Histo-architectural alterations induced by *Euclinostomum heterostomum* (metacercariae) infected liver of *Channa punctata* (Bloch)

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Abstract Present investigation was carried out to study the effect of digenetic trematode, *Euclinostomum heretostomum* on the histo-architecture of liver of *Channa punctata*. In case of mild infection, the metacercariae were found attached to the external surface of hepatic tissue. While in case of acute or chronic infection, the encysted metacercariae of *Euclinostomum heterostomum* were found deeply embedded in the entire hepatic tissue due to which liver appeared thin, compressed and pale with yellowish-black nodules of encysted metacercariae. A space occupying cavity is created by the metacercarial cysts due to which tissue appeared in the form of lumps. Histo-architectural alterations induced by parasite included degeneration, compression and loosening of hepatic tissue with enucleated and deshaped hepatocytes.

Keywords *Euclinostomum heretostomum* · Histo-architecture · *Channa punctata* · Metacercariae · Liver

Introduction

Helminths are found in almost all the animals including fishes throughout the world (Bychowsky 1962). Fish does not only serve as the host for different parasites but some parasitic forms cause serious damage to the tissue and also

alter the normal physiology, histology and haematology of the host. The histological study of liver is a direct evidence of robust effect on the fish health as it is considered as the principal site for digestion, filtration and storage of glucose in fishes. Liver also functions to detoxify the blood impurities coming from the intestine. Therefore, the histological study of liver is helpful in knowing the possible effect of parasitism on the functions of different body systems.

Freshwater murels of the family Ophiocephalidae harbour a good number of helminth parasites. Metacercarial infections particularly those of *Euclinostomum heterostomum* show high prevalence in these fish. During the present investigation, heavy infections with the metacercariae of *Euclinostomum heterostomum* (Rudolphi 1809) were found in the liver of *Channa punctata* (Bl.). Usually digenetic metacercariae which occur in the liver and other visceral organs cause severe melanosis of the liver and visceral fibrosis (Mitchell et al. 1983). Therefore, an attempt has been made to record the histopathological changes induced by *E. heterostomum* in the liver of the host fish *Channa punctata*.

Materials and methods

Collection of fish specimens: For purpose of present investigation, *Channa punctata* was chosen since it is a hardy, edible and amply available fish at Bhopal. Living specimens of this fish were collected from the Lower Lake of Bhopal. They were brought to the laboratory and examined morphologically and internally for the occurrence of helminth parasites.

Collection of parasites: The host fish, *C. punctata* was collected continuously for one year at regular intervals. Fish specimens were dissected out in physiological saline

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(0.75% NaCl solution) for collecting helminth parasites. Encysted trematode were collected from the liver. Collected parasites were fixed in hot alcohol-formol-acetate (AFA) solution and stained with aceto-carmine to prepare permanent slides. The parasites were identified according to the keys given by Yamaguti (1958), Gibson et al. (2001) and Jhansilakshmibai and Madhavi (1997).

Histopathological study: The infected tissue of *C. punctata* was taken out and fixed in alcoholic Bouin's fluid for 72 h. After the complete removal of picric acid, the tissue was processed for preparation of paraffin wax blocks. The tissue was then cut at 6 µm thick sections and stained with Delafield's haematoxylin and eosin (H-E) which after proper processing prepared in permanent slides.

Results

During present investigation, the metacercariae of *Euclinostomum heterostomum* were found embedded in the liver of *C. punctata*. Excysted metacercaria is linguiform with both ends bluntly rounded and measures 3.92–8.24 mm (Fig. 1). 175 specimens of *Channa punctata* were examined, out of which 115 were found infected by metacercariae of *Euclinostomum heterostomum*. The total prevalence of metacercarial infection was calculated to be 65.7%.

Histo-pathology of liver

The liver of *Channa punctata* in normal condition is a compact gland which is composed of polygonal glandular cells, each with a central nucleus. There is no definite arrangement of cells but narrow microscopic passages were observed. The liver tissue is richly supplied with blood capillaries (Fig. 2).

The histo-pathological study of *E. heterostomum* infected liver of *Channa punctata* exhibited chronic infection as

Fig. 1 Excysted and encysted metacercaria of *E. heterostomum*

Fig. 2 Microphotograph of a cross section of normal liver showing hepatocytes (HC), granular cytoplasm (GC) and nuclei (N) ×400

Fig. 3 Microphotograph of a cross section of infected liver of *C. punctata* showing parasite (P), necrosis (N), cyst wall (CW) and loosening of hepatic tissue (LHT) ×70

the parasites were found deeply embedded in the entire hepatic tissue. This restricted the hepatic tissue in the form of lumps between the cysts. A space occupying cavity is created by the metacercarial cysts which may result in the compression of hepatic tissue (Figs. 3, 4). Pathological effects included degeneration, loosening and necrosis of hepatic tissue with enucleated hepatocytes. Most of the hepatocytes were indistinguishable with round outline instead of polygonal shape (Fig. 5).

Discussion

Histo-pathological investigations made on the histology of liver infected by *E. heterostomum* revealed several

Fig. 4 Microphotograph of a cross section of infected liver of *C. punctata* showing parasite (P), cyst wall (CW), compressed hepatic tissue (CHT) and space occupying cavity (SOC) ×150

Fig. 5 Microphotograph of a cross section of infected liver of *C. punctata* showing degeneration of hepatocytes (DHC), desheaped hepatocytes (DSH), enucleated hepatocytes (EH), loosening of hepatic tissue (LHT) and necrosis (N) ×400

histological alterations. Encysted metacercariae of *E. heterostomum* were reported from the liver of *Channa spp.* from India and Philippines Tubangui and Masilungan (1935), Bhagavathiammai and Ramalingam (1983) and Gupta and Agarwal (1983).

Beverly-Burton (1963) reported that the presence of metacercariae, in some sensitive organs in *Clarias* species do not necessarily imply a debilitating impact on the fish, even at relatively high infection loads. Under present study severe pathological changes have been observed in the liver resulting in the formation of spaces occupying cavity created by metacercariae which might be due to toxic

substances released by the parasite. Sommerville (1982) also reported that pronounced inflammatory response and focal haemorrhages accompanies penetration and early migration of metacercariae. The inflammatory reaction, predominated by infiltrating macrophages, is particularly intense around unencysted migrating metacercariae and preceded the eventual enclosure in a fibrous capsule of the encapsulating metacercaria (Yekutieli 1985). Harris et al. (2005) observed atrophy of the liver tissue of *C. punctata* due to *E. heterostomum* infection, which may be a result of inflow of nutrients from the host tissue to the metacercariae. They also observed compressed and distorted hepatocytes due to the metacercarial growth in the liver.

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