

Histopathological Changes In Vital Organs Of Channa Punctatus Of Moradabad Caused By Helminth Parasitic Infestation

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Abstract: Present reports deals with the histopathological impacts in vital organs (liver, intestine and muscles) of freshwater fish *Channa punctatus* caused by helminth parasites, which mainly includes vacuolization, sinusoidal formation, degeneration of villi, an increase number in the cells (hyperplasia) as well as size of cells (hypertrophy) and epithelial necrosis as estimated by the degree of tissue change (DTC). Among the vital organs DTC was recorded highest in liver and lowest in muscles. As in our investigation a lots of lesions in vital organs of host fish has been reported which favours the river contamination due to parasitic burden.

Index Terms: vital organs, necrosis, hypertrophy, hyperplasia, degree of tissue change (DTC).

1. Introduction

Channa punctatus (Bloch) locally known as "Bajaria" is an important edible fish. The nutritive value of the fish has been recognized because of its protein content and due to its high market value is a good source of income for fish farmers in Uttar Pradesh. *C. punctatus* the spotted murrel is regarded as delicious fish food in India (Sharif and Abidi, 2012). Different types of helminths i.e Cestode, Trematode and Nematode found in edible fishes are invasive in nature and cause horrifying infestation and disease thereby affecting various host tissue as reported by various scientist (Akhtar 2008, Reddy and Banarjee; 2011 and 2014). Kelly and Janz (2009) analysed histopathological changes including dilated tubules, vacuolization, fragmented nuclei of kidney and thickening of gill epithelium in juvenile of northern pike influenced by trace metal. Adeyemo and Agbede (2008) investigated malfunctioning of host tissues i.e gills and skin, body cavity and pharyngeal region induced by trematode metacercaria *Clinostomum tilapiae* in the host *Oreochromis*. Lilley et al, (1992) suggested in their study of an epizootic ulcerative syndrome that the parasites use the fish for their shelter and food, destruct more or less, each and every organ, resulting in pathogenic effects. Reddy and Benerjee (2014) observed a dominant alteration in internal anatomy which leads ultimately to the change of its appearance due to parasitic infection induced by cestode parasites in freshwater murrel. These parasites utilize the nutritive material for its nourishment from the host tissue which affects the regular growth and causing damage in the form of lesions and atrophy to intestinal tissue of host as studied by Gaikwad et al (2016). Scholz et al, (2001)

proposed in their investigations of trematodes of the family heterophyidae that metacercarial encyst may present in different organs of fish such as fin, skin, gills, bronchial chamber, body cavity and other internal organs (Intestinal peritoneum, liver, gall bladder, heart, ventricle and kidney). Butchiram et al (2009) reported in their studies on histopathological changes in the gill, liver and kidney of *Channa punctatus* (Bloch) exposed to Alachlor that encystment of trematode parasite in the liver and kidney would result in histopathological lesions. The infestation in intestine of the fishes Karachi coast due to the nematode parasite cause destruction, atrophy, of intestinal mucosa, necrosis and degeneration of the intestinal tissue, causing damage to the whole thickness of the bowel wall due to nematode larvae observed by Akhtar, (2008). Pathological changes such as ruptured serosa layers, swelling, vacuolization and irregular villi formation found in intestine of *C. gachua* induced by trematode metacercaria were also noticed by Jadhav et al. (2019). Histopathological studies on many other fish species and impaired functioning of the organs affected by helminthic infestation have been reported by various workers such as Altinok and Caplin (2007) and Kelly and Janz (2009) The degree of lesion in development is directly proportional to the infective parasite concentration and progression of the infestation as reported by Morrison et al. 2004 and Taylor et al. 2009.

2. Material and method

To study histopathological changes in the vital organ of the host specifically *C. punctatus* caused by helminth parasites, live fish samples collected from the river Ramganga of Moradabad locality, dissected in the laboratory and examined keenly. For histological studies tissue from the desired organs were separated carefully, immediately washed out with normal saline and fixed in 4% formalin or Bouin' fluid for 24 hours followed by paraffin embedding, sectioning and staining using Haematoxylin and Eosin (H and E) staining technique, (Bullock, 1978; Roberts, 1978; Bancroft and Cook, 1994) Histopathological preparations of different internal organs were randomly selected to the histometric analysis and were examined under light microscope Olympus BX53 for photomicrograph. In the present investigations to observe the lesion index damage the desired host organs such as liver, intestine and muscles were photomicrographed. The

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presence of histological alterations in host organs was calculated by the degree of tissue change (DTC). On the basis of the severity of the lesion DTC I, II, and III are categorised which corresponds with number of alterations in stages. The categorised lesions were analysed in terms of frequency on the basis of severity of tissue-damage. The first-stage (DTC I) lesions did not affect the normal functioning of the tissue; the second-stage (DTC II) lesions were advanced and had certain influence on the functions of the tissue; the third-stage (DTC III) were severe and produced irreversible injury to the organ. On the microscopic level, the presence of histopathological changes in tissue was determined by the histopathological index (HAI) as modified by Poleksic and Mitrovic-Tutundzic (1994). Moreover, each lesion was assigned on a numerical scale from 0 to 6 to describe the extent where upto 2 indicates minor lesions, between 2 to 4 show moderate lesions and more than 4 but up to 6 represent extensive (vast) lesions as formulated by Bernet et al. (1999).

3. Result and discussion

In the present report we have investigated various histopathological changes due to the natural infection in the internal organs of some host *C. punctatus* caused by helminthic parasites i.e. *Pallisentis*, *Clinostomum*, *Euclinostomum* and some unidentified nematodes at Moradabad. The cells of liver, intestine and muscles of host have shown a major impact on shape as compared to the control ones as represented by enlargement of cells (fig 2 a-g). Liver followed by intestine were reported as the most prevalent site of infestation. (Table.1). Multitude of cyst of trematode metacercariae was recovered in the liver (Fig 1c). Infected liver showed parasite larvae surrounded by a cavity along with vacuoles degeneration and sinusoid (large venous cavity of inactive blood flow in cells) in cytoplasm along with necrosis of cells (dead cells or failure of blood supply) i.e. show in fig. 2.abc. These histopathological changes including abnormal tissue, hypertrophy of cells, degeneration of cytoplasm, sinusoid and formation of vacuole were also observed previously by Shareef and abidi (2015) in *Channa punctatus* induced by *Clinostomum complanatum* and Magharbi (2016) in the liver of serranid fish caused by helminth parasites. In the intestine of the *C. punctatus*, acanthocephalan, nematode and trematode parasites were found attached to the lumen, causing rupturing in the intestinal wall, discontinuous process in the villi (fig 2 e), which resembles with the findings of Gaikwad et al (2016) on *C. gachua* in which they reported changes in intestinal villi and mucosa due to the cestode parasites *Circumoncobothrium shindei* and *Lytocestus indicus*. Reddy and Benerjee (2014) also observed damage of villi and inflammation as well as necrosis in intestine in *C. punctatus* due to the helminth infection. Muscles show remarkable continuous changes showing cellular degeneration followed by hypertrophy, aggregation of infected cells and intense lesion in the tissues (fig 2g) whereas Ramesh and Nagarajan (2013) observed the disintegrated epidermis, broken myofibrils and lost of myoseptum in muscles section of *Clarias batrachus* exposed to sago effluent. Shareef and Abidi (2015) also reported fewer pathological changes in the muscles of *C. punctatus* caused by *Euclinostomum heterostomum*. In the present study different types of helminthes found attached

with liver, intestine and muscles also was recovered to reveal the degree of tissue change (DTC) which vary according to damage due to disruption in the tissue and organs of the host resulting from structural changes in the affected organ (Table 1) as also being reported by Dane and Sisman (2016) in the histopathological study of freshwater species *Squalius cephalus*.



1. a) Parasites attached to the muscles. b). Encysted larva of trematode parasite embedded in liver tissue. c). Parasite separated from host. d). Desired tissues samples fixed in bouin's fluid.

Table 1: HAI frequency of various alterations in lesions in different organs of the host.

Pathological organs	vacuolization	Hyperplasia of the epithelium	Necrosis	Hypertrophy	DTC Stages
Liver	++++	+++	+++++	++++	III
Intestine	++	+++	++++	+++	II
Muscles	0	++	++	+++	I

0= absent, '+' = mild frequency, ++ = moderate frequency, ++++ = very frequent, ++++++" = severe.

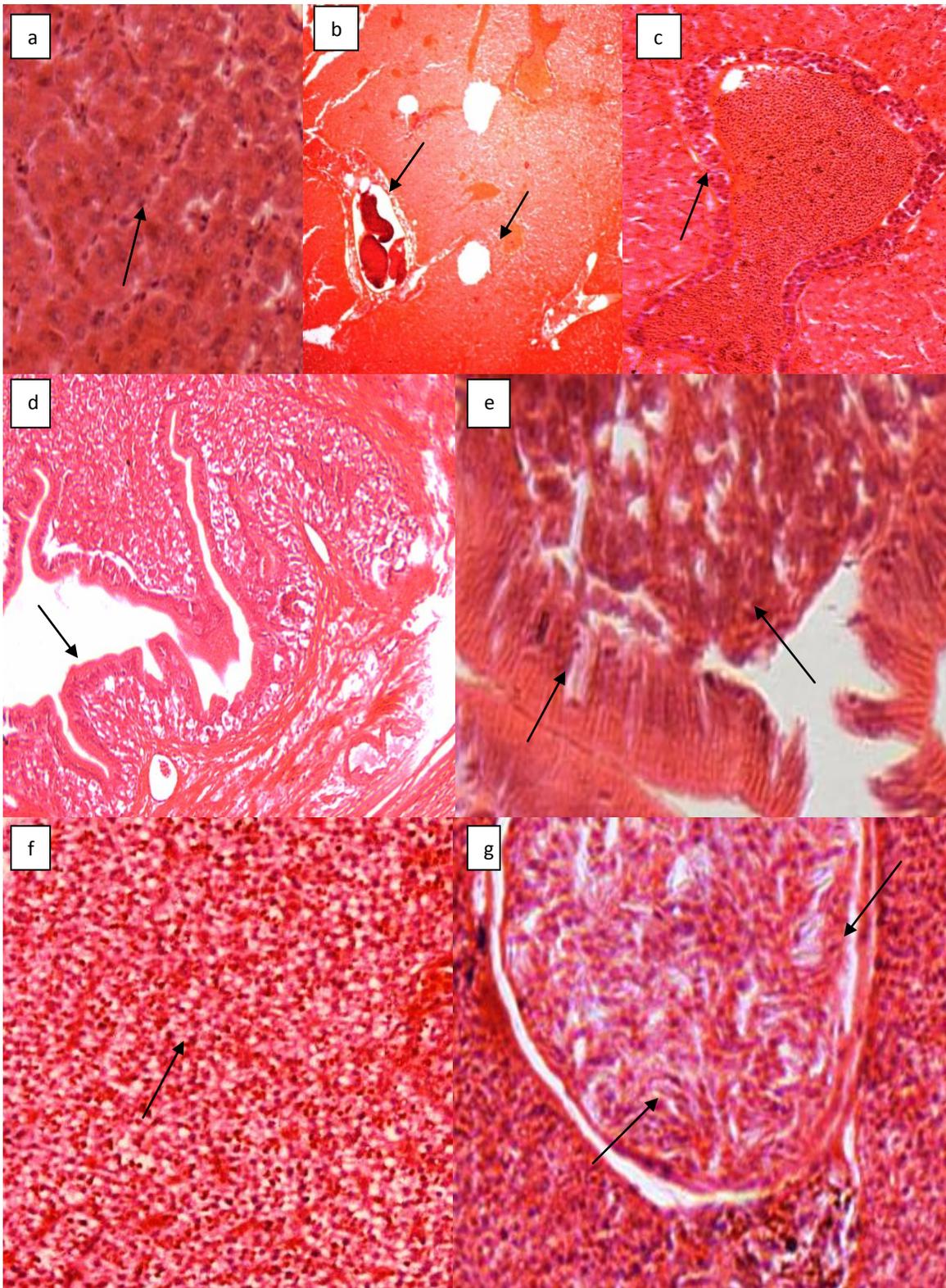


Fig. 2. a, d, f , Sections of controlled liver, intestine and muscles respectively (H & E)
 b, larvae embedded in liver cells, c, Vacuole formation and sinusoidal cavity.
 e. Hyperplasia, hypertrophy and degenerating villi of intestine. g. Hyperplasia and necrosis in muscles of host.

The liver cells of affected fish with parasites has been reported highest frequency of vacuolization, hyperplasia, necrosis as well as hypertrophy which corresponds to DTC III stage while muscles has shown DTC I stage and intestine exists in between of these two stages (Table 1).

4. Conclusion

Parasites of fishes are directly associated with human health in India. The injurious parts affected by the helminth parasites are responsible for infectious diseases and high mortality rates of the host. Such fishes are more susceptible to spread zoonotic disease (a disease that can be transmitted from animals to humans). It is also important to examine the other fish species available which are considered to be noneconomic because they function either as carrier hosts or reservoir host or at the same time are an important part of the food chain. The study of fish parasites is important because parasites have been shown to reduce the fish productivity which results in loss of economic returns and loss of protein sources. Presently, the country ranks second in the world in total fish production, therefore if we are not aware of mortality due to parasitic infection, it may be dangerous for human health.

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