ULTRASTRUCTURE OF THE DIGESTIVE TRACT
OF LEUCOCHLORIDIUM PARADOXUM
METACERCARIAE

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Abstract. The digestive tract of L. paradoxum metacercariae is lined with two structurally distinct components. The posterior part of the oral sucker cavity and pharynx are covered with invaginated body tegument with a base of special structure. The ceca are lined with cecal cells possessing on the luminal side a great number of microvilli cemented with one another by a high layer of a dense substance. The basal plasma membrane of these cells forms infoldings. Under lamina basalis is a thick layer of muscles. The digestive tract of L. paradoxum metacercariae is morphologically prepared for the future resorptive function.

The present paper is a continuation of complex studies of the structural and functional peculiarities of L. paradoxum larval stages. It follows the studies of Ždárská (1981), Ždárská and Soboleva (1981) and Ždárská et al. (1982).

MATERIAL AND METHODS

The metacercariae were recovered from naturally infected snails Succinea alticola ecolata collected by Dr. Soboleva and Dr. Osipovskaya in the vicinity of Almas-Ata. The material was fixed in 3% glutaraldehyde in 0.1 M cacodylate buffer (pH 7.2) at 4 °C for 2 h and postfixed in 1% OsO₄ for 2 h. After dehydration through ethanol series and acetone the specimens were embedded in Araldite or Epon. Ultrathin sections made by Reichert's OM-U2 ultramicrotome were contrasted with 20% uranylacetate and Reynolds's solution and examined in a JEM 100 B electron microscope.

RESULTS

The digestive tract of L. paradoxum metacercariae comprises the oral sucker cavity, pharynx and ceca. The cavity of the oral sucker and pharynx is lined with a tegument almost identical with the body tegument. The trilaminar unit membrane on the surface of tegument is connected by its outer lamina with the filaments of glycoalcalyx. The tegument in the anterior part of the oral sucker cavity is identical with the body tegument (Plate I, Fig. 1), but the tegument in the posterior part of oral sucker and pharynx (Plate I, Figs. 2, 3) is thinner than the body tegument and differs from it in the structure of the basal layer. The basal plasma membrane of the tegument in posterior part of oral sucker and pharynx is connected by means of hemidesmosomes with lamina basalis. In some places it is separated from lamina basalis and forms large cavities (filled with a fine fibrillar material or optically empty) giving the basal part of tegument a lacunal appearance (Plate I, Fig. 1). In addition to this lacunal system, the tegument of the posterior part of oral sucker and pharynx contains a large number of rod-shaped granules and mitochondria. The rod-shaped granules are irregularly distributed in the basal part of tegument, whereas in the su-
peripheral part they are upright to the surface of tegument. Radial muscles of pharynx are attached to lamina basalis by a large number of hemidesmosomes (Plate I, Fig. 3), like the tegument of the opposite side.

The wall of oes is consists of a layer of circular and longitudinal muscle fibres (Plate III, Fig. 1, Plate IV, Fig. 2), thin connective tissue layer terminated with lamina basalis to which adhere individual intestinal cells with a large nucleus, conspicuous compact nucleolus and regularly distributed chromat (Plate II, Figs. 1, 2). The cytoplasm contains a larger number of mitochondria with few cristae, large lipid vacuoles and minute bodies. The basal plasma membrane of cell forms numerous infoldings (Plate IV, Fig. 4) and their apical part proceeds into numerous thin microvilli (Plate II, Figs. 1, 2; Plate III, Figs. 1, 2; Plate IV, Fig. 1) covered with a high layer of dense substance by which the microvilli are cemented to one another (Plate II, Figs. 1, 2; Plate III, Figs. 1, 2; Plate IV, Fig. 1). The dense substance adheres to the plasma membrane of microvilli (Plate III, Fig. 2). Large fat vacuoles and dense bodies are also in the layer of cemented microvilli (Plate II, Fig. 1; Plate III, Figs. 1, 2).

**DISCUSSION**

The studies of the ultrastructure of the digestive tract of *L. paradoxum* metacercariae were preceded by histochemical studies. Already the histochemical properties in the inner layer of pharynx and intestinal branches showed that the digestive tract of metacercariae is fully developed and identical with the digestive tract of adult nematodes. Similarly as reported by Halton (1972) in *Aspidogaster coccinella* and Spence and Silk (1980) in *Schistosoma mansoni*, the body tegument in *L. paradoxum* metacercariae passes to the cavity of oral sucker and pharynx and retains there the syncytial character. The tegument of oral sucker and pharynx differs from the body tegument only in the cavities between plasma membrane and lamina basalis, filled with a fine fibrillar substance and giving it a lamellar appearance (Zdárská and Sobolíva 1981). In the optical microscope, the tegument of posterior part of oral sucker and pharynx differed from the body tegument in a high activity of non-specific esterase, but it could not be differentiated morphologically (Zdárská and Sobolíva 1981). The remaining parts of tegument, including glyocalyx, are identical. Similar cavities between the basal plasma membrane of tegument and lamina basalis were described also by Matricon-Gondran (1980).

Ebrahimezadeh and Kraft (1969) and Bruce et al. (1971) describe different structure in individual parts of the digestive tract even in cercaria and schistosomulum of *Schistosoma mansoni*. The pharynx and oesophagus are covered with tegument and only the ceca are lined withecal cells with long microvilli on the luminal side. However, the microvilli described in adults (Spence and Silk 1970, Halton 1972) and larvae of nematodes (Ebrahimezadeh and Kraft 1969, Bruce et al. 1971) are of different shape and the thick dense layer characteristic ofecal cells of *L. paradoxum* metacercariae was not described in them.

Threadgold and Brennan (1978) demonstrated morphologically and experimentally that the tegument in *Fasciola hepatica* behaves like a transporting epithelium and Gallagher and Threadgold (1967) and Halton (1972) observed numerous intercellular junctions between the parenchymal and other cells. The two parts of the digestive tract in *L. paradoxum* metacercariae, though differing in their structure, have the same, i.e. resorptive function.

**REFERENCES**


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Fig. 1. Body segment of *L. porosorum* metacecilia (G, Os, UAe, Pb) (× 96,888). Fig. 2. Tegument of pharynx in *L. porosorum* metacecilia (G, Os, UAe, Pb) (× 11,134). Fig. 3. Detail of pharynx tegument with hemidesmosomes and large cavities between basal plasmalemma of tegument and lamina basalis (G, Os, UAe, Pb) (× 25,100).

Fig. 1. Anterior part of ceca in *L. porosorum* metacecilia comprising two cecal cells the apical part of which is terminated by a high microvillus zone. The nuclei have a compact nucleolus (arrows). The cytoplasm contains large lipid vacuoles (G, Os, UAe, Pb) (× 22,340). Fig. 2. Detail of nucleus of cecal cell (right) and basal part of microvillus zone (left at the bottom) in which the microvilli are cemented by a dense substance (G, Os, UAe, Pb) (× 34,800).
Fig. 1. Cecal wall from microvillous zone (left) to muscle layer (right). Note numerous lipid vacuoles in both cytoplasm and microvillous zone of cecal cells (G, Os, UAc, Pb) (× 11,400). Fig. 2. Detail from Fig. 1 marked with arrow. Large lipid vacuole near base of microvilli the surface of which is covered by conspicuous unit membrane (G, Os, UAc, Pb) (× 39,444).

Fig. 1. Detail of apical part of cecal cell of *L. paradoxa* metacercaria from the base of microvillous zone (left) to nucleus (right at the top) (G, Os, UAc, Pb) (× 18,700). Fig. 2. Detail of basal part of cecal cell with a nucleus (left) and muscle layer of cecal wall (right). Note infoldings of basal plasmalemma (left at the top) (G, Os, UAc, Pb) (× 18,700).