Histopathological Changes in the Intestine of Domestic Chickens (Gallus gallus domesticus) Naturally Infected with the Cestode Cotugnia sp. in Basrah, Southern Iraq

Dawood S. Mahdi1*, Baydaa F. Swadi1 & Mahdi M. Thuwaini2

1 College of Health & Medical Technology, Southern Technical University, Basrah, Iraq
2 College of Nursing, Thi-Qar University, Nasiriya, Iraq

*Corresponding author: dr.dawds@stu.edu.iq

Abstract: The aim of the present study is to investigate the histopathological changes in the intestine of the domestic chickens Gallus gallus domesticus that infected with the cestode Cotugnia sp. A report on identification of this parasite from a chicken is placed on record. Twenty-five fowls obtained from a local market in Basrah city were examined, to find out the histopathological effects of Cotugnia sp. The present study focuses on the histopathological changes in the intestine, which was naturally infected with the cestoda Cotugnia sp. The histopathological changes showed degeneration and sloughing of the epithelial lining of intestine mucosa, destruction, degeneration and atrophy of villi. Moreover, there were desquamations of epithelium, destructions of secretary glands, infiltration of inflammatory cells, congestion of blood vessels, hypertrophy of intestine glands and occurrence of bundles of fibrosis in longitudinal section of damaged villi. The present study indicated a state of grave problems facing the chickens.

Keywords: Cotugnia sp., Histopathology, Intestine, Chickens, Basrah.

Introduction

Chickens play an important role in the purveyance of animal protein. Both poultry meat and eggs are affordable sources and are directly associated with the rural economic situation of Iraq (Allouse, 1961). Endoparasites affect the intestine and cause nodules and severe enteritis, thus impairing the absorbing power of intestine for nutrients and vitamins from the host (Hayat & Hayat, 1983). Borghare et al. (2009) indicated that this infection leads to loss in body weight, delay growth, reduced egg production, weakened body resistance and even death.

The genus Cotugnia was erected by Diamare in 1893, with its type species Cotugnia digonopora from Gallus gallus dometicus (Shukla & Bhavare,
So far, 14 species of *Cotugnia* were added to this genus (Global Cestode Database, 2017).

The parasitic infection of chicken causes loss of their economic value. Domestic chickens facilitate the parasite life cycle with intermediate hosts such as earthworms, beetles, flies, ants, or grasshoppers (Permin & Hansen, 2003). Bhowmik & Sinha (1983) showed that cestodes can cause most of lesions including nodules formation in intestinal mucosa, inflammation, congestion and pin point haemorrhages.

The parasitic disease reduces the productivity of rural poultry. Even though, parasitic diseases are among the major factors determining the decrease in productivity of chickens and are often neglected due to rarely lethal effect (Alemu, 1985; Sonaiya, 1990).

Many researchers referred to over 1400 species of cestodes that have been described from wild and domestic birds. Many species of parasites may display necropsy assay of digestive canal or other internal organs of poultry. Large sized cestodes block the intestine of infected birds and thus affecting the health of the bird. Knowing species plays a major role in giving direction to control measures toward removing the intermediate host, by exploring the life cycle (Shameem et al., 2010).

Helminthiasis is considered to be an important problem of local chickens and helminth parasites were incriminated as major causes of health deterioration and loss of productivity in different parts of Ethiopia (Abebe et al., 1997; Eshetu et al., 2001). The commonest species of *Cotugnia* in domestic fowls, ducks and pigeons are *C. digonopora*, *C. brotogeris* and *C. fastigata*. These cestodes are of low pathogenic significance but heavy infections may affect the health of the bird. The life history of known species of *Cotugnia* is fully elucidated. Infection is acquired through the ingestion of infected intermediate hosts such as earthworms, grasshoppers, flies, ants or beetles (Taylor et al., 2007).

Based on such brief presentation, due to paucity of information regarding of these parasites and their histopathological effects in chickens of Iraq, which are naturally infected with *Cotugnia* sp. in Basrah province, the present study was carried out to highlight these phenomena.

**Materials and Methods**

Twenty-five domestic chickens; *G. gallus domesticus* were randomly collected from a local market in Basrah city. All chicken were examined immediately upon reaching the laboratory of parasitology in the College of Health and Medical Technology, Southern Technical University during the period from June 2016 to March 2017.

A sample of 25 chickens was randomly selected from a local market in Basrah city to be examined. The chickens examined did not exhibit any
symptoms of the disease (apparently healthy). The small and large intestines were removed and opened carefully by scissors to diagnose the parasites. Small pieces of infected small intestines were cut and transferred to 10% formalin for fixation. Paraffin sections were made by dehydrating using graduate ethanol alcohol (50%, 70%, 90% and 100%) and cleared later by Xylene, then embedded in paraffin to make blocks. Histological paraffin blocks were cut by microtome into sections of 5 µm, stained with hematoxylin and eosin and then mounted in DPX (Vacca, 1985). The prepared slides were examined under 40X objective to identify the histopathological changes in the target organs.

**Results**

The results showed that *Cotugnia* sp. in the intestine of infected chicken (Figure 1) affects the tissue layers of the digestive tract. Effects were varied and distributed among the four layers of the gastrointestinal tract: epithelial layer, lamina propria, external muscle layer and serosa layer. The main effects of the parasite are:

- Congestion of blood vessel in the lamina propria and external layer of muscle and appearance of packages of fibrosis in connective tissues of lamina propria in villus (Figures 2 and 3).
- Hypertrophy of some intestinal glands and expansion of their lumen (Figure 4).
- Expansion of blood vessels and necrotic tissue in some damaged areas of villi (Figure 5).
- Appearance of bundles of fibrosis in longitudinal section of damaged villi (Figure 6) as well as metaplasia of epithelial tissue of villi and necrosis in some parts of them (Figure 7).
- Other sections showed bundles of fibrosis in villi, metaplasia of lining epithelial tissue and expansion of blood vessels (Figure 8).

**Discussion**

Cestodiasis is the most important disease of different species of poultry (Dranzoa et al., 1999). It dilates the intestine in heavy infection causing pathological changes like, nodule and severe enteritis. The resultant situation leads to loss of body weight, retarded growth, reduced egg production, weakened body resistance and sometime death (Hayat & Hayat, 1983). The available information on *Cotugnia* sp. from birds in Iraq and particularly in Basrah city is scarce (Mustafa, 1984; Al-Emarah & Al-Azizz, 2016). Hungerford (1969) found that the parasites cause damage to the host like injuries and metabolic consequences affecting enzymes and hormones of the host or despoil part of their food and this negative influence does not stop at this level but extend further.
The present study showed that the occurrence of inflammatory cells of lamina propria of vilii and the infected chicken with *Cotugnia* sp. affects the textile layers of the small intestine. The effects were varied and distributed among the four layers of the intestine.

One of the most common effects of the parasite are the congestion of blood vessel in the lamina propria and external layer of muscle and appearance of packages of fibrosis in connective tissue of lamina propria in villi. The results showed several changes due the infection including:

- Hypertrophy of some intestinal glands and expansion of lumen.
- Expansion of blood vessels, necrotic tissue in some damaged area of villi.
- Appearance of bundles of fibrosis in longitudinal section of damaged villi as well as metaplasia of epithelial tissue of villi and few necrosis areas.
- Appearance of bundles of fibrosis in villi, metaplasia of lining epithelial tissue.
- Expansion of blood vessel.
- Bundles of fibrosis in lamina propria and detachment of epithelial tissue of villi.

These results are due to a host immune defense against the parasites as an antigen. These findings were also observed by Hungerford (1969) and Mustafa (1984), where intestine has been displayed with reactive change of gland and mixed inflammatory cells and infiltration lymphocytes with degenerative cell (necrosis).

The chickens investigated in the present study were of variable size and have no apparent symptoms of *Cotugnia* sp. infection, yet the changes observed seem to be similar to those identified in the study of Mustafa (1984) in which the pathological effects are based on the size of the parasites and the cestode in the intestine caused necrosis, destruction of intestinal tissues, villus atrophy and inflammatory cells aggregation.

Moreover, the results revealed that the histopathological effects, which were observed in the intestine and the intestinal mucosa emphasized the occurrence of inflammatory lesions and focal hemorrhages caused by the attachment of the parasites. Adang et al. (2010) reported that in many cases, the intestinal mucosa also reveals inflammatory lesions and focal hemorrhages caused by the parasites. On the other hand, the findings obtained in the present study are in accordance with the histopathology of some internal organs indicated by Lapage (1956) and Scott (1980) on birds (including chickens) naturally infected with different species of internal parasites. In conclusion, the prevalence of different parasites in poultry is somewhat different from domestic chickens in the same area. Parasite infection could have some histopathological effects on intestine tissues.
Moreover, the *Cotugnia* sp. needs further research to ascertain any histopathological effects of other tapeworms or nematode infection on the vital organs to confirm the findings of the present study.

Figure 1a: Scolex of *Cotugnia* sp. illustrates four cup-shaped suckers, b: Few segments of the worm (100X) staining with Semichon's acid carmine.

Figure 2: Cross section of chicken intestine shows the congestion of blood vessel in the lamina propria and external layer of muscle (→). (400X). H & E stain.
Figure 3: Cross section of chicken intestine shows packages of fibrosis (→) in connective tissue of lamina propria in villi. (400X). H & E stain.

Figure 4: Cross section of chicken intestine shows bundles of fibrosis in L.S. of damaged villi (←) (400X). H & E stain.
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Figure 5: Cross section in the chicken intestine shows hypertrophy of some intestinal glands (→) and expansion of its lumen (→). (400X) H & E stain.

Figure 6: Cross section in intestine of chicken shows the expansion of blood vessels (←) and necrotic tissue (↑) in some damaged areas of villi. (400X) H & E stain.
Figure 7: Cross section of intestine of chicken shows metaplasia of epithelial tissue of villi (→) and necrosis parts of it (←) (400X) H & E stain.

Figure 8: Cross section of chicken intestine shows expansion of blood vessel (→), bundles of fibrosis in lamina propria (←) and detachment of epithelial tissue of villi (↓). (400X). H & E stain.
References


