

RECOVERY OF HELMINTHS POSTMORTEM FROM EQUINES. I. PARASITES IN ARTERIES, SUBPERITONEUM, LIVER AND LUNGS

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ABSTRACT

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The entire gastro-intestinal tract and viscera of the abdomen and thorax, including the heart, aorta and its branches to the viscera, are removed from the carcass. All the branches of the aorta, with the exception of the *A. gastrica sinistra*, are dissected from the intestinal tract, and subsequently each branch is isolated from the mesentery, fat, pancreas, kidneys, etc. Usually, the *A. ileocolica* is grossly enlarged due to chronic arteritis with thrombus formation caused by 4th stage larvae, 4th moult and 5th stage *Strongylus vulgaris*. Descriptions of methods to examine the subperitoneal tissues, liver and lungs are included.

Résumé

RÉCUPÉRATION POST-MORTEM D'HELMINTHES ÉQUINS. I. PARASITES DES ARTÈRES, DU PÉRITOINE, DU FOIE ET DES POUMONS

L'ensemble du tractus gastro-intestinal et des viscères de l'abdomen et du thorax, incluant le cœur, l'aorte et ses branches jusqu'aux viscères sont enlevés de la carcasse. Toutes les branches de l'aorte, à l'exception de l'*A. gastrica sinistra*, sont disséquées de l'appareil intestinal et ensuite, chaque branche est isolée du mésentère, de la graisse, du pancréas, des reins, etc. Habituellement, l'*A. ileocolica* est fortement agrandie à cause d'une artérite chronique et une thrombose causée par des larves de 4^{me} stade, 4^{me} mue et 5^{me} stade de *Strongylus vulgaris*.

Des descriptions et des méthodes pour examiner les tissus sous péritonéaux, le foie et les poumons, sont incluses.

INTRODUCTION

Apart from Rooney (1970), most authors describing autopsy techniques fail to mention the examination of the aorta and arteries supplying blood to the small intestine, caecum and colon. It has been conclusively proved that a major cause of colic in horses is 4th stage larvae (L₄) and 5th stage *Strongylus vulgaris*, which cause arteritis, embolism and thrombosis with resulting infarction in those parts of the intestinal tract supplied by the affected artery (Duncan & Pirie, 1973; Ogbourne & Duncan, 1977; Drudge, 1979).

This paper describes simple techniques to locate these lesions and recover the developmental stages of *S. vulgaris* from the arteries and those of *Strongylus edentatus* subperitoneally. The liver is examined for these helminths as well as for the larval stages of *Echinococcus* spp., while the lungs are examined for *Dictyocaulus arnfieldi* and the larval stages of *Echinococcus* spp.

MATERIALS AND METHODS

Postmortem

Exposure of the viscera

The cadaver is placed on its back and a knife used to incise the skin and underlying tissues along the ventral mid-line from the intermandibular space to the perineal region. Special precautions are taken when opening the abdominal cavity to avoid puncturing the gut. The left abdominal wall is removed between the last rib and the terminal line and between the linea alba and the lumbar region.

The forelimbs are abducted and the sternum is split with powerful, long-handled pruning shears† which give the worker considerable mechanical advantage. The costal attachment of the diaphragm is cut on both sides and the left forelimb removed. The horse is then placed on its right side.

The skin and underlying muscles are removed along the left rib cage, exposing the rib angles. The rib angles are cut with the long-handled pruning shears and the thoracic wall is removed. The pelvic symphysis is then sawn through in the ventral mid-line.

Removal of the viscera

With a sharp-pointed knife 2 longitudinal incisions are made along the medial aspect of the mandible in the intermandibular space, starting rostrally at the body of the mandible. The index finger and thumb are pushed into the mouth from the ventral aspect, the tip of the tongue grasped firmly and the tongue pulled through the intermandibular space. With firm traction the tongue is pulled caudally, the hyoid bone incised and the pharynx and larynx removed. The trachea and oesophagus are pulled ventrally and dissected away from the ventral aspect of the neck. The attached thoracic organs are removed by an incision along the ventral aspect of the spine. The diaphragm is severed at the pillars dorsally to the hiatus aorticus and the incision continued caudally, dorsal to the abdominal aorta to its bifurcation. Ligatures are placed around the external and internal iliac arteries to serve as markers, and they are then severed to release the aorta and its branches. The anus and rectum are dissected from the pelvic cavity. The viscera are positioned to expose the blood supply of the colon.

Removal of the arteries

The terminology used below originates from *Nomina Anatomica Veterinaria* (1973). The abbreviations used are *A.* for *Arteria*, *Aa.* for *arteriae* (more than 1), *R.* for *Ramus* and *V.* for *vena*. The arteries are illustrated in Fig. 1.

The major lesion caused by *S. vulgaris* is usually confined to the *A. ileocolica* (Fig. 2). This region is always palpated before the arteries are opened. The major lesion is left intact until all the minor arteries to the gut have been opened. The tissue surrounding the lesion is removed by blunt dissection. Before an artery is opened, it is palpated and the

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size and nature of lesions are recorded. After an artery is opened, the state of the intima is noted and any worms present are counted and preserved in 10% formalin for subsequent microscopic examination.

Starting at the pelvic flexure (Fig. 1), the *A. colica dextra* is opened with small, curved, blunt-pointed scissors to a point distal to the major lesion and about 100 mm from the *A. ileocolica*. The *R. colicus* is opened in the same manner and then the *Aa. caecales* (double in equines), starting from the tip of the caecum.



FIG. 1 *A. mesenterica cranialis* and *A. mesenterica caudalis* of the horse. Semi-schematic. a. Stomach; b. Duodenum; c. Jejunum; d. Ileum; e. Caecum; f. Colon ascendens; g. Colon transversum; h. Colon descendens; k. Rectum

1. *A. mesenterica cranialis*; 2. *A. pancreaticoduodenalis caudalis*; 3. *Aa. jejunalis*; 4. *Aa. ilei*; 5. *A. ileocolica*; 6. *R. colicus*; 7'. *A. caecalis medialis*; 7''. *A. caecalis lateralis*; 9. *R. ilei mesenterialis*; 10. *A. colica dextra*; 11. *A. colica media*; 12. *A. mesenterica caudalis*; 13. *A. colica sinistra*; 15. *A. rectalis cranialis*

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FIG. 2 The aorta and branches of the *A. cranialis mesenterica*. Note the chronic arteritis of the *A. ileocolica* caused by larvae and 5th stage *S. vulgaris*

The mesentery is removed from the duodenum, jejunum and ileum. The mesojejunum with the *Aa. jejunalis* remains intact at the point where the latter branch from the *A. mesenterica cranialis*. Two ligatures are tied around the transverse colon where the faeces start becoming hard. The *mesocolon*

descendens containing the *A. mesenterica caudalis* and its branches is removed from the descending colon and rectum. Care is taken to locate and isolate the short *A. colica media* which supplies blood to the transverse colon.

Subsequently, the remaining mesentery is removed by blunt dissection. The *A. coeliaca* and its branches are palpated and only the *A. gastrica sinistra* dissected from the stomach, freeing the entire gastro-intestinal tract from its major blood supply. The lungs, heart, aorta with all its major branches, spleen, liver and kidneys are placed in a plastic tray for detailed dissection.

Examination of arteries

The heart, lungs, liver, spleen and kidneys are removed from the aorta and its branches for examination at a later stage. Artery forceps are attached to each branch of the *A. mesenterica cranialis*, using the aorta, *Aa. iliacae*, *A. colica dextra* and *R. colicus* as landmarks. By a combination of blunt dissection and careful cutting with small (20 cm long), curved, blunt-pointed scissors, the mesentery, pancreas, suprarenal glands, lymph nodes, fat, ligaments, *V. cava caudalis* and its branches are carefully removed.

Finally, the aorta and its branches related to the lesion(s) caused by *S. vulgaris* are separated from the surrounding tissues (Fig. 1 & 2). The shape of the lesion resembles an aneurysm but, according to Ogbourne & Duncan (1977), this diagnosis is incorrect, because the arterial wall is markedly thickened and fibrotic due to a chronic arteritis, which is illustrated in Fig. 2. The measurements of the lesion(s) and their configuration are recorded. Thereafter, the aorta is cut open and its narrow branches are opened with the small scissors and forceps, and the entire lesion exposed with artery forceps. Thrombi are noted, larvae removed and placed in saline for later microscopical examination to determine whether they are alive and also their stage of development. Thereafter, the intima of the blood vessels may be scraped and digested if necessary for the possible recovery of worms. Alternatively, the lesion may be placed in formal-saline for examination by a pathologist.

Abdominal peritoneum

The larvae of *S. edentatus* migrate under the abdominal peritoneum in the right abdominal wall (Wetzel, 1952; Wetzel & Kersten, 1956). Both the left and right walls are examined for lesions and larvae of *S. edentatus* removed (Duncan, McBeath & Preston, 1980).

These parasites form haemorrhages, ranging from small haematomas 3-5 mm in size to large subperitoneal suggillations 10 cm in diameter. Any visible haemorrhages are incised, the size and appearance of the lesion recorded, and larvae and 5th stage *S. edentatus* removed.

With a very sharp knife the peritoneum is dissected from the underlying tissue and the muscle layers are separated from each other. In the RSA *S. edentatus* is not common and we have seldom found these lesions despite diligent search.

Liver

Larval stages of *Strongylus equinus* and *S. edentatus* migrate through the liver, but are rarely found intact.

McCully, Kruger, Basson, Ebedes & Van Niekerk (1969) reported round lesions in the livers of zebras caused by 5th stage *S. vulgaris*. Verminous nodules white in colour and often with calcification caused by strongyles and *Parascaris equorum* are frequently found in older horses. Since larval stages of *Echinococcus* spp. are occasionally present, the intact liver is palpated for these cysts. Thereafter, the liver is cut into slices 5–10 mm thick and examined for all the lesions described.

Lungs

Dictyocaulus arnfieldi is reported from the donkey and, more rarely larval stages of *Echinococcus* spp. are found in equines. The lungs are palpated for cysts which are then excised, the bronchi opened, and any *D. arnfieldi* present removed.

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