American Journal of Zoological Research, 2019, Vol. 7, No. 1, 1-7
Available online at http: //pubs.sciepub.com/ajzr/7/1/1
Published by Science and Education Publishing
DOI: 10.12691/ajzr-7-1-1

Prevalence of Gastro-Intestinal Helminths in Local and Broiler Chickens in Ibesikpo Local Government Area, Akwa Ibom State, Nigeria

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Received April 23, 2019; Revised June 06, 2019; Accepted July 30, 2019

Abstract A cross-sectional study was conducted on local and broiler chickens in Afaha Ibesikpo Local Government Area, Akwa Ibom State, to determine the prevalence of gastrointestinal helminths infection and identify the parasitic species involved. A total of fifty-five (55) gastrointestinal tract of broiler chicken and 50 gastrointestinal tracts of local chicken were examined for helminths parasites using direct wet mount method. Out of 55 broilers and 50 local chickens examined, 2 broilers (3.6%) and 50 local chickens (100%) were infected. Eight (8) nematode species were identified in the prevalence rate of Ascaridiagalli (41.9%), Capillaria species (4.7%), Enterobiusvermicularis (2.8%), Heterakisgallinarum (3.8%), Streptocara recta (0.9%), Strongyloides species (2.9%), and Trichuristrichuria (1.9%). The cestode species encountered were five and included; Raillietina species (19.0%), Hymenolepsis species (13.5%), Choanotaenia infundibulum (1.9%), Diphylobothriumlatum (2.8%), Dipylidium caninum (6.6%). The overall prevalence of helminths infection was 49.5% with the occurrence of mixed infection of about 38% in birds and a single infection of 12.4%. There was a significant difference (X^2=96, df=1, $p<0.05$) in the prevalence rate of infection between broiler and local chickens. This study affirms that helminth infection is a major challenge in the poultry industry. Hence the need for poultry farmers to be educated on these infections and appropriate control measures implemented.

Keywords: *prevalence, gastrointestinal, Helminths, local chicken, broiler chicken*

Cite This Article: Afia U. U., Usip L. P., and Udoaka U. E., "Prevalence of Gastro-Intestinal Helminths in Local and Broiler Chickens in Ibesikpo Local Government Area, Akwa Ibom State, Nigeria." *American Journal of Zoological Research*, vol. 7, no. 1 (2019): 1-7. doi: 10.12691/ajzr-7-1-1.

1. Introduction

Poultry farming is the process of raising domesticated birds such as chickens (*Gallus species*), ducks (*Carina species*), turkey (*Meleagris species*) and geese (*Anser* species) for the purpose of meat or eggs for food. Among these, domestic chickens (*Gallus domesticus)* are the most important [1]. However, over the years, egg production has doubled, and poultry meat production has tripled, whereas the production of turkey, goose, and duck meat has only recently started to expand. This expansion in poultry production is in part due to easy industrialization, short turnover, low establishment cost, disease prophylaxis compared with production of other livestock [2]. In most tropical countries, poultry production is based mainly on scavenging production system [3]. This system of scavenging production exposes birds to a range of parasites, as the birds can go around searching for their food in the soil, and this brings them in close contact with most of the soil-transmitted helminth parasites. But on the contrary, there is a reduction in parasite infection in the broiler or exotic breed of chicken because of their confinement management system [4]. Internal and external parasites of poultry are common in the tropics because of the favorable climatic condition for their development and the poor standards of poultry husbandry [5]. Losses due to increased feed conversion ratio, poor weight gain, and poor egg production, caused by helminthiasis are economically important to the poultry industry [5]. Pinckney found out that helminth infection is more prevalent (66.9%) in poultry production while it was discovered by Puttalahshmamma [4,6]. that improved poultry management practices are responsible for the reduction in the incidence of parasitic infection.

The exotic or local breed of the domestic fowl; *Gallus domestica* is reared by rural and urban householders who use their eggs and meat as a source of animal protein and farm manure [7]. Gastrointestinal parasites which invade the host possess morphological and physiological features such as small, thread-like, cylindrical body, hooks and hard body cuticle which enhance their adaptation to long living and existence in their hosts. These parasites constitute a major factor in limiting the productivity of the poultry industry by affecting the growth rate of the host resulting in malfunctioning of organs and eventually death [8]. A lot of losses in poultry have been linked to diseases

causing agents such as viruses, bacteria, and parasites. Intestinal parasitic helminths have a serious impact on poultry health, product quality and quantity of meat. Helminth parasites of poultry birds are commonly divided into three main groups; Cestode, Nematode, and Trematode [9]. The Cestodes of significant importance are of the two genera namely; *Railleitina* and *Hymenolepsis*. Nematode constitutes the most important group of helminth parasites of poultry both in several species and the extent of damage they cause.

The main nematode genera include *Ascaridia, Heterakis*, and *Capillaria* [10]. The prevalence and density of parasitic helminths may be influenced by several factors, such as a climatic factor of the parasites' environment, resulting in dramatic changes in the prevalence and intensity of helminths infections [11]. Many insects that may act as vectors for helminths are also favored by high temperature and to some extent humidity. These factors may explain the wide range and distribution of cestode and nematode species in poultry birds, especially during the tropical rainy season [12].

For a growing economy like Nigeria, however, there is a need to continually revalidate existing data on the health of chickens at regular intervals. In addition, as co-factors in another poultry disease, the knowledge of their prevalence is essential in understanding their epidemiology and control measures [13,14].

2. Materials and Methods

2.1. Study Area

This study was carried out in Ibesikpo Local Government area of Akwa Ibom State, Nigeria. Ibesikpo Local Government Area is in the South-south zone of Nigeria and occupies the western axis of Akwa Ibom State and lies between latitudes $40^{0}32^{'}$-50^{0} $33^{'}$N and longitudes $70^{0}25^{'}$-$80^{0}25^{'}$E. See Figure 1.

2.2. Collection of Samples

A total of fifty-five (55) gastrointestinal tracts of broiler chickens slaughtered in Afaha market, Ibesikpo L.G.A and fifty (50) gastrointestinal tract of local chicken were also obtained and taken to the Department of Animal and Environmental Biology laboratory unit, the University of Uyo for examination.

2.3. Laboratory Examination

In the laboratory, the gastrointestinal tracts were separated into different parts; the gizzard, small intestine, caeca, and large intestine. Each part was cut open using dissecting scissors and their content emptied into different beakers. The method employed in the examination of the gut contents was.

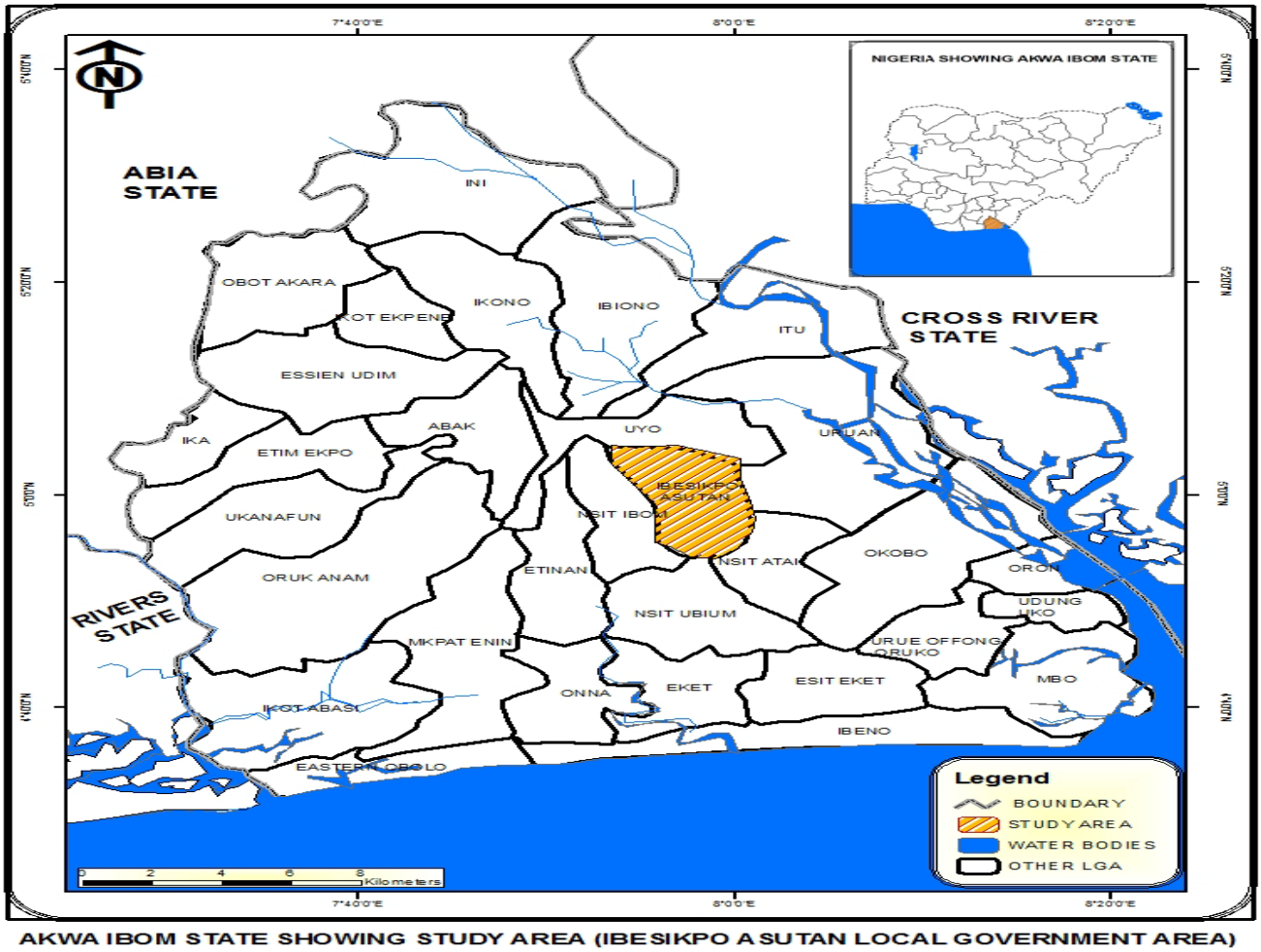

Figure 1. Map Showing the Study Area

2.4. Direct Wet Mount

About 8-10 drops of normal saline were added depending on the amount of the gut content and then mixed together using a spatula. A drop or two of the solution was taken and dropped on a slide, covered with a cover slip then examined under a light microscope with the magnification of x10 and x40.

2.5. Identification of Parasites

The adult worms, eggs, and larva were identified under the microscope with the aid of the identification keys by Ashenafi and Eshetu (2004), and Soulsby (2002).

2.6. Data Analysis

Chi-square statistical test was used to analyze the data obtained. Level of significance was set at $p \leq 0.05$.

3. Results

A total of one hundred and five (105) gastrointestinal tracts of chickens were examined for helminth infection, fifty-five (55) were broilers while fifty (50) were local chickens. Out of the 55 broiler chickens examined, two (2) were infected while fifty (50) of the local chicken examined were infected (Table 1). Hence, the percentage prevalence for both chicken breeds was observed to be 3.6% and 100% respectively. There was a significant difference ($p<0.05$) in the prevalence of helminths infection between broilers and local chickens. Thirteen (13) different species of intestinal parasites were isolated and identified, which comprised of nematode and cestode species as shown in Table 2. The nematode species isolated were *Ascaridia galli* 44 (41.9%), *Capillaria* species 5(4.7%), *Enterobius vermicularis* 3(2.8%), *Heterakis gallinarum* 4(3.8%), *Streptocararecta* 1(0.9%), *Strongyloidesstercoralis* 2(1.9%), *Trichostrongylustenuis* 1(0.9%), and *Trichuris trichuria* 2 (1.9%), while the cestodes species were *Diphylobothriumlatum* 3(2.8%), *Dipyllidiumcaninum* 7(6.6%), *Raillietina* species 20(19.0%), *Choanotaeniainfundibulum* 2(1.9%) and *Hymenolepsis* species 14(13.5%). Prevalence of the various intestinal parasites varied considerably ($p<0.05$, for all tests). Prevalence of single, double and triple infections was observed. In all the gastrointestinal tracts examined, there was a higher frequency of double infection 22 (20.9%) compared to single infection and triple infection which were 13 (12.3%) and 18 (17.1%) respectively as shown in Table 3. There was a significant difference ($p<0.05$) in the prevalence of single, double and triple infection.

The heterogeneous dispersion of helminth species in relation to their predilection sites is shown in Table 4. The segments of the digestive tract examined all harbored one helminth species or the other. More worms were recovered from the small intestine.

Among the eight (8) nematode species recorded, *Ascaridia galli* had the highest prevalence while the *Raillietina species* had the highest prevalence among the five (5) cestode species observed as shown in Figure 2 (bar graph). The helminth parasites that had the least prevalence rate were *Strongyloides species* and *Trichostrongyloides tenuis*.

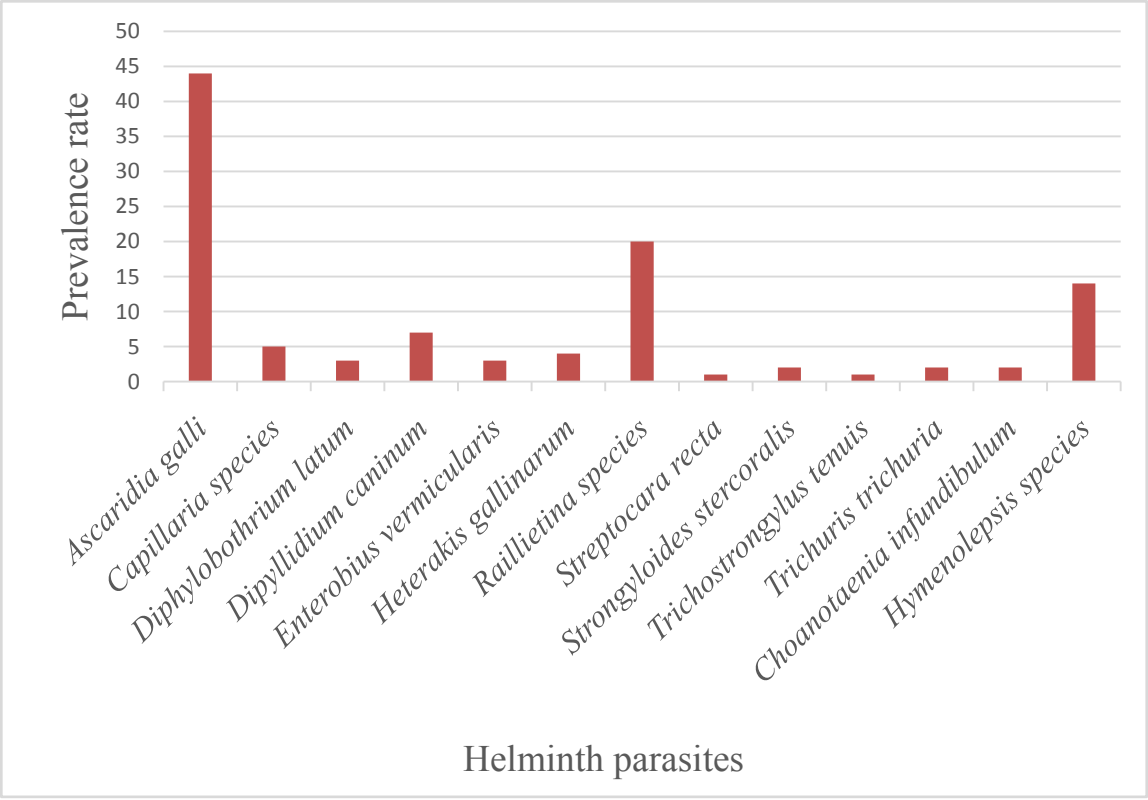

Figure 2. A Bar-Chart Showing the Prevalence rate of individual parasites

Table 1. Prevalence of helminth parasites in chickens examined

Chicken breeds	Number examined	Number infected	Percentage infected	X^2
Broiler chicken	55	2	3.6%	96
Local chicken	50	50	100%	

X^2 =96; df =1; p<0.05.

Table 2. Prevalence of individual parasites in each chicken category

Parasites	Broiler chicken, N=55 Number infected (%)	Local chicken N=50 Number infected (%)	Total
Ascaridia galli	1(1.8)	43(86)	44 (41.9)
Capillaria species	0(0)	5(10)	5 (4.7)
Diphylobothrium latum	0(0)	3 (6)	3 (2.8)
Dipyllidium caninum	0 (0)	7(14)	7 (6.6)
Enterobius vermicularis	0 (0)	3(6)	3 (2.8)
Heterakis gallinarum	0 (0)	4(8)	4 (3.8)
Raillietina species	0 (0)	20(40)	20 (19.0)
Streptocara recta	0 (0)	1(2)	1(0.9)
Strongyloides stercoralis	0 (0)	2(4)	2(1.9)
Trichostrongylus tenuis	1 (1.8)	0(0)	1(0.9)
Trichuris trichuria	0 (0)	2(4)	2(1.9)
Choanotaenia infundibulum	0 (0)	2(4)	2(1.9)
Hymenolepsis species	0 (0)	14(28)	14(13.5)

X^2 =239.27, df =12, p<0.05.

Table 3. Prevalence of single, double and triple infection

Infection Type	**Parasites**	**Broiler Chicken N=55**	**Local Chicken N=50**
Single	*Ascaridia galli*	1 (1.8%)	11 (22%)
	Trichostrongylus tenuis	1 (1.8%)	0 (0%)
		2 (3.6%)	11 (22%)
Double	*Ascaridia galli + Hymenolepsis species*	0(0%)	6(12%)
	Ascaridia galli +Diphylobothrium latum	0(0%)	3(6%)
	Ascaridia galli + Raillietina species	0(0%)	4(8%)
	Choanotaenia infundibulum + Raillietina species	0(0%)	1(2%)
	Enterobius vermicularis+ Ascaridia galli	0(0%)	2(4%)
	Dipyllidium caninum + Raillietina species	0(0%)	1 (2%)
	Ascaridia galli + Trichuris trichuria	0(0%)	1(2%)
	Heterakis gallinarum + Raillietina species	0(0%)	3(6%)
		0 (0%)	22 (82%)
		0 (0%)	18 (36%)
Triple	*Ascaridia galli + Hymenolepsis species + Raillietina species*	0 (0%)	4 (8%)
	Ascaridia galli+ Choanotaenia infundibulum+Enterobius vermicularis	0 (0%)	1 (2%)
	Hymenolepsis species+Capillaria species +Ascaridia galli	0 (0%)	3 (6%)
	Ascaridia galli+Streptocara reta+Capillaria species	0 (0%)	1 (2%)
	Hymenolepsis species+Strongyloides stercoralis+ Raillietina species	0 (0%)	1 (2%)
	Dipyllidium caninum +Raillietina species+Capillaria species	0 (0%)	1 (2%)
	Heterakis gallinarum +Raillietina species+ Ascaridia galli	0 (0%)	6 (12%)
	Trichuris trichuria +Ascaridia galli +Strongyloides stercoralis	0 (0%)	1 (2%)
		0(0%)	18(36%)

X^2 =40.8, df =2, p<0.05.

Table 4. Parasites and their predilection sites

Parasitic Nematodes	Gizzard	Small intestine	Caeca	large intestine
Ascaridia galli	√	√	√	√
Capillaria species		√	√	
Enterobius vermicularis	√	√		√
Heterakis gallinarum			√	
Streptocara recta	√			
Strongyloides stercoralis		√	√	√
Trichostrongylus tenuis		√		
Trichuris trichuria	√	√		
Parasitic Cestodes				
Diphylobothrium latum		√		
Dipyllidium caninum	√	√		√
Raillietina species		√		
Choanotaenia infundibulum		√		
Hymenolepsis species	√	√	√	

Plate 1. Anterior view of *Streptocara recta*

Plate 2. Anterior view of *Heterakis gallinarum*

Plate 3. Posterior view of *Heterakis gallinarum*

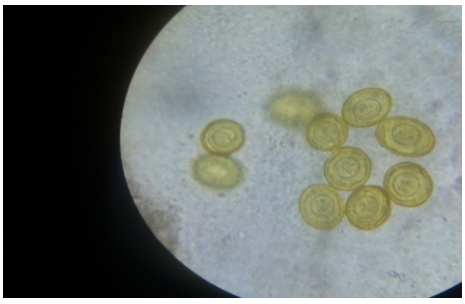

Plate 4. Eggs of *Hymenolepsis* species

4. Discussion

In this study, the overall prevalence of gastrointestinal infection with helminth parasites was 49.5%. This is similar to the results obtained by [3]. The result obtained in this study is low when compared with other studies; 99% recorded by [15], 65% by [16] and 61.9% by [17]. The result of this study is slightly higher than 37.9% obtained by [18]. This study revealed a high prevalence of intestinal helminth infection in local chickens and a lower occurrence of these helminth parasites in broiler chickens. This supports the results of [16] and [9]. This could be attributed to differences in chicken management practices, hygiene standards, feeding habit and possibly host immunity.

Based on the chicken breeds examined, the prevalence of helminths infection in broilers in this study is 3.6%. The low prevalence in this study is similar to that obtained by [5]. In contrast, [19] and [16] recorded a higher prevalence of helminth infection in broiler chickens. The prevalence of infection in this study could be associated with the management system, where the chickens have restricted contact with the various intermediate hosts of the parasites. In addition, the periodic deworming carried out in some poultry farms could also contribute to the low prevalence.

In local chickens, there was a high prevalence (100%) of helminth infection recorded. This was similarly reported by [20,21,22,23,24]. However, the result of this study is higher than those obtained by [1,16,25,26]. This high gastrointestinal helminth infection in local chickens revealed in this study could be attributed to environmental conditions and traditional breeding which are suitable for infection establishment. The chickens seek their food in the soil, and they are frequently contaminated with infective stages of parasites and living organisms (earthworms, insects, mollusks; in the case of trematode infection) which serves as intermediate hosts.

In this study, two classes of parasites were recovered namely; Nematode and Cestode of which there were eight (8) and five (5) different species of these classes respectively. This is in tandem with the earlier results [16,23,27,28,29], that recorded nematode and cestode parasites. In contrast, [9,24] in addition to nematode and cestode parasites also recovered (trematodes and acanthocephalan) and coccidian parasites respectively. This difference in species of parasites recovered might be as a result of changes in environmental and favorable conditions.

The most prevalent nematode and cestode parasites in this study are *Ascaridia galli* (41.9%) and *Raillietina* sp (19.0%) respectively. This result corroborates studies by [7,30,23,31]. The high rate of *Ascaridia galli* in this study could be as a result of poor sanitary conditions of the environment and lack of proper medication. It could also be due to a high rate of moisture which supports larval development and enhances transmission. The reason for the dominance of *Raillietina species* could be attributed to favorable environmental conditions which appear to be favorable for the survival of *Raillietina species* eggs and the development of insects (Hymenoptera) which serves as an intermediate host. In contrast, [1] and [24] recorded *Heterakis gallinarum* as the most prevalent nematode parasites. There were no trematodes or acanthocephalans observed in this study. According to studies conducted in Africa, the trematodes and acanthocephalan were rarely observed in the local chicken or broiler chicken. This can be explained by the complexity of their life cycle and the inaccessibility of intermediates hosts. Otherwise, the variations in the prevalence of gastrointestinal helminths of local chickens from different regions of Africa is in relation to the geographic factors and climatic conditions that influence the life cycle of worms. These variations could be due to differences in local environmental

conditions, which support larval development and facilitate transmission.

Observations from this study showed that double infection is more prevalent than single and triple infections which correlate with results recorded by [32]. The mixed infection of two or more species of parasites per bird could be due to food preference at a particular time, which determines the establishment of mixed or single infection in chickens. Mixed infections have been reported in several studies; [16,17,32].

The predilection site for most of the parasites was the small intestine where semi-digested food and debris abound and thus, favors the establishment of the helminth. Similar observations were made by [25,29,30,33]. Though the effects of the presence of this helminth on the debility, morbidity, and motility of chickens could be investigated, it is certain that gastrointestinal helminth infection interferes with host metabolism resulting in poor feed utilization, reduced growth rate and size and death in severe cases [33].

These parasites observed causes different damages to the host in one way or the other. Extensive *A. Galli* infection may reduce egg production in floor housed breeders and commercial layers. Death may occur due to intestinal obstruction in birds which are immune suppressed or are affected by an intercurrent debilitating condition. Infections with Capillaria species can be highly pathogenic for birds kept in deep litter systems or in free-range systems where big numbers of infective eggs may build up in the litter or in the soil. Light infections with *Capillaria species* produce inflammation and thickening of the crop and esophagus. Heavy infections produce marked thickening of the esophagus and crop wall with catarrhal and copious inflammation. When infections occur in the small intestine or in the caeca the animals become emaciated, weak and anemic. Bloody diarrhea with hemorrhagic enteritis is seen in heavy infections of *Capillaria species* [29].

Chronic infections due to *Raillietina* species are characterized by reduced growth, emaciation, and weakness. Of the three species, *R. echinobothrida* is the most pathogenic. Nodules and hyperplastic enteritis may develop at the site of attachment. This phenomenon is named "Nodular tapeworm disease" and may occur in heavy infections. Cestodiasis results in emaciation in mature flocks, especially if the severe infestation is exacerbated by malnutrition or immunosuppression. The adult *Choanotaenia infundibulum* tapeworms are moderately pathogenic causing weight loss.

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