SECTION – B

HISTOPATHOLOGY
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A parasite is an organism that obtains food and shelter from another organism and derives all benefits from this association. The parasite is termed obligate when it can live only in a host. It is classified as facultative when it can live both in a host as well as in free form.

The organism that harbors the parasite and suffers a loss caused by the parasite is called as host. The host in which the parasite lives its adult and sexual stage is the definitive host whereas the host in which a parasite lives as the larval and asexual stage is the intermediate host. Other hosts that harbor the parasite and thus ensure continuity of the parasites life cycle and act as additional sources of human infection are known as reservoir hosts.

All cestode parasites develop via one or more intermediate hosts (heteroxenous). Adult cestodes are all intestinal parasites. Eggs are laid into the intestinal lumen and evacuated with faeces. First intermediate hosts of piscine cestodes are copepods, snails, crab and small fishes. The first larvae hatch from eggs after being swallowed by a suitable invertebrate host. Some species will develop to the adult stage when their larvae in the invertebrate host are ingested by the definitive invertebrate host (George & Nadakal, 1973; Schmidt, 1985). Definitive hosts of such cestodes are either predatory fish or piscivorous birds (Hassan & Qasim, 1960; Hoffman, 1967).

Pathogenic effects of cestodes are due to attachment of the adult parasite in the gastrointestinal tract and also to the encapsulation of larval stages in the tissues. In low to moderate infections, pathological effects are localized around the attachment of the adult worm. The extent of damage is proportional to the depth of penetration of the scolex. It is negligible when parasites are attached to the epithelial mucosa only and becomes extreme, with extensive granuloma and subsequent fibrosis, when the scolex is anchored in the muscle layer or entirely perforates the intestinal wall (paperna & zwerner, 1976, McDonough & Gleason, 1981, Kabata 1985). The depth of penetration of some species,
may vary in different host fishes (Tarachewski 1988). Extensive inflammation peritonitis due to perforation of the gut and systemic clinical changes (anurhersia) will occur only in massive infection.

The study of the relationship between a host and a parasite is called as "Histopathology". The microscopic examination of tissue is an extremely valuable component for the study of degree of infection by cestodes. During or after the gross microscopy, small pieces of intestinal tissue are removed that are examined. It is important to collect both normal and infected intestinal tissues because tissues that appear normal may be found infected at the microscopic level. Also, including both normal and infected tissues from the intestine allows for comparison of healthy and infected tissues and may help in understanding the development or progression of the cestode infection.

The relationship between host and parasite as studied by Nadkal, Mohandas, John and Simon (1973). The establishment and distribution of Rallietina cesticillas in the fowl was studied by Foster and Daughtery in 1959. the parasites can find their suitable host, some thoughts on these inception of host parasite integration was studied by MacNissis 1976. Host versus parasite responses were described by Mitchell in 1981.


When the parasite come in contact with host at cellular level, the host react by bringing into action cellular and serological reactions, because the host is able to know the ‘self” and ‘non – self” or foreign material, which is at molecular level, but the
mechanism of the recognition may be take place at the surface of the recognising cells (Smyth 1969).

The effect of inflammation is characterized by vasodilation of blood capillaries. Later the various nervous reactions taken place and release on active factor ‘histamine’ from the most cells. By this there is increase in blood supply to affected area, accompanied by an increased permeability of the capillary walls and the passage of proteins from blood into the tissue fluid.

In the region of ruptured tissue, the vessel wall becomes sticky and polymorphonuclear so leucocytes adhere to them. The leucocytes then proceed to infiltrate through vessel walls and collect in large number at the site of invasion.

Naturally it is important to study this relationship not because of their parasitological value but for the relative existence of mankind. Some author like Nahrung (1991) studied on some pathological and biochemical experimental *ascaridiasis* in chickens. Mpoame M, Agbede G. (1995) observed on the gastro – intestinal helminth infections of domestic fowl in Dschang western cameroon.
HISTOPATHOLOGY OF THE CESTODE *PHOREIOBOTHRIUM hemlatae* N.Sp.

**MATERIAL AND METHOD**

Sixteen intestines of the *Mobula mobular* were dissected to see the degree of infection. Few of the intestines were infected with cestode parasites were flattened, processed and stained for morphological studies and were identified as *Phoriobothrium hemlatae* n.sp.

The attached worms were kept intact to the intestine, which were cut into small pieces and were fixed in Bouins Fluid. The pieces of uninfected intestines were also fixed in Bouins Fluid.

This material was washed, dehydrated through graded alcohol cleared in xylene and embedded in paraffin wax (M.P. 58-60°C).

The blocks were cut at 7μm and slides were stained with Mallory’s triple stain. Best slides were selected and observed under microscope.

**OBSERVATION**

The worm *Phoriobothrium* n.sp. Is having penetrative type of scolex; there is no doubt that they cause heavy mechanical damage to their host *Mobula Modular* intestinal tissue.

Some observations shows that the worm is attached to villi of intestine, due to this attachment, necrosis of host tissue is observed in mucosal and submucosal wall and inflammatory reaction is also observed tissues of villi are infected by the parasites to go in necrotic stage.

Thus, it can be concluded that, the rich environment of host intestine is favorable for the development and growth of the worm. Hence, the parasites maintaining good histopathological relationship with its host.
Mobula mobular  Bonnaterre, 1788

T.S. of Non-infected intestine

T.S. of intestine with Scolex penetrating in the villi of intestine
HISTOPATHOLOGY OF THE CESTODE CALYCOBOTHRHIUM walgae N.Sp.

MATERIAL AND METHOD

Fifteen intestines of the marine water fish Dasyatis walgae were dissected and observed to see the degree of infection. Few of the intestines are heavily infected with the cestode parasites and parasites after closer observation identified as calycobothrium walgae n.sp. Some of the cestode parasites were free and were collected and preserved in 4% formalin for taxonomic study.

The worms, which were attached to intestine, were kept intact and small pieces of infected and non-infected intestines were fixed in Bouins Fluid fixative. This material was later taken out from the fixative, washed with water, dehydrated through alcohol grades, cleared in xylene and embedded in paraffin wax with melting point (58-60°C).

The blocks were cut at 7mu and slides were stained with Mallory’s triple stain. Best slides were selected and observed under microscope.

OBSERVATION AND DISCUSSION

Microscopic observations revealed that the host tissue is damaged by the parasites Calycobothrium walgae n.sp. As the scolex is medium size with tentacles and 4 suckers, which are used for attachment of worms to host Dasyatis walgae, the attachment part of intestine by parasite shows damage of intestinal villi.

When observed keenly under microscope, the worm is not only successful to adhere to host tissue but also quite successful to enter into the intestine forming the ulceration to there intestinal wall, causing damage to the host tissue.

Thus, it can be concluded that, the parasite finds the nutritive material, favorable for the growth and development of the worm by causing damage to the host tissue.
PLATE - 2

*Dasyatis walga* Muller & Henle, 1841

T.S. of Non-infected intestine

T.S. of intestine with Scolex penetrating in the villi of intestine
HISTOPATHOLOGY OF THE CESTODE HEXACANALIS shindei N.Sp.

MATERIAL AND METHOD

Twenty intestines of the host Aetomyelaeus nichofii were dissected and observed to see the degree of infection most of the intestine were infected with parasites few of them were flattened and stained for morphological study and were identified as hexacanalis shindei n.sp. The attached worms were kept intact to intestine and fixed in Bouin’s fluid. The pieces of uninfection intestine were also fixed in Bouin’s fluid. The material was later dehydrated through alcohol grades cleared in xylene and embedded in paraffin wax (M.P.58 - 60°C).

Blocks were cut at 7mu and slides were stained with Mallory’s triple stain. Best slides were selected and observed under microscope.

OBSERVATION AND DISCUSSION

The cestodes Hexacanalis shindei n.sp. are having non-penetrative type of scolex with four suckers, there is no doubt that they cause damage to their host tissue.

When observed keenly the worm i.e., Hexacanalis shindei n.sp. Attaches and entangles, invades in the intestinal villi.

The host intestine is rich in protein, carbohydrate and lipids and they are also present in parasites, which have been accumulated by the active absorption of food by the help of teguments, from the nutritional rich environment of the intestine.

Thus, it can be concluded that the worm absorbs the glycogen, protein and lipid from the host tissue causing damage to the host’s intestinal tissue.
Aetomylaeus nichofii Bloch & Schneider, 1801

T.S. of Non-infected intestine

T.S. of intestine with Parasite attached in intestinal villi
HISTOPATHOLOGY OF THE CESTODE TYLOCEPHALUM ratnagiriensis n.sp.

MATERIAL AND METHOD

Ten intestine of Aetomylaeus nichofii were dissected and observed to see the degree of infection some of the intestine were found to be infected with cestode parasites. Few worms were collected for the taxonomic study and remaining worms attached to the intestine were kept in Bouin’s fluid for histopathology study. The worm was identified as the Tylocephalum ratnagiriensis n.sp.

Later on the tissue were taken out from the fixative, washed with water, dehydrated, cleared in xylene and embedded in paraffin wax (M.P. 58-60°C). Sections were taken on microtone i.e., 7mu. Slides were stained with Mallory’s triple stain; best slides were selected for observation.

OBSERVATION

The selected slides were observed under microscope and reveal that it causes much damage to the host intestine by invading in the mucosa layer.

The worm Tylocephalum ratnagiriensis is having non-penetrative type of scolex, further it was observed that worms are easily floating near the villi in lumen of intestine. The worms are able to reach the intestine and are adhered to it. Due to favorable conditions for the parasites in the lumen of intestine is freely floating to cause a disturbance in the absorption of food by piercing the intestinal tissue.

Thus it can be concluded that the worm could be able to take nourishment from the host and maintain good histopathology relationship with its host.
Aetomylaeus nichofii Bloch & Schneider, 1801

T.S. of Non-infected intestine

T.S. of Heavily infected intestine with cyst formation
HISTOPATHOLOGY OF THE CESTODE TETRAONOCEPHALUM akuskarae N.Sp.

MATERIAL AND METHOD

Ten intestine of the Chiloscyllium plagiosum were dissected and observed the degree of cestode parasitic infection. Most of the intestine was infected with cestode parasites. Few were flattened processed and stained for morphological studies and were identified as Tetragonocephalum akuskarae n.sp.

The parasite attached with intestine was cut into small pieces and were fixed in Bouins Fluid. The pieces of uninfected intestines were also fixed in Bouins Fluid. This material was later taken out from fixative, washed with water, dehydrated through alcohol grades, cleared in xylene and embedded in paraffin wax (M.P. 58-60°C).

The blocks were cut at 7mu and slides were stained with Mallory’s triple stain. Best slides were selected and observed under microscope.

OBSERVATIONS

The worm Tetragonocephalum akuskarae n.sp. Is having non-penetrative type of scolex; hence, they have only close intimate contact with the intestinal tissue of its host Chiloscyllium plagiosum.

In transverse section of intestine of Chiloscyllium plagiosum it has been observed that the worm attached to the mucosa layer of intestine and slowly invades the host tissue, causing less damage but destroys the intestinal epithelium showing that the worms are moderately pathogenic.

Thus, it can be concluded that the rich environment of host intestine, is favorable for the development and growth of the worm. Hence, the parasites maintaining good histopathological relationship with its host.
**PLATE - 5**

*Chiloscyllium plagiosum* Anonymous (Bennett), 1830

T.S. of Non-infected intestine

T.S. of intestine with cyst formation and scolex penetrating in villi of intestine