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International Journal of Current Research
Vol. 5, Issue, 06, pp.1426-1428, June, 2013

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

REVIEW ARTICLE

GLOBAL SIGNIFICANCE OF EPIDEMIOLOGY, IMMUNODIAGNOSTICS AND HISTOPATHOLOGY OF CESTODE PARASITES IN FOWL (*Gallus gallus*)

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ARTICLE INFO

Article History:
Received 07th March, 2013
Received in revised form
24th April, 2013
Accepted 09th May, 2013
Published online 15th June, 2013

Key words:
Epidemiology,
Histopathology,
Cestodiasis.

ABSTRACT

An epidemiological analysis has got a significant role in analyzing the emerging population-based health management frameworks. Thus, it is need of hour to include studies on different hosts including the poultry fowls. The aim behind the review is to encourage more young researchers to initiate work on this critical approach. The present work stresses on integrated approach to the control and diagnose of cestodiosis in domestic fowl. Moreover, the histopathological studies will help in estimating damage done to hosts by parasites. The immunological techniques such as (ELISA and Western Blot) will help in quick diagnosis of cestodiasis and prepare the materials to control the disease at early stages without much morbidity.

INTRODUCTION

In livestock, sudden outbreak of diseases is a severe problem, causing heavy losses to the poor farmer worldwide. There is a growing interest in understanding the parasitic diseases in poultry so that they can be prevented and treated. Poultry husbandry is by far the most common in the livestock sector throughout the world. In India, poultry meat and egg production has been the fastest growing in agricultural or livestock production, with an average growth of 8% per annum (Mehta and Nambiar, 2007). But with increase in poultry management, a range of different parasitic infections are re-emerging, which are a serious hindrance to successful economic output. Poultry products have been one of the most important protein sources for man throughout the world and the poultry industry, particularly the commercial production systems have experienced a continuing growth during the last 20-30 years. The traditional extensive rural scavenging systems have not, however seen the same growth and are faced with serious management, nutritional and disease constraints. These include a number of parasites which are widely distributed in developing countries and contributing significantly to the low productivity of backyard flocks. In free-range chickens parasitic infestations are often neglected (Pandey and Jiang 1992). Helminth infestations are associated with unthriftness, poor growth due to poor feed conversion rate, reduced egg production and fertility and in acute worm infestations lead to death (Soulsby 1982). So it is important to carry out study on domestication of chick to understand the problems associated with the ruralscavenhing system and to suggest improvising measures for the same.

Significance of the Study

Although lot of work has been carried out on different aspects of helminth parasites in the world as well as in Indian sub-continent, but the previous work has mainly focused on infection indices of domestic fowl. In order to fill the gap we intend to focus on epidemiology of cestode parasites' of domestic fowl in temperate climatic zone with special emphasis on immunodiagnostics and histopathology. This study will help in knowing the risk factors involved in cestode infection and devising measures to prevent progression and transmission of cestode infection. This will also help domestic fowl managers to have a first hand information regarding cestode infection in this region and will open new interesting areas in this emerging field.

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Epidemiology

Lot of Work has been done around the globe by different workers. Pandey and Jiang 1992, reported that all free-range managed birds are in constant contact with soil which serves as an important reservoir and transmission site for external larval stages of helminths and insects. Faust 1927, for the first time recorded some of the helminth parasites of vertebrates of Kashmir valley. Johri (1950) described cestodes of rat with special reference to hymenolipidid showing variations in the genital organs. Qureshi (1950) reported incidence of helminthic infection in the avian fauna. Pennycott (1998) observed lead poisoning and parasitism in a flock of mute swans and the parasites recovered were tamidostomum, trinoton, wadoides and echinoparyphium.Bondarenko and Petkevichiute (1998) described the type species of the genus *Wardiumfryei* and the type specimen of *W. fryei* was morphologically identical to *H. clavicirrus*. Dimitrov *et al*., (1999) furnished an account on argentophilic structures of two populations of *Echinostomarevolutum.* Dranzoa *et al*., (1999) observed that *Pseudolynchiacanariensis* (the "pigeon fly") was the most prevalent ecto-parasite (100%).

The louse *Columbicolacolumbae* was next in prevalence (94.1%). It is postulated that the pigeon fly transports this parasite. Three ice of economic importance were found: *Menopongallinae, Menacanthusstramineus* and *Chelopistesmeleagridis.* Cestodes were the only helminths found, occurring in 23.5% of the birds. While working on effects of a diet deficient in Vitamins A, D and E on infectivity and development of *Echinostomatrivolvis* in chicks, it was observed that avian hosts lacking fat soluble vitamins showed poor development of *E. trivolvis* (Simpkins and Fried, 1999).

While presenting an elaborate data on morphology and taxonomy of *Tschertkovilepis* and *Orepanidotaenia* of geese in Solvaka, the presence of 8 *Diorchoidrostellar* hooks and numerous muscle bundle in *Drepanidotaenia* were reported (Macko and Spakulova, 1999). Sobhan *et al*., (2000) investigated the occurrence of avian nematodes viz.; *Acuariahamulosa* and *Acuariaspiralis*, in fowls of Bangladesh. The Pyknotic nuclei in the epithelial lining of the proventricular mucosa indicated necrosis of the organ. Mullican, Hugfman and Fried (2001) made some observations on the infectivity and comparative pathology of 37 Collar spined species of *Echinostoma* and it was studied that the nice selection of different *Echinostoma* varied. Betlejewska and Kalisinska (2001) observed that significantly more worm cysts of *Echinostomauncinata* were found in young mallards (33.3%) than in older ones (13.3%). Magwisha *et al*., (2002) stated that all the chickens taken in experiment harboured at least three different species. Growers contained 4-14 and adults 3-12 helminth species. The number of species increased per chicken in rainy season. There were significantly higher helminth burdens ($p<0.05$) in growers than in adults. Permin *et al*., (2002) stated that eight different ectoparasites were identified; the more prevalent ones had the following prevalences (Young, %; adult, %):

Argaspersicus (6; 14),
Cnemidocoptesmutans (6; 32),
Echidnophagagallinacea (72; 74),
Goniocotesgallinae (0; 22),
Menacanthusstramenius (90; 88) and *Menopongallinea* (24; 66).

The prevalences of *C. mutans, G. gallinae* and *M. gallinae* were higher in adults compared to young chickens. The most prevalent nematodes identified were (with prevalence in % for young/adult birds):

Allodapasuctoria (76; 72),
Ascaridiagalli (48; 24),
Gongylonemaingluvicola (28; 56),
Heterakisgallinarum (64; 62) and *Tetrameresamericana* (70; 62).

For cestodes the prevalences were:
Amoebotaeniacuneata (60; 68),
Hymenolepis spp. (62; 80),
Raillietinaechinobothrida (66; 34),
Raillietinatetragona (94; 100) and *Skrjabiniacesticillus* (50; 76).

In the study on gastrointestinal helminths of *Leptoptiloscrumeniferus*, there were reported the nematodes viz.; *Acuariaspiralis, Cheilospirura, Echinurialeptopti* and *Amidostomum* (Bwangamoi *et al*., 2003). Toledo *et al*., (2004) while working on the effect of age of adult worms of *Echinostomafreid*i on the infectivity of meracidia, suggested that adult worms producing viable eggs required additional maturation to be able to yield eggs containing infective miracidia. Martı´n-Pacho, 2005 conducted Coprological and Serological Survey for the prevalence of *Ascaridia spp*. in laying hens and found seroprevalence of 21.8% (range 7.6–95%). In four experimentally infected hens, a progressive increase of the IgG antibody levels was observed, surpassing the cut-off point established for ELISA test 6 weeks post-infection. Serological tests are able to detect the infection before the eggs of the parasite appear in the faeces of infected hens, providing a useful tool to detect infections with *scaridia spp*. in avian farms.

Phiri *et al*., (2007) gave an account on helminths of chickens: *Allodapasuctoria*(85.6%),
Tetrameresamericana(80.8%),
Ascaridiagalli (28.8%),
Gonglonemaingluvicola (50.4%),
Raillietina spp. (81.6%) and *Heterakisgallinarum* (32.8%) although no trematodes were found. Mixed infections accounted for 88.2% as compared to 7.2% of single infections. These results confirm the higher risk of helminth infections in free-range systems and may explain the deleterious effects in chickens.

Cestodiasis

Gut of domestic fowl is a safe haven for many cestode parasites, but the tapeworms belonging to the genus *Raillietina* are the most prevalent avian helminth parasites throughout the world. *R. echinobothrida* (Mégnin, 1880) is the most important species in terms of prevalence and pathogenicity, particularly in the domestic fowl, *Gallus domesticus* Linnaeus, 1758 (Permin and Hansen, 2003). The cestode inhabits the small intestine and causes stunted growth of young chicken, emaciation of the adult, and decreased egg production of the hen (McDougald, 2003). In conditions of heavy infestation, *R. echinobothrida* is listed as one of the most pathogenic tapeworms, causing conspicuous intestinal nodules in chicken, with characteristic hyperplastic enteritis associated with the formation of granuloma (Kumar, 2007). The symptom is termed 'nodular tapeworm disease' in poultry. Intestinal nodules often result in degeneration and necrosis of intestinal villi and ultimately lead to death.cestodes interfere with the metabolisms of certain compounds: they absorb glucose and galactose and stored them as glycogen as well as absorbed amino acids, polypeptides and protein (Cheng, 1973). Infection of chickens with 20 or 50 cysticercoids of Raillietinatetragona had no effect on the total protein content of the liver, but did cause a slight decrease in content of intestinal tissue (Vijayakumaran and Nadakal, 1980). The free amino acid nitrogen in the blood was not altered by infection. However, the serum total proteins and the serum albumin/globulin ratio was significantly reduced.

Weight gain over the 8 weeks of the experiment was significantly less in infected birds. The changes observed were more marked in birds infected with the higher dose, and in the period 4 to 6 weeks after infection. Shah *et al*., 1999 found that prevalence and magnitude of variation of cestode infection was high in indigenous (59.9%) in comparison to exotic (16%) and reasoned that poor management in the indigenous layers could be the reason.LukaandNdams, 2007 encountered cestode parasites including *Raillietinatetragona* Molin 1858, *R. echinobothrida*Megnin 1880, *R. cesticillus*Molin 1858, *Choanotaenia infundibulum* Bloch1779 and ymenolepiscarioca de Magalhaes 1898. Out of which *Hymenolepis carioca* was the most prevalent and *R. cesticillus* the least.

Imunodiagnostics

To diagnose parasitic infections in poultry is a time consuming job, but it can be done with relatively simple tools. The more sophisticated immunological and molecular biology techniques have not yet been developed for diagnosis of poultry parasites. In Imunodiagnostics the ractivity of sera from cases of domestic fowl infected with cestode parasites are carried out by double diffusion andindirect hemagglutination (IHA). IgG antibodies are analysed by enzyme-linked immunosorbent assay (ELISA) test performed as described by Prieto *et al*. (1997). All serum samples that are found positive in the ELISA analysis, also analysed by Western blot asdescribed by Tsang *et al*. (1985).

Conclusion

Cestode**s** (tapeworms) are also found in poultry, and those reared under free range, scavenging or backyard conditions are more likely to be infected with them. These worms were reported to have impact in the health and growth of these chickens thus recommendations for control of these parasites are a necessity. This study will help in knowing the risk factors involved in cestode infection and devising measures to prevent progression and transmission of cestode infection. This will also help domestic fowl managers to have a firsthand information regarding cestode infection in this region and will open new interesting areas in this emerging field.

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