Occurrence of helminths and coccidia in apparently healthy free range local chickens slaughtered at Morogoro live bird market

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SUMMARY

Endoparasites are among important causes of mortality and reduced productivity in village chickens. This study was carried out to determine the presence of intestinal helminths and coccidia in apparently healthy free range local chickens slaughtered at Morogoro live bird market so as to establish the magnitude of the problem. A total of 252 intestines of slaughtered chickens were examined during the survey. Helminths were recovered and identified using standard methods. Smears of intestinal scrapings were examined under light microscope to detect coccidia oocysts. Two hundred and twenty chickens (87.3%) were infested with helminth species, whereas 28 birds (11.1%) were infected with coccidia. Twenty five birds (9.9%) had conjoint infestations with helminth and coccidia. In the present survey nine, different helminth species were recovered, namely; *Ascaridia galli* (10.5%); *Heterakis gallinarum* (5.3%); *H. isolonche* (3.9%); *Capillaria* spp. (2.6%); *Raillietina echinobothrida* (38.2%); *R. tetragona* (34.2%); *R. cesticillus* (2.6%); *Choanotaenia infundibulum* (1.3%) and *Hymenolepsis cantaniana* (1.3%). The predilection site for the cestodes was the small intestines except for *H. cantaniana* which was also recovered from the large intestines. With the nematodes, *Capillaria spp.* and *H. isolonche* were recovered from the caeca, *H. gallinarum* from small and large intestines and *A. galli* from all intestinal parts. Our findings indicate that helminth and coccidia are common and pose health problems in free range local chickens. Integrated sustainable control strategies need to be put in place to improve chicken productivity and enhance smallholder farmers' livelihoods in the rural areas where most of the village chickens are produced.

Keywords: Helminth, coccidia, village chicken, live bird market

INTRODUCTION

Free range local chickens refer to breeds of chickens indigenous to a particular locality with no improvement history (Njue *et al.,* 2001). These constitute a rich genetic resource base for any future genetic improvement and production of strains adaptable to the tropics (Horst, 1988). In Tanzania the contribution of these chickens to the economy and human nutrition is immense as the industry constitutes 98.3% of the estimated 26,065,000 chickens' population (MoA, 1995; FAO, 2002). The industry provides petty cash to the resource-poor farmers and almost all of the eggs and chicken meat requirements in the rural areas and 13-20% of the urban requirements (Kabatange and Katule, 1990). However, the mortality rate in free-range chickens is known to be very high especially at the early age and during outbreaks of viral or bacterial diseases such as Newcastle disease (Minga *et al.,* 1989) and fowl typhoid (Sa'idu *et al.,* 1994). Predators such as mongoose, hawks and eagles (Negesse, 1993) and parasitic infections are also among the important causes of mortality to village chickens (Sa'idu *et al.,* 1994). Kuit *et al.* (1986) and Bell *et al.* (1990) noted that the majority of the free-range chickens die before they are three months old. Only 30% of the hatched chicks are known to grow to adult stage (Minga *et al.,* 1989).

A high mortality rate caused by Newcastle disease to village chickens masks the contribution of other diseases to chicken losses and these do not therefore receive much attention (Bell, 1992). However parasitism ranks high among factors that threaten village chicken production. According to Adene and Dipeolu (1975), chicken losses due to parasitic diseases are higher than those attributed to Newcastle disease. Helminths and coccidia are among the common poultry parasites (Nnadozie, 1996), with predilection to the gastrointestinal tract. Studies have shown that the prevalence of parasitic infestations in village chicken flocks is

close to 100%, and in most cases individual birds harbour more than one parasite type (Permin *et al.*, 1997; Magwisha *et al*., 2002). In Zambia, Phiri *et al.* (2007) reported helminth prevalence at 95.2%, whereas in Northern Nigeria, a study reported the prevalence of helminth infection to be about 70% (Yoriyo *et al.,* 2008). In Ethiopia, the coccidiosis was reported to be prevalent in village chicken (Ashenafi *et al.,* 2004).

Helminths exert their effects on the host by different ways such as blood sucking, tissue destruction during larval migration, feeding, mechanical or chemical irritation of contact surfaces, and liberation of toxic metabolites and obstruction of excretory ducts, air passages or blood vessels (Nielsen, 1976; Kassai, 1999). Their pathogenic effects depend on their type and burdens; and also on the environmental and management factors e.g. nutrition, climate and management system (Permin *et al.,* 1997). Chickens reared in battery cage are less parasitised with helminths compared to those reared in deep litter systems which in turn are better off if compared to free-range chickens (Hussain, 1967; Humphrey, 1979, Hemalatha *et al.,* 1987; Oyeka, 1989; Abebe *et al.,* 1997; Permin *et al., 1999).* Helminth parasites are responsible for low productivity of free-range chickens as they slow growth rate and cause production of few eggs per year (Yadav and Tandon, 1991; Permin *et al.,* 1997; Mukaratirwa *et al.,* 2001). Some poultry worms such as *Heterakis gallinarum* have been associated with the transmission of *Histomonas meleagridis* in turkeys and chickens (Russel *et al.,* 1978). Postmortem examinations have revealed poor body conditions in free-range chickens with high worm burdens (He *et al., 1990) as the parasites interfere with metabolic activities.*

The development of poultry health programmes requires reliable information on the epidemiology of diseases which need regular updates on their dynamics both in terms of prevalence, distribution and aetiology characteristics. Meanwhile, funding for research and surveillance of animal diseases has decreased at both national and international levels. This study therefore used a market facility with the aim of establishing the presence of helminths and coccidia in apparently healthy free range local chicken slaughtered at Morogoro live bird market. The findings of the study would serve as an update to the existing and eventually aid in the process of devising control programmes for the infections.

MATERIALS AND METHODS

Study area

The study was conducted in March and April 2011 at a live bird market located in Morogoro Municipality, Morogoro region of Tanzania. It involved collection of intestinal samples from birds slaughtered at the market. The market is an appendage of the Morogoro Municipality central market, located at the centre of the town. It receives village chickens from different rural parts of the region and neighbouring regions such as Dodoma and Singida. The birds are sold in cages with most customers buying them for consumption. Some consumers buying the chickens for consumption prefer to have the chickens slaughtered at the market in which facilities are available to that effect.

Study design and sample size determination

The present research adopted a cross-sectional study design. The sample size was calculated using the formula for random sampling developed by Martin *et al.* (1987) as follows: $n=Z^2PQ/L^2$; where n = required sample size, Z is the Z value for a given confidence level, P is a known or estimated prevalence, Q= (1-P), and L=allowable error of estimation. For the purpose of this study a confidence level was assumed at 95% with an allowable error of estimation of 5%. The average prevalence of helminths and coccidia in village chicken were estimated at 87% (Msanga and Tungaraza, 1985; Otaru and Nsengwa, 1985; Permin *et al.,* 1997 and Magwisha *et al.,* 2002) and 20% (Kaingu *et al.,* 2010) respectively. Therefore, 174 and 246 chickens were to be examined for helminth and coccidia infections respectively. The present study however examined intestines from 252 chickens for both parasites.

Collection of intestinal samples

Around noon on each sampling day, a batch of 12 intestines were randomly picked from a group of intestines from chickens slaughtered between early morning and the time of collection. The intestinal samples were immediately conveyed to the Parasitology laboratory at Sokoine University of Agriculture for recovery of helminths and detection of coccidia oocysts.

Recovery and identification of helminths

Each chicken intestinal loop was separated into small intestines and large intestines including caeca. Each segment was opened into a separate container. The mucosae of the separated parts were scraped off using a glass slide and thoroughly washed in tap water over a sieve with pores sized 200 µm. Helminths were recovered from the washings with the aid of a stereoscopic microscope and preserved in 70% alcohol for identification. Processing and identification of helminths species adopted methods and identification keys described previously (Soulsby, 1982; Gibbons *et al.*, 1996; Kaufmann, 1996).

Coccidia oocyst detection

For the detection of coccidian oocysts, intestinal scrapings were mixed with a drop of normal saline to form suspension on a microscope slide. Then a cover slip was applied and the slide observed under a standard microscope under ×10 objective magnification.

Data analysis

Data were cleaned in Microsoft office Excel and analyzed in Medcalc®. Descriptive statistics (frequencies) were computed to determine the prevalence of worms and coccidia in sampled chicken. Worm species specific prevalence was also computed.

RESULTS

During the survey, a total of 21 visits were made to the market. The average number of birds slaughtered between early morning and the time of sample collection was 26 (15-48). Twelve intestinal samples were randomly picked during each visit day making a total of 252 samples collected and screened for the endoparasites (helminths and coccidia) for the whole study.

Overall prevalence of helminths

The prevalence of helminth infection was recorded at 87.3% (220 out of 252 sampled chickens found to be infected) Ninety seven chickens (38.5%) presented with multiple helminth species infection; with the the remaining number (123) having single helminth species infection. Of the recovered worms, 77.6% were cestodes with *Raillietina echinobothrida* being recovered more frequently in the group; where as nematodes formed 22.3% of the recovered helminths with *Ascaridia galli* being frequently recovered in the group (Table 1).

Type of helminths species infecting chickens

In the present study, a total of nine helminth species were recovered from the study birds; of which five species were in the group of cestodes and four species were nematodes. Trematodes were not recovered. Table 1 displays the species recovered and their corresponding prevalence in the study population. The predilection sites for the recovered worm species are shown in Table 2.

Prevalence of coccidia

Through detection of oocysts in intestinal scrapings, 28 chickens (11.1%) were found to be infected with coccidia. Twenty five (9.9%) of them had coccidia oocysts occurring conjointly with helminth infection.

Table 1. Prevalence of different helminths species in village chicken slaughtered at Morogoro live bird Market

Helminth species	Number positive for Individual helminth	Prevalence in the Study chicken population	Prevalence among helminth types
Cestodes			
Raillietina tetragona	78	31.0	34.2
Raillietina echinobothrida	87	34.5	38.2
Choanotaenia infundibulum	3	1.2	1.3
Raillietina cesticullus	6	2.4	2.6
Hymenolepsis cantaniana	3	1.2	1.3
Nematodes			
Ascaridia galli	24	9.5	10.5
Heterakis isolonche	9	3.6	3.9
Capillaria spp.	6	2.4	2.6
Heterakis gallinarum	12	4.8	5.2

Table 2. Distribution of different helminths species in different parts of the intestinal tract

Helminth species	Number (%) positive in different parts of the intestinal tract		
	Small intestine	Large intestine	Caecum
Cestodes			
Raillietina tetragona	78 (100.0)	0 (0.0)	0 (0.0)
Raillietina echinobothrida	87 (100.0)	0 (0.0)	0 (0.0)
Choanotaenia infundibulum	3 (100.0)	0 (0.0)	0 (0.0)
Raillietina cesticullus	6 (100.0)	0 (0.0)	0 (0.0)
Hymenolepsis cantaniana	3 (60.0)	2 (40.0)	0 (0.0)
Nematodes			
Ascaridia galli	24 (100.0)	24 (100.0)	3 (12.5)
Heterakis isolonche	0 (0.0)	0 (0.0)	9 (100.0)
Capillaria spp.	0 (0.0)	0 (0.0)	6 (100.0)
Heterakis gallinarum	12 (100.0)	7 (58.3)	0 (0.0)

DISCUSSION

Similar to many other developing countries, free range local chickens are strictly linked to rural households in Tanzania. The production system is small-scale scavenging in a free-range environment. They however constitute a significant portion of human livelihood and contribute significantly to food security. A major weakness in free range local chicken farming is on disease control. Losses caused by mortalities due to diseases alone have been overshadowed by devastating pressure of Newcastle disease (ND). This has led to underestimation of other factors whose contribution to chicken losses is huge (Alders *et al.,* 2002; Muhairwa *et al.,* 2008). Endoparasites and ectoparasites are equally economically important in village chicken farming. They reduce weight gain, egg production and hatchability and are responsible for significant deaths in young birds (Muhairwa *et al.,* 2008). In the present study a significant proportion of the sampled birds were infested with one or more types of helminths. This further implies lack of control measures of these important endoparasites in areas of production of the birds, the rural areas.

The epidemiology of helminths in chickens is influenced by many factors such as the life cycle of the helminth species, climatic and ecological conditions of the area and management system (Terregino *et al.,* 1999). Many studies in tropical countries have observed that infected chickens usually carry multiple helminth species (Kaushik

and Deorani 1968; Ssenyonga, 1982; Otaru and Nsengwa, 1985; Shamsul-Islam, 1985; Fakae *et al.,* 1991; Mpoame and Agbede, 1995; Abebe *et al.,* 1997; Permin *et al.,* 1997; Poulsen *et al.,* 2000 and Mukaratirwa *et al.,* 2001). This was also evident in the present study in which the obtained prevalence of 87.3% falls within the range reported in previous surveys in the country (74 to 100%) (Msanga and Tungaraza, 1985; Otaru and Nsengwa, 1985; Permin *et al.,* 1997; Magwisha *et al.,* 2002). Another similar finding of this study to most of these other studies is that only nematodes and cestodes were recovered. None of the examined birds harboured trematode parasites, may be due to non-accessibility to infected snails (Puttalakshmamma *et al.,* 2008). Many other reports elsewhere indicate that the geographical distribution of nematodes and cestodes in free-range chicken is wide especially in the tropical areas like Africa (Edgar, 1953; Round, 1962; Banage, 1968; Mpoame and Agbede, 1995; Mukaratirwa *et al.,* 2001; Magwisha *et al.,* 2002 and Islam *et al.,* 1988). However contrary to other studies in the country, in the present study a high prevalence of cestodes was revealed as compared to nematodes. This may partly however be explained by the number of recovery sites whereby in the present study only the intestines were involved and so missing the worms whose predilection sites are the respiratory tract and gastrointestinal parts above the gizzard. A similar observation to ours was however made by Puttalakshmamma *et al.* (2008) who reported highest prevalence rate of cestodes followed nematodes in desi birds. The presence of *Heterakis gallinae* also poses the danger of enhanced transmission of *Histomonas meleagridis* to both susceptible turkeys and other poultry through shedding of the eggs in the environment.

Our results indicate differences in predilection sites for the different worm species recovered, with some species being recovered in more than one segments. A similar observation was reported in previous studies elsewhere (Hussen *et al.,* 2012; Molla *et al.,* 2012). This specificity in parasite distribution in the gut is thought to be an attribute of differences in physicochemical environments in various regions of the gut (Nkwengulila and Mwita, 2004). Among other factors, availability of suitable food and attachment sites; and presence of certain specific stimuli such as pressure differences are also known to dictate parasite site segregation along the gut (Nkwengulila and Mwita, 2004). Some other authors attribute interactive competition for site and food among cohabiting species as among the factors determining parasite distribution in the gut (Holmes 1973; William and Jones, 1994). With all these possibilities some authors (William and Jones, 1994) still find that information on determinants of site specificity in parasite distribution is insufficient. Some authors have used predilection sites as one of the identification techniques for the worms (Molla *et al.,* 2012).

Protozoa are common in poultry and may produce moderate to severe clinical symptoms. Coccidia are probably the most widespread protozoan parasites in poultry causing enormous economic losses (Nakamura *et al.,* 1989). Reports show that the organisms are found in free range local chickens (Ashenafi *et al.,* 2004; Nnadi and George, 2010, Kaingu *et al.,* 2010). The organisms were also detected in some sampled birds in this study. Their conjoint infestations with helminth in some chickens could heighten their role in productivity losses among the birds as they all share the gastrointestinal predilection site (Nnadi and George, 2010). They could result into devastating combined effects on host metabolism. Moreover, concurrent parasitic infections result in immunosuppression, especially in response to vaccines against some poultry diseases.

In conclusion, the study has found that helminth and coccidia parasites continue to feature in the free range local chicken industry at higher prevalence similar to what has been reported previously. This has a great impact on the chicken productivity with substantial impact on rural poor farmers' livelihoods. Integrated sustainable control strategies need to be put in place to make village chicken production a profitable enterprise.

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