



ORIGINAL RESEARCH PAPER

Zoology

STUDIES ON THE LYMPHATIC SYSTEM OF SOME AMPHISTOMATOUS PARASITES OF BUFFALO

KEY WORDS: Lymphatic system, Buffalo, Amphistomatous parasite.

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ABSTRACT

The lymphatic system in few amphistomes and discussed the relationship between it and the excretory system. He is of view that practically it is not possible to consider it for classification purpose. The lymphatic system has been known to exist in only a few families of trematodes, specially in the families Paramphistomatidae, Microseaphididae, Cyclocoelidae, Heronimidae, and S.pirorchidae. It has also been reported from a monogenetic genus. The system represents a primitive circulatory system of simple flattened mesenchyma cells and contains a fluid resembling the primitive invertebrate blood.

INTRODUCTION

The lymphatic system has been known to exist in only a few families of trematodes, specially in the families Paramphistomatidae, Microseaphididae, Cyclocoelidae, Heronimidae, and S.pirorchidae. It has also been reported from a monogenetic genus. The system represents a primitive circulatory system of simple flattened mesenchyma cells and contains a fluid resembling the primitive invertebrate blood. Van Beneden as early as 1893, showed the lymphatic ducts in a monostome without giving any explanation. Walter (1893) interpreted these ducts as excretory ducts. Looss (1896) identified the lymphatic ducts as a part of the excretory system, with a change of function.

Alvey & Martin (1934) studied it in genus of monogenea also. Willey (1935 & 54) showed a relationship between the excretory and lymphatic systems and even expressed the two systems to be identical in the early stages of the life, an observation which needs further verification and study. Tandon (1951 & 55) described it in a few amphistomes. Morishi (1924) described it in a monostome. Fukui (1929) described it in a number of amphistomes Jain (2001) also described the lymphatic system in few amphistomes and discussed the relationship between it and the excretory system. He is of view that practically it is not possible to consider it for classification purpose.

MATERIALS AND METHODS

The live worms of amphistomes, though present in smaller number, in the ruminants slaughtered in the local slaughter house could be obtained during the different parts of the year. Gravid as well as very small immature worm can be obtained during the different months of the year. The worms are flattened under pressure of the two slides tied together with a thread and fixed in a concentrated solution of acidic Corrosive sublimate from 10 — 24 hours. After fixation these are washed first in distilled water, then in tap water from an hour to several hours depending upon the size of the worm, as very thin and small worms require a shorter washing period. It is always better to change the water two or three times and to examine the individual worms under the binocular for proper washing.

After washing the worms are treated with 0.5% solution of Sodium-thio-sulphate and washed again. In glycerin mounts the lymphatic ducts appear to be yellow. The permanent preparations are not possible as the precipitate formed in the ducts is washed off during dehydration.

The other method for the fixation of the system has also been quite satisfactory. The live worms are pressed between the two slides and kept either in a large petri-dish or a specimen tube and boiling 90% alcohol is poured over them. The lymphatic ducts become very prominent due to the coagulation of the lymphatic fluid within and are fixed with the worm. The worms are cleared in glycerin and studied as such. The ducts so fixed take Borax carmine and Carmine alum stains and their permanent preparations can be made, but as all other parts of the body also take the stain the prominence of the ducts is lost. The smaller worms are directly

studied in the live condition, and both the excretory and lymphatic systems can be seen simultaneously.

OBSERVATIONS

***Carmyerius spatiosus* (Stiles & Goldberger. 1910) Nasmark, 1937 (Plate 1)**

The lymphatic system consists of two main longitudinal lymphatic ducts which run along the entire length of the worm, on its dorsal side, internal to the intestinal caeca, except for a short distance in the anterior region where they run external to the caeca. Each longitudinal duct divides into two branches, near the middle of the acetabulum, one branch supplies the dorsal side, while the other runs postero-laterally giving a large number of branches to the postero-ventral part of the acetabulum, forming a net work around it.

At the anterior end also the main longitudinal duct divides into two branches at the level of the oral sucker. One of the branches runs singly in a zigzag course from the anterior end of the oral sucker to the level of the intestinal bifurcation, while the other divides into two and follow the same course as the first supplying the oral sucker and the oesophagus. Near the oesophagus and the intestinal bifurcation the longitudinal duct gives three or four branches, each of which divides into two and all these supply the oesophagus, the intestinal caeca and the reproductive ducts in this region. The intestinal caeca are surrounded by a large number of branches from the longitudinal ducts of the respective sides. The lymphatic plexuses around the testes are formed by the transverse branches from the main ducts of the respective sides, while the ovary gets its supply from both the sides and the branches to it come also from those supplying the two testes. The excretory bladder, which is profusely surrounded by the lymph ducts, gets its branches from both the sides.

Besides these the longitudinal ducts give off a large number of branches in transverse direction to the general body both laterodorsally and lateroventrally as well as towards the median line. The branches are thin, slender, and wavy. These give off secondary, tertiary and quaternary branches, which extend to a great length in the transverse direction, resulting in the union of the branches of the two sides in the median line. The branches finally terminate in knobbed ends.

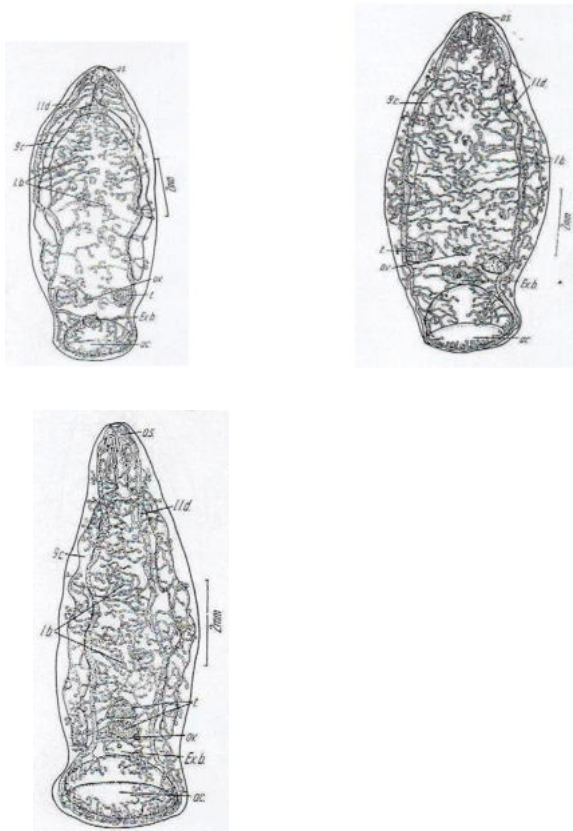
***Gastrothylax crumenifer* (Creplin, 1847) Stiles & Goldberger, 1910 (Plate 2)**

The lymphatic system consists of the two main longitudinal lymphatic ducts, which run more or less parallel and internal to the intestinal caeca, during their course, except for some distance in the anterior part of the body, where they run external to the caeca. Each longitudinal duct divides into two anterolaterally to the acetabulum, one of the branches supplies to the anterior and dorsal part, while the other runs laterally and its branches supply the lateral, ventral and posterior parts of the acetabulum. At the anterior end the longitudinal duct divides into two, each again

divides and thus 4 inverted U-shaped branches are given to the oral sucker on its either side. A little posterior to the oral sucker two or three lateral branches are given from the main duct of either side of the oesophagus. The intestinal caeca are surrounded by the lateral branches along their entire length. The two testes get their supply from the longitudinal duct of either side while the ovary and the excretory bladder are supplied from the branches of the two sides simultaneously. During their entire run the two longitudinal ducts give off thin and long branches, which may either curve round the caeca or may continue towards the middle of the body and supply the various organs lying in the region. These branches may be very long and very often reach and touch the branches of the other side, in the middle of the body. The lateral branches are simple in nature. No secondary branches are present near the oral sucker and the oesophagus, while the branches given to the rest of the body from the main ducts divide and sub-divide giving from two to eight secondary branches from the main lateral branch.

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Plates 1-3

Fiscoederius elongatus (Stiles & Goldberger 1910)(Plate 3)

In this species also the lymphatic system consists of a pair of longitudinal lymphatic ducts, running internal to the intestinal caeca, which occupy a very short space in the width of the body and though the intestinal caeca end nearly in the middle of the body length, the two ducts maintain the same distance between them till they reach the acetabulum. Each longitudinal duct gives two branches, which supply the dorso-lateral and dorso-ventral sides of the acetabulum and also the posterior end of the body. At the anterior end the long duct divides into two and each one gives two recurved branches to the oral sucker, around which these eight branches form a plexus. The testes, ovary and the excretory bladder, in this case are supplied by branches from the long ducts of the two sides. The intestinal caeca are, as usual, surrounded by a large number of the lateral branches, having two to four sub-branches, ending into ampullae or knobs. The branching is not so profuse and complicated as in the other species of the genus. The branches never sub-divide into more than four and are not too very long. These resemble more with the branches in *Gastrothylax crumenifer* than those in *Fiscoederius cobboldi*.