HISTOPATHOLOGY
**Introduction:**

The host parasite relationship in cestodes is complex one, involving interactions between at least two and sometime more genetically system namely those of the parasites, its intermediate and its definitive host. Thus a cestode is suitably adapted to the morphology, physiological, biochemistry, immunology and ecology of its hosts.

A parasite is an organism which obtains food and shelter from another organism and derives all benefits from this associations. The host in which the parasite lives its adult and sexual stage is the definitive host where as the host in which a parasite lives as the larval and asexual stage is intermediate host other hosts that harbor the parasite and thus ensure continuity of the parasites life cycle and act as additional source of human infection are known as reservoir hosts.

Pathological effects of cestode are due to attachment of the adult parasite in the gastrointestinal tract and also to the encapsulation of larval stages in the tissues. Cestode live in a very hazardous environment as on there is continuous movement of the gut lining, food gut surface and the nature of its related glands, they have a hold fast organ (scolex) for attachment, which may be acetabulate with 4 suckers, and scolex may also be armed with hooks and spines or have a retractable rostellum or proboscis covered with fine hooks.

Histopathological studies of intestine infected with cestode have been carried out by many authors in various orders of tapeworm. It is to study the host-parasite interaction between cestode parasite and its host. In Pseudophyllidia, *Bothriocephalus gowkongensis* (Korting, 1977) is an intestinal parasite. The group of bothria, becomes flat to make room for the
villi, the other epithelial cells of the bothria are undisturbed. He also worked on *Caryophyllaeus laticeps* where the attachment is weak.

In order Tetraphyllidea, attachment is accomplished by varied types of bothridia. In *Echeneibothrium*, there are two types of bothridia, one is shallow and roughly spoon shaped with 10-20 loculi, and the other one with smaller openings and cup-shaped depressions. These bothridia are adapted for attaching to a larger area of the mucosa of the host. The mucosa is thrown into deep tubular crypts and bothridia are deeply embedded in crypts.

In *Pseudanthobothrium*, the bothria are without loculi and cover only the tips of villi like a cap, but the rostellum is very long and penetrates into closely packed villi and the terminal sucker attached to the wall of the villus (Williams 1966).

In Cycophyllidea many genera like *Hymenolepis, Dipylidium, Echinococcus, Cotugnia, and Raillietina* are studied for histopathology, host-tissue reactions, host specificity, host-parasite relationship etc. In Cycophyllidea the scoleces are of two types: Penetrative type and Non-penetrative type. In the penetrative type the scolex penetrates down into the crypts of Lieberkuhn at the base of the villi. The scolex may be armed with hooks. In non-penetrative type the sucker encloses a group of villi, but the scolex does not penetrate into the mucosa.

Intestinal helminthes of vertebrates can includes inflammation of the host digestive tract, resulting in altered gastrointestinal function, namely enhanced secretion and propulsive motility of the gut (Palmer and Green-wood-van Meerveld, 2001). Furthermore, helminthes seriously disrupt structures of the gut wall and interrupt communications
between the nervous and endocrine system (Fair-weather, 1997). One of the most important factors in the pathogenesis of gastrointestinal parasite infections is a reduction in the host feed intake (Houtert & Van Sykes, 1996; Mercer et al., 2000). Moreover, gut parasites also increase endogenous protein and fat losses thus affecting growth rate of the host (Hiscox & Brocksen, 1973).

This work is an attempt to bring out the different aspect of pathology of infection of *Gallus g. domesticus* (Linnaeus 1758) by the adult cestode, *Amoebotaenia prabhuravii n.sp*, *Raillietina tetragona* and *Cotugnia wankhedii n.sp*.

**Material and Methods:**

Gastrointestinal tract of host *Gallus g. domesticus* were brought to the laboratory alive and sacrificed just before examination. During the parasitological examination the intestines were cut open and examined under stereomicroscope to see the degree of infection. The tapeworms were collected, placed in saline solution, freed from the adhering mucus by gentle shaking, they were flattened, processed and stained for morphological studies and were identified as *Raillietina tetragona*, *Cotugnia wankhedii n.sp* and *Amoebotaenia prabhuravii n.sp*. with in short time 2 to 3 cm long pieces of proximal intestinal and liver segments containing tapeworms were fix in Bouin’s solution for 24 hrs, as the tissue undergoes autolysis rapidly after death and rapid fixation is essential.

The fixed material were transferred and processed through ascending grades of alcohol, dried in a wax miscible agent and impregnated in wax (M.P 58° to 60°C). Sectioning were carried
out on a rotary microtome at 6μm. Sections were floated on warm water at 48°C and mounted on chemically cleaned slides coated with egg albumin. The mounted, unstained sections were dewaxed in three stages of xylene at 1 minute each and stained with most widely used standard haematoxylin and eosin stain, staining was carried out using haematoxylin and eosin staining technique (Bullock, 1978). This stained is often sufficient for identification of larger parasites such as helminthes, in this method the nuclei of cells are stained by the haematoxylin, the cytoplasm is coloured by the eosin. Stained mounted sections were examined under light microscope for good ones that were selected for photomicrography. These slides were identified by using keys “Systema Helminthium” (Yamaguti, 1959).

**Results:**

- **Histopathological sections from intestine of Gallus domesticus** (Linnaeus, 1758) *infected with cestode parasite Amoebotania prabhuravii n.sp.*

  Scolex of *Amoebotaenia prabhuravii* n.sp. is of penetrative type, scolex found deeply pierced in submucosa of intestine. Scolex attached by rostellar hooks and suckers are unarmed, the scolex attached superficially to the intestine.

  it was approaching the intestinal villi. The worm is not only successful to enter in to the intestine forming the ulceration in the intestinal wall causing damage to the host tissue *G. gallus domesticus* (Linnaeus, 1758).
Plate No: 7

- Histopathological sections from intestine of *Gallus domesticus* (Linnaeus, 1758) infected with cestode parasite *Amoebotania prabharvii n.sp.*
  
  A) T.S. of normal intestine of *Gallus domesticus* Linnaeus, 1758.

  B) *Amoebotania prabharvii* n.sp. attached to intestinal villi.

  C) *Amoebotania prabharvii* n.sp in lumen of intestine.

  D) *Amoebotania prabharvii n.sp* disturbs intestinal villi.
PLATE - 7

A

B

C

D
• Histopathological sections from intestine of *Gallus domesticus* (Linnaeus, 1758) infected with cestode parasite *cotugnia wankhedii n.sp.*

The worm *Cotugnia wankhedii n.sp.* is having adhering type of scolex with help of they damage the intestinal tissue of host *G. gallus domesticus* (Linnaeus, 1758). Microscopical observation reveled that, the T.S. of intestine of host showing the damage to the intestinal wall by adhering scolex of *Cotugnia wankhedii n.sp* due to this attachment it has disturbed the structure of intestinal region and broken the intestinal villi but not the crypts of liberkubin, that worm tries to overcome the entanglement of the crypts of liberkubin. It cannot reach the muscles layers, probably due to absence of neck and the short length. So the attachment is superficial (Chincholkar 1978).

Intact intestinal villi of normal host. The infected intestines were looked diseased with swellings blood clot, all along the alimentary canal and bleeding at certain places. Histopathology revealed disseminated erosion at the site of attachment, lymphocyte migration and hyperplasia of connective tissue in the submucosa (Ivona, 2006).
Plate No. 8

- **Histopathological sections from intestine of *Gallus domesticus* (Linnaeus, 1758) infected with cestode parasite *cotugnia wankhedii* n.sp.


  B). Scolex of *cotugnia wankhedii* n.sp. attached to intestinal villi.

  C). Scolex of *cotugnia wankhedii* n.sp. approaching towards the intestinal villi of *Gallus gallus domesticus*

  D). *Cotugnia wankhedii* n.sp penetrates up to submucosal layer
• Histopathological sections from intestine of *Gallus domesticus* (Linnaeus, 1758) infected with cestode parasite *Raillietina (R) tetragona* (Molin 1858.)

The worm *Raillietina (R) tetragona* (Molin 1858.) heavily destroyed, rupturing the villi, piercing through submucosa. So the scolex of *Raillietina tetragona* is of penetrative type (Shinde and Mitra, 1980). The intestine was heavily infected, so most of intestinal villi were ruptured, Attachment of scolex by rostellar hooks and suckers they damage the intestinal tissue of host *G. gallus domesticus* (Linnaeus, 1758).

In transverse section of intestine, it has been observed that, the worm attached to the mucosal layer of intestine and invaded the host intestinal tissue.

Microscopical observation reveled the worm not only successful to adhere to host tissue but also successful to enter in to the intestinal layers and destroying the intestinal wall; causing heavy mechanical damage to the host tissue.
Plate No:9

- Histopathological sections from intestine of *Gallus domesticus* (Linnaeus, 1758) infected with cestode parasite *Raillietina (R) tetragona* (Molin 1858.)
  
  A) *Raillietina* tetragona Molin1858, attached to intestinal villi.

  c) *Raillietina* tetragona Molin1858, disturbs intestinal villi.
Discussion:

The interrelation of the parasite with the host results in the survival of the parasite and a slight damage to the host intestine since the parasite has don’t reaches beyond the submucosal layer as *Cotugnia Sillodensis* sp. (Jadhav et al., 2003) in the same host.

Recently many scientists have worked out on the host parasite relationship. The cestode parasites were attached mostly in the duodenal mucosa and heavy infection with this parasites caused inflammation, congestion and swelling of intestinal mucosa along with this pinpoint hemorrhagic spots. Microscopic studies revealed chronic catarrhal enteritis with server destruction of the vili, degeneration and desquamation of the lining epithelial cells, frequent ulceration and thickening of the mucosa and submucosa due to celliar infiltration. The muscular coat and serosa were unaffected. *Amoebotenia* sp. caused nodule formation on the wall of the intestine there by indicating its high pathogen city. Similar observation was made by earlier workers (Mitra and Shinde, 1980) the scolex of *Amoebotenia prabhuravii* sp. Penetrated into the dilated crypts of the muscular is mucosa of the duodenum and formed to rostellum penetrates into the muscular coat causing fragmentation of the muscular fibers with diffuse infiltration of lymphocytes, plasma cells and monocytes, foreign body giants cells and fibrous connective tissue. The observations support the descriptions of (Mpoame and Agbede, 1995. Borvclnska and Caira, 1993) explain the mode of all attachment and pathogen city of tapeworms. (Shinde et al.,1984) studies interrelationship between cestode parasites with their host.
caracharias acutus. (Nanware et al., 2005) observed histopathological changes in an intestinal tract.

The pathological changes observed with *Amoebaena sphenoides* infection in fowl is in agreement with earlier reports (Nath and Pande, 1963; Jha et al., 1981; Bhowmik et al., 1983). The parasites have been frequently reported free in the lumen and also attached to the lining. The mucosal damage has been attributed to dragging of epithelial tissue by the parasite sucker. Besides these various other reports also indicate that the tapeworm infection causes leucocytosis, heterophilia (Matta, 1980) and eosinophilia (Yakimoff and Rastegaieff, 1929; Asdrubali and Mughetti, 1969).

Khadap (2010) state that cestodes get attached to the host by the hooks on the rostellum. Here the worm tries to approach the intestine through the crypts of Lieberkuhn and succeeds in destroying the crypts and reaching up to the sub mucosa. When these tissue get disturbed and become loose the rostellum protrudes and depends its position in the intestine for a attachment it pierces’ in gland of the sub mucosa, with half of the body fragile that worm tries to overcome the entanglement of the crypts of liberkubin. It cannot reach the muscles layers, probably due to absence of neck and the short length.

According to Salam (2010) Histological, sections of the parasite were observed in the lumen as well as deep in the mucosa. At places mucosal plugs were observed drawn inside the rostellum, which formed a cup-shaped appearance. Lesions to the intestine were characterized by varying degree of degenerative changes to sloughing of mucosa in heavy and multiple infestations. In cases with higher parasitic load, partial villous atrophy with broadened surface and increased
vascularity was observed in the duodenum and jejunum. At the site of parasitic attachment, the epithelium and glands were disintegrated. The inflammatory reaction was characterized by predominant heterophils, especially in the areas of mechanical damage by scolex. Sparse infiltration of mononuclear cells, chiefly lymphocytes, and eosinophils was observed thought out the mucosa; especially in the lamina propria. Infiltration was observed in muscularis or serosal layers. In cases with parasitic associations, sections of other cestodes were observed in the disintegrated mucosa.

Various helminth parasites shows pathological consequences of parasitic effects on birds are well documented. Cestode parasites influences the avian health, causes morbidity and also mortality which pose a major threat to avian population. (Chincholkar and Shinde, 1956) However, the extent of damage depends upon depth of penetration of scolex, type and number of cestode parasite and site where they localize in the body of host (Paperna and Zwerner, 1976).

Attachment and activity of some parasites can lead to bacterial or fungal secondary infection and causes mass mortality in cultured and wild situation. (Mehdi Raissy et al., 2011) Parasite development within host epithelial tissues initiates localized leukocytic infiltrations, although the relationship between these responses and host resistance is uncertain, and whether or not leukocyte responses play a role in protective immunity is unclear (Cross, 1994).
Conclusion:

The presence of worms in the gastrointestinal tract of *Gallus g. domesticus*, destroys the intestinal villi, sometimes blocks the intestine and interferes with passing of food. Cyst mostly found deep in the submucosa. The non-penetrative type of worms are *Cotugnia wankhedii n.sp* while the penetrative type of worms are *Raillietina (R) tetragona; Amoebotaenia prabharvii n.sp*. Free gravid segments mostly found in the posterior region of intestine while mature segments are freely suspended from scolex in the lumen of intestine, only scolex are attached, either superficially (non-penetrative type) or deep in submucosa (Penetrative type). The lesions observed on the intestinal wall of the infected birds may be due to the severe infestation or heavy worm burden (Luka and Ndams, 2007).

Thus it can be concluded that the worm contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak, affecting the growth of host causing damage to intestinal tissue of host.