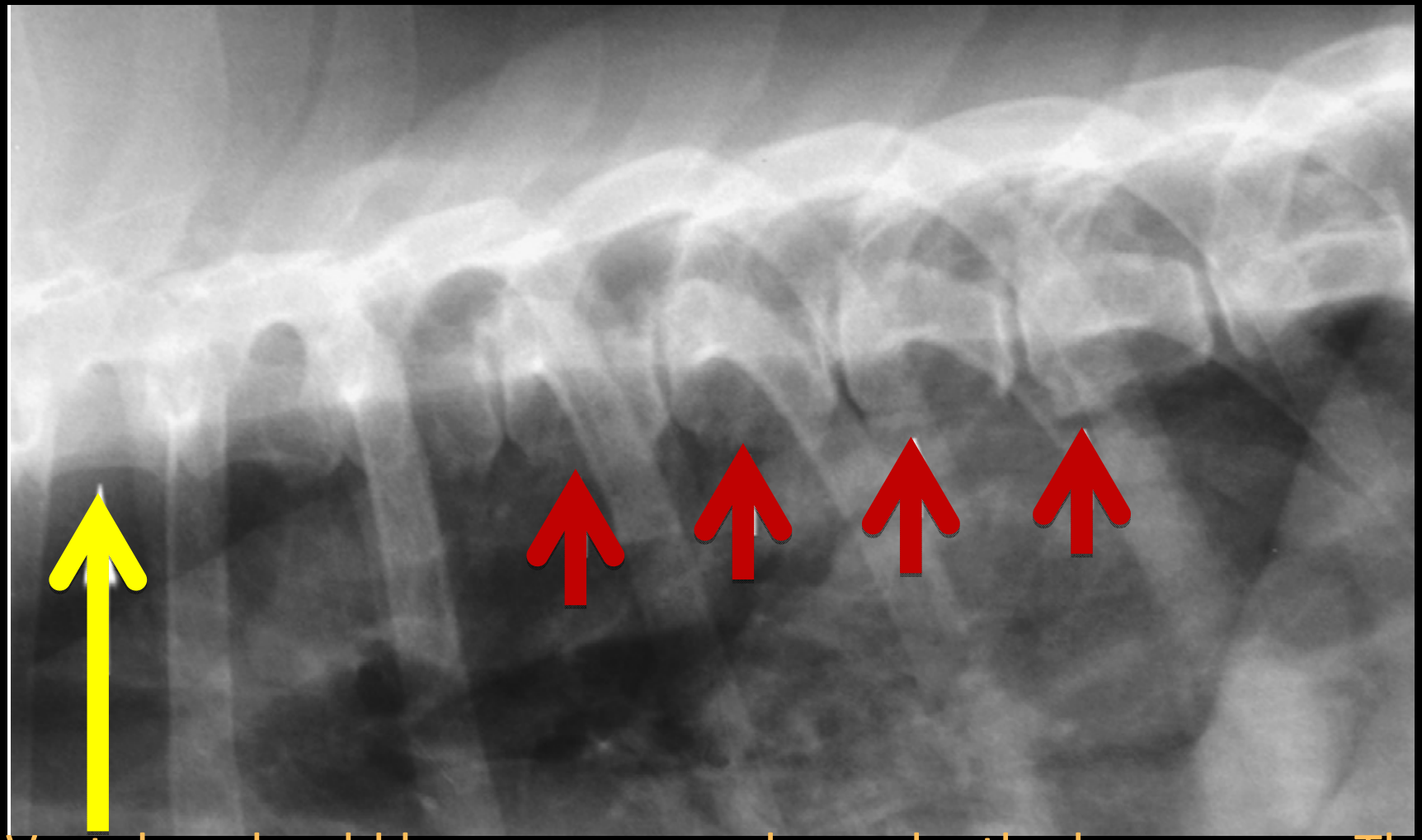


Vertebra should be concave as shown by the long arrow. The vertebrae shown by the short arrows however are more convex due to inflammation

Aberrant Migration

HYPERTROPHIC OSTEOPATHY IS A DISEASE THAT CAUSES SEVERE SWELLING OF THE LOWER LIMBS

While the exact cause of Hypertrophic osteopathy is still not fully understood. Spirocercosis infections have been linked to this condition

Symptoms of Hypertrophic osteopathy are often observed **BEFORE** any digestive or respiratory signs

Aberrant Migration

Dogs suffering from Hypertrophic osteopathy

Notice the severe swelling of the lower limbs in both pictures

Aberrant Migration

NODULES CONTAINING WORMS CAN FOUND IN THE STOMACH AND CHEST CAVITY

S.Lupi found in other locations in the body cause tissue damage and leave lesions (scars). They may also disrupt the overall functionality of the organs/tissue they infect

Diagnosis

Early detection is extremely challenging

If you suspect a *S.Lupi* infection discuss the best diagnostic methodology with your Vet

UNFORTUNATELY MOST ANIMALS ARE ONLY DIAGNOSED ONCE ADVANCED DISEASE IS ALREADY PRESENT

Diagnosis

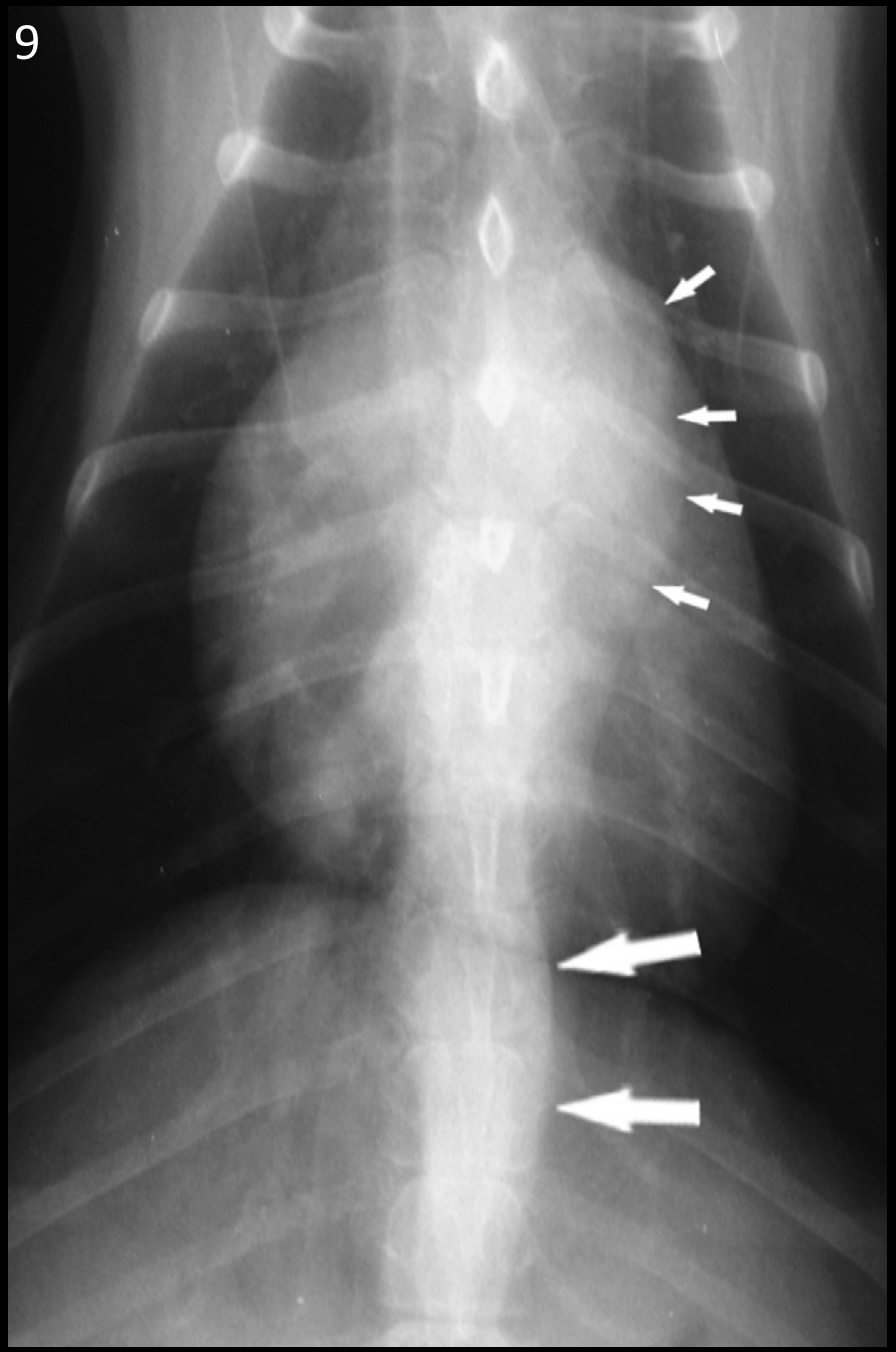
FAECAL FLOTATION

While it is possible for *S.Lupi* eggs to be detected in faeces, faecal floations have limitations:

- *S.Lupi* eggs are small and difficult to detect in standard flotation preparations

- Eggs are shed intermittently, this makes accurate diagnosis difficult

Diagnosis



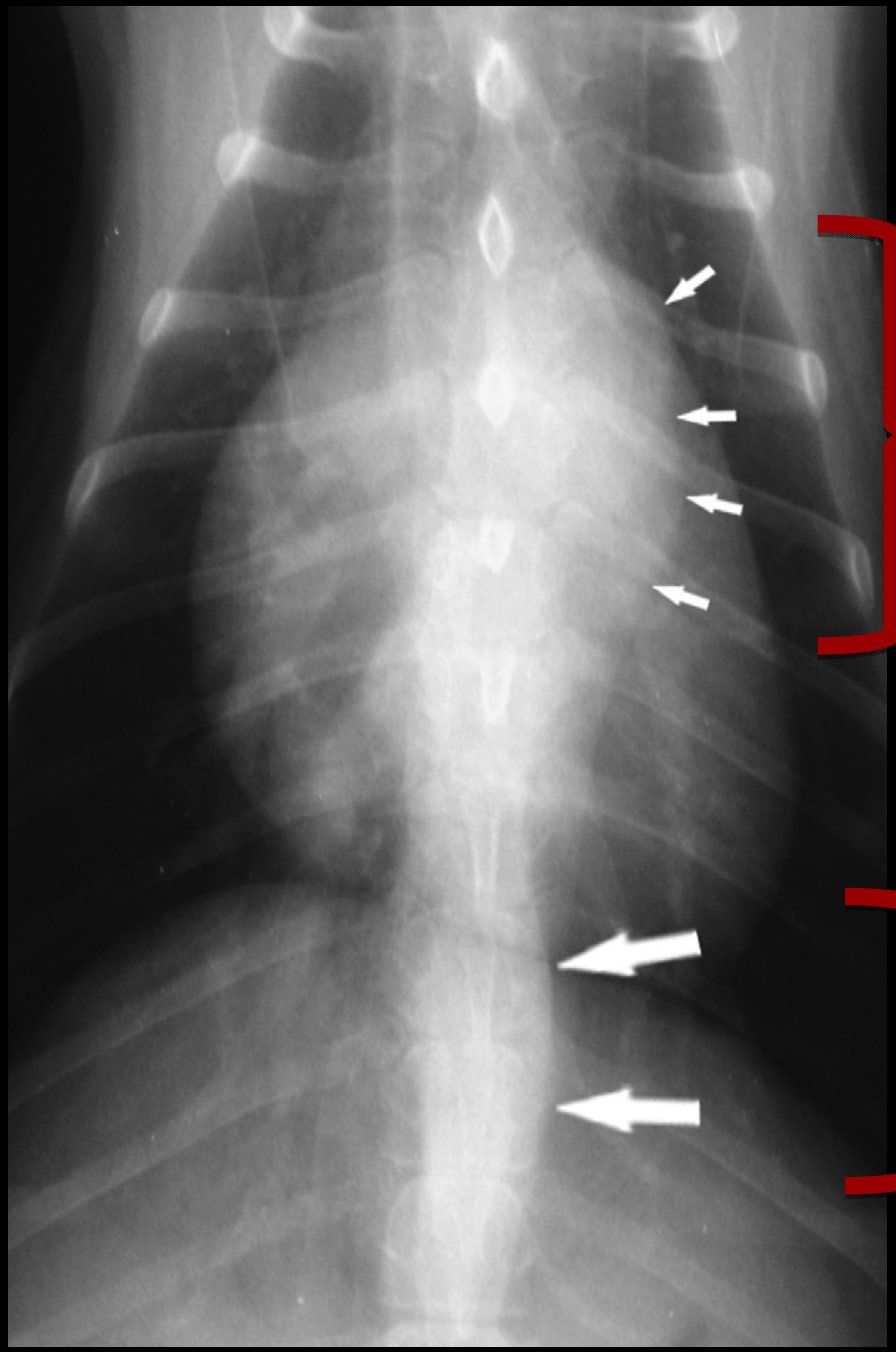
RADIOGRAPHY

Radiography plays an important in the diagnosis of *Spirocercosis*

Oesophageal masses and other abnormalites caused by *S.Lupi* can be seen directly in x-rays

Radiography also has the benefit of being non-invasive and easy to perform

Diagnosis



A radiograph of the chest cavity of a dog

The bulge indicated by the short arrows shows multiple lesions in the aorta caused by *S.Lupi*

The large arrows show the beginnings of a *S.Lupi* granuloma in the oesophagus

Diagnosis

ENDOSCOPY

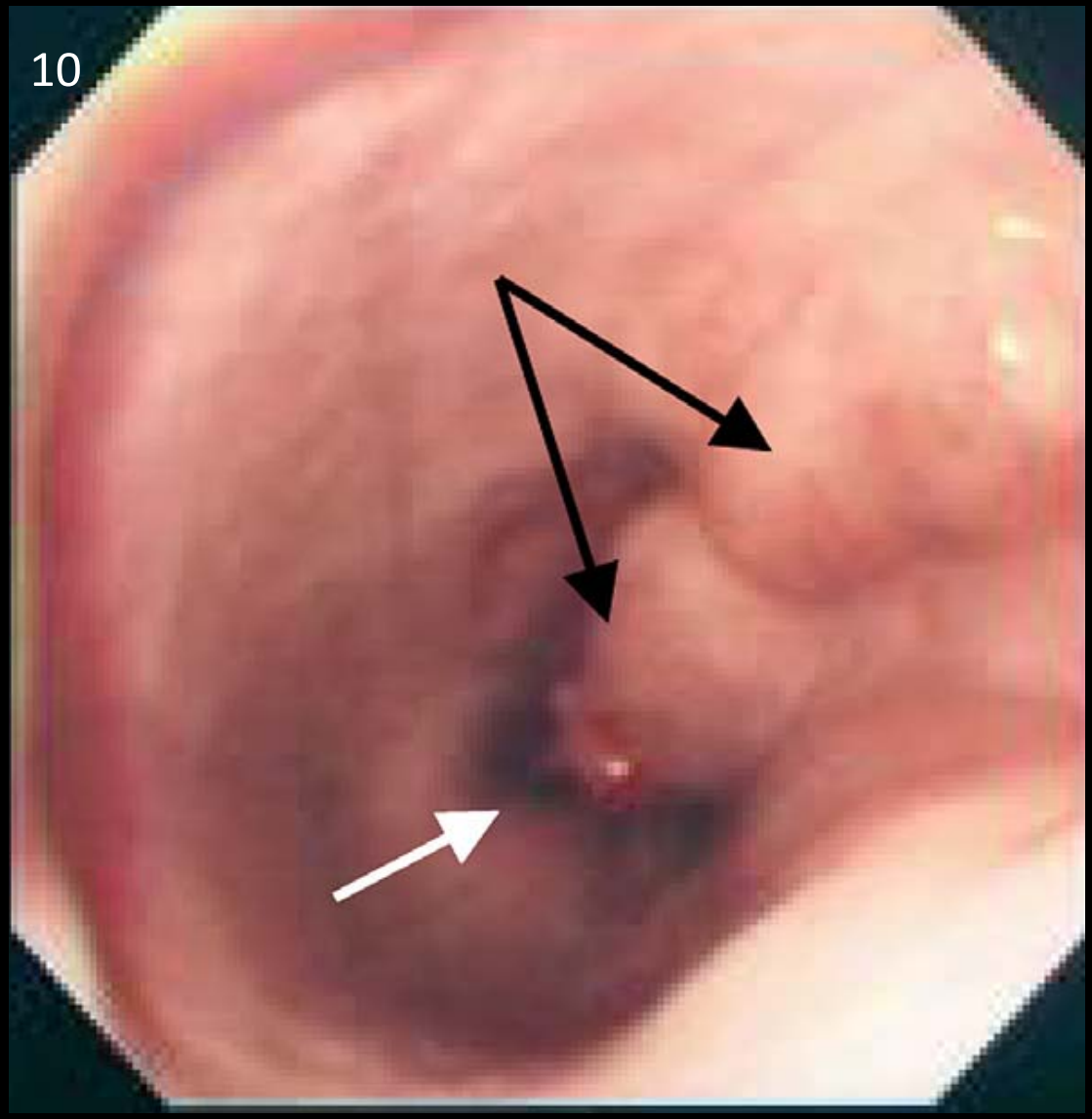
An endoscopy involves a medical camera being passed through the mouth down the oesophagus to visualize the oesophageal wall

Small nodules in the early stages of the disease which could be missed in x-rays can be detected by endoscopy. The extent of *Spirocercosis* can also be evaluated.

Endoscopies must however be done under anesthesia and not all veterinary practices have the necessary equipment

Diagnosis

ENDOSCOPY IMAGES



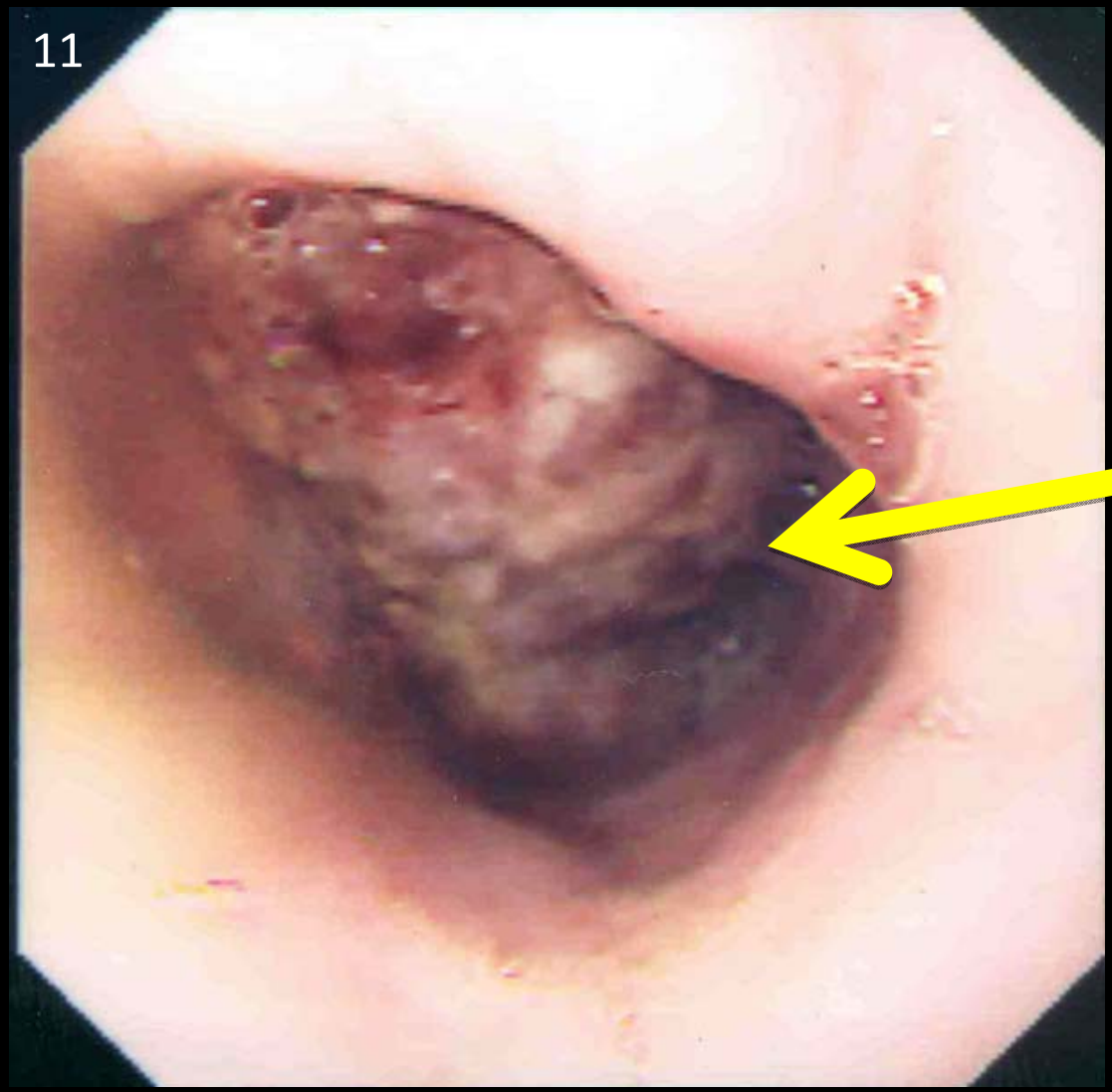
Oesophageal endoscopy showing a typical case of *Spirocercosis*

The two black arrows show two *S.Lupi* nodules

The white arrow shows a pink tip through which the female will lay eggs

Diagnosis

ENDOSCOPY IMAGES



Oesophageal endoscopy showing a case of *Spirocercosis*

The necrotic grey-green mass is and S.Lupi associated oesophageal sarcoma (cancerous mass)

Treatment

This information is purely educational and DOES NOT constitute medical advice

Before adopting ANY medical treatments please consult with your Veterinarian!

Treatment

Research is still ongoing into the most effective means of killing all stages of *S.Lupi.*

What is clear however is that:

MOST ROUTINE DEWORMERS HAVE NO EFFECT OF *S.LUPI*

Treatment

MILBEMYCIN

Milbemycin oxime, trade name MILBEMAX® is a broad spectrum dewormer that has proven effective against *S.Lupi*

MILBEMAX® is available as a palatable chewable tablet. Dosage is based on weight.

Appropriate dosage amount and frequency should be done in consultation with you Vet

Treatment

MILBEMYCIN

MILBEMAX® is intended for use in dogs and has NO major risks or side effects

It is also safe to use on pregnant & lactating bitches

Treatment

DORAMECTIN

Doramectin, trade name DECTOMAX® is a livestock deworming product which has proven effective against *S.Lupi*

Doramectin, has been proven to eradicate all non cancerous nodules, kill worms and stop secondary symptoms of *Spirocercosis*

Treatment

DORAMECTIN

Doramectin is injected subcutaneously

Dosage quantity and frequency are based on a dog's weight and the severity of infection

Proper dosage should be decided in conjunction with your Veterinarian

Treatment

DORAMECTIN

It should be noted that Doramectin is a drug used for livestock, and is <u>not registered for the use in dogs</u>. Therefore owners have their dogs treated with this drug at their own risk

Doramectin is also **<u>TOXIC</u>** to all Collies and Collie cross and should NEVER be administered to these dogs!!

Treatment

IVERMECTIN AND PREDNISOLONE

A combination treatment of *Ivermectin* (trade name Ivomec) and *prednisolone* a corticosteroid has been suggested as effective against *S.Lupi*

Ivermectin kills the parasite while the prednisolone reduces inflammation and promotes the regression of *S.Lupi* nodules

Treatment

IVERMECTIN AND PREDNISOLONE

Ivermectin and *predinisolone* are available in various forms. The dosage and frequency should be done in conjunction with your Vet

Treatment

IVERMECTIN AND PREDNISOLONE

Ivermectin is also **TOXIC** to all Collies and Collie crosses and should NEVER be administered to these dogs!!

Prevention

GOOD SANITATION & HYGIENE!

Remove ALL faeces from the dog's environment

as soon and as often as possible

By removing faeces regularly, the risk of dung beetles and their associated predators such as birds is greatly reduced. This helps in preventing *S.Lupi* infection!

Prevention

RAW MEAT DIETS

The feeding of raw meat can lead to *S.Lupi* infection

Raw diets are a controversial issue and this presentation does not wish to enter into this debate

However as mentioned earlier, chicken is a noted transport host for *S.Lupi.* By feeding dogs raw chicken the risk of *S.Lupi* infection is greatly increased. Cooking meat kills *S.Lupi* and thus makes the meat safer to eat

Prevention

REGULAR PARASITE CONTROL MEASURES

In order to ensure long term prevention and maintenance of parasites, including *S.Lupi* a routine parasite management program must be established and followed

This is best done in consultation with your Vet!

Many thanks to Emeritus Professor Department of Veterinary Tropical diseases Joop Boomker for graciously sharing his wealth of knowledge

Bibliography

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3. L.L. van der Merwe et al./ *Spirocerca lupi* infection in the dog: A review, The Veterinary Jouranl 176 (2008), 296
4. L.L. van der Merwe et al./ *Spirocerca lupi* infection in the dog: A review, The Veterinary Jouranl 176 (2008), 296
5. Bullmastiff Club SA, Spirocerca lupi: A cautionary tale, be aware of this worm that kills, viewed 16 November 2011, http://www.bullmastiffclubsa.co.za/Components/GetFile.aspx?fileID=1462
6. Last R., Smith R., Spirocerca lupi: fascinating new facts and research opportunities, viewed 16 Nov 2011, www.vetdiagnostix.co.za/download.php?File...PHPSESSID…
7. L.L. van der Merwe et al./ *Spirocerca lupi* infection in the dog: A review, The Veterinary Jouranl 176 (2008), 302
8. Last R., Smith R., Spirocerca lupi: fascinating new facts and research opportunities, viewed 16 Nov 2011, www.vetdiagnostix.co.za/download.php?File...PHPSESSID…
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11. L.L. van der Merwe et al./ *Spirocerca lupi* infection in the dog: A review, The Veterinary Jouranl 176 (2008), 305

Recommended Reading

1. L.L. van der Merwe et al./ *Spirocerca lupi* infection in the dog: A review, The Veterinary Jouranl 176 (2008), 296
2. Bullmastiff Club SA, Spirocerca lupi: A cautionary tale, be aware of this worm that kills, viewed 16 November 2011, http://www.bullmastiffclubsa.co.za/Components/GetFile.aspx?fileID=1462
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