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Parasitic adaptation of fresh water fish, Channa Striatus

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Abstract
The thorny headed acanthocephan, Pallisentis nagapurensis infects the intestine of fresh water murrel, Channa striatus. This parasite broughts severe histopathological changes in the intestine includes mucosa and submucosa are completely disrupted, thickened lamina propria, damage of epithelial cells, mucosa folds clumped. The intestinal villi of the mucosa shrinked, infected intestine often enlarged and slightly inflamed. Increase in the thickness of the muscular layer may be considered as an adaptation in the presence of parasite. The present paper deals with parasitic adaptation of an acanthocehalan and histopathological changes in the intestine of fresh water murrel, Channa striatus.

Keywords: Channa striatus, Pallisentis nagapurensis, Histopathology, Adaptation

1. Introduction
The adaptation of the parasites to the fish morphologically signifies a natural formation of organs which render the parasitisation possible. Hooks, spines, clasping organs, suction pits and suction discs are developed for attachment. Adaptations in the alimentary aspects are regarded as physiological adaptations, such as nourishment through fluid foods such as intestinal juices, which are often associated with considerable loss of self digesting enzymes. A higher degree of adaptation is very often synonymous with a higher specificity of the fish parasites to the host and the tissue. Evidently the parasites in the course of long development, have adopted themselves more to the physiology of their hosts than to the morphology. These adaptations of the parasites have greatly influenced the structural organisation of the host body, resulting in the abnormalities in the various tissues. The structure of the alimentary canal is related to their food feeding habits. The organs of digestion provide the optimal supply of essential nutritional substance to the organism. Therefore, adaptation to a particular or environment results in the modifications of the various regions of the alimentary tract. The pathogenic action of the parasites indicate the intensity of clinical signs, which depends mainly on the nature and degree of adaptation of fish to parasitism on the number of invading parasites, on the contribution and condition of infected fish, on the living habits of the fish, the condition of the environment which can act directly on the parasites and the fish. (Bullock, W.l. 1963. Chaicharan, A. and Bullock, W.L.1967. Kennedy, C. R. and Lord D.1982; Taraschewski, H.1988) [3, 5, 7, 9].

2. Material and Methods
For the present study, C. stritatus was procured from fresh water bodies such as rivers, tanks, lakes and ponds located in Warangal district of Andhra Pradesh. To identify the infection and also to collect the parasite, the fish were dissected and various visceral organs such as digestive tract and liver were examined carefully after placing them in petridishes containing normal saline. The parasites collected from the infected fish were enumerated and permanent slides prepared by preserving the parasites in 10% formaldehyde for 48hours. These were later stained with Alum carmine (Pearse, 1968; Bancroft, 1975) [4] and. the parasites were identified. The intestine of the infected and uninfected fish were isolated and preserved in Bouins, Susa, Carnoy and Zenkers fluids (Gurr, 1962) [6] for the histopathological and histochemical studies (Pearse, 1968; Bancroft, 1975) [4]. A battery of histochemical tests were applied on the microtome cut sections of intestine both infected and uninfected to demonstrate

And also to assess the histochemical changes that occur in the tissues of the infected organ if any due to infection with Genarchopsis goppo.

3. Results and Discussion

Pallisentis nagpurensis is found infected to the intestine of the fish, Channa striatus. It is a thorny headed worm whitish to slightly yellow in colour having wrinkled body. The anterior most structure is proboscis, cylindrical in shape, bearing rows of spines that serve to attach the worm to the gut of the host. This proboscis can be usually withdrawn into a proboscis receptacle or proboscis sac. The sac extends into the body cavity from the neck region, there are ligament sacs, that extend from the proboscis sheath adjacent to the body wall and form as tubes around the reproductive organs. The protonephridia serve as excretory organs. They consist of flame bulbs and collecting tubules. The nervous system consists mainly of a ganglion to proboscis sheath and of nerves that connect the ganglion to other organs and tissues of the body. Sense organs are found in the proboscis and in the male reproductive organs. Male reproductive organs consist of a pair of testes, one behind the other, and a common sperm duct formed by the union of a duct from each testis. There is cluster of large cement glands. Female reproductive organs consist of an ovary fragmented into ovarian balls that lie in the ligament sac.

The distribution of acanthocephalan parasites along the alimentary canal of several species of fishes has been studied both in natural and experimental infections. These parasites exhibit clear preference for a particular region of the alimentary canal, but it is capable of surviving in all the regions of the alimentary canal. The parasite remains in the same site throughout the period of infection. Although the precise factors responsible for site selection are not known, the observed distribution of acanthocephalan accorded their mode of feeding and their dependence upon the hosts digestive processes. In the present study it has been found that P.nagapurensis occurs as an adult in the alimentary canal, particularly in the intestine of Channa striatus. The association of host and parasite resulted in the pathogenicity of the host. The effects on the host tissues are very much conspicuous. Primarily these pathological processes are brought alone by the attachment of the parasite in between the intestinal villi.

While there are numerous references in the literature to the pathogenicity of adult acanthocephalans, few of these furnish histopathological details. Pathogenicity of spiny headed Worm is usually presumed on the basis of the depth of penetration of the proboscis or the presence of large number of worms. But the problem of acanthocephalan pathogenicity is as not as simple as these references indicate (Boyd, 1951: Bullock. 1962) [1, 2]. The present study, therefore emphasizes the changes that take place in the fish intestinal epithelium during infection period. The effect noted on the fish and the histopathology observed, both indicate that this worm seriously impairs the health of the fish.

These acanthocephalan parasites usually inhabited the intestine. The usual position of the parasite was with its body lying in the lumen of the intestine with its anterior and passed firmly into the hosts tissue, so that the hosts tissue surrounds the anterior end of the parasite. In the present study it has been found that, the proboscis of the parasite was retracted and enlarged with the hosts tissue. In the hosts tissue at the location of the parasite the mucosa and submucosa are completely disrupted and form a debris containing fragment of epithelium as isolated clumps of columnar epithelial cells. The enlargement was not pronounced in the posterior part of the intestine. The infected intestine was often enlarged and slightly inflamed (Fig 1, 2 & 3).

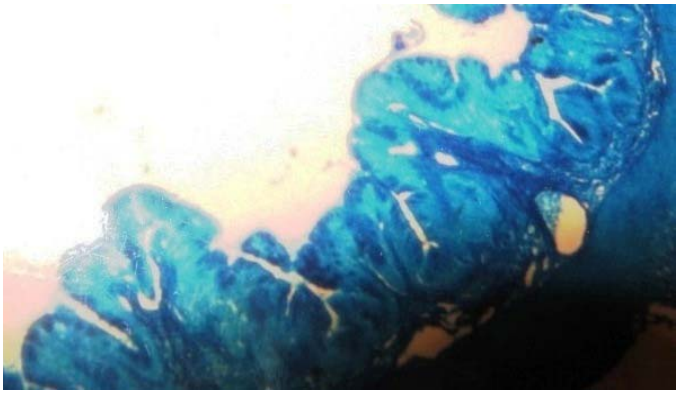

Fig 1: T.S of infected intestine shows shortening of villi

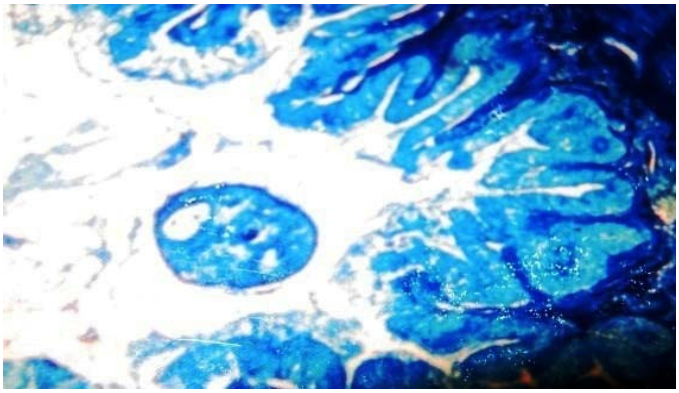

Fig 2: T.S of infected intestine with parasite

Fig 3: T.S of infected intestine showing destruction of villi

The acanthocephalan infection greatly affected the anatomy of the intestine. Microscopically the effects were observed in the epithelium and in the underlying lamina propria. There was destruction of the epithelium which became very much degenerated. Though there was obvious damage to the epithelium revealed by this study is the multiplicity of cell types. The most pronounced reaction of the fish intestine to the presence of acanthocephalan was the thickened lamina propria. The intestinal villi of the mucosa region became shrinked and this resulted in the widening of the lumen. The longitudinal muscle layer became thin while the circular muscle layer became abnormally thick.

Opening the intestine, showed that the acanthocephalans were firmly embedded in the mucosa. In the most tissue at the location of the parasite, the mucosa and submucosa are

disrupted very much and the epithelial cells clumped. The tissue became disorganized. The submucosa was not recognized well, except in the areas immediately adjacent to the inner circular layer. There was a marked enlargement of circular muscle layer, when compared to longitudinal muscles. The uninfected fish showed a moderately thin muscularis, but after infection, there was much abnormality. The mucosa folds clumped together and the differentiation into regular folds was not present.

Total destruction of mucosal epithelium occurred at the point of attachment. The host intestine exhibited a marked connective tissue reaction to the penetration of the acanthocephalan by developing collagenous fibres around the slender neck and destroying the normal architecture of the intestinal wall. The most pronounced reaction of the fish intestine to the presence of acanthocephalan was the thickened lamina propria. These changes indicated that helminth infections and particularly acanthocephalans as evidenced in the present study definitely cause pathological changes in the infected tissues. These changes may be either due to the mechanical damage or due to the toxic secretions released by the parasite in to the infected tissue. Generally when a parasite causes histopathological conditions in a tissue, the main changes that occur in the infected tissues are increase or decrease in a particular region of the tissue. A similar condition has been observed in the present study. The decrease in the muscle fibers of the longitudinal muscular layer seen in the infected fish may be of mechanical damage due to the erosion of the intestinal layers. On the other hand the increase in the thickness of the muscular layer may be considered as an adaptation to the presence of parasite. Further, the destruction of important regions of the host suggests that, there will be less supply of nutrients to the infected tissue, from other organs of the body, as such a deteriorated condition of fish exists. The damage of epithelial cells, particularly absorptive and goblet cells indicate the loss of absorptive power of intestine in the infected fish. Thus the food entering the intestinal villi is utilized by the parasite or circulated into the blood. A similar observation has been made by Bullock (1963) [3] on the intestinal histology of some salmonoid fishes with particular reference to the histopathology of acanthocephalan infections. The acanthocephalan infections interfere with the digestion and absorption of food material causing metabolic disorders. The excretory products and the metabolic end products excreted by the parasite in to the intestine produce toxicity. These abnormal conditions in the infected tissue alters the quality and the secretory nature of various chemical substances.

4. Acknowledgements

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