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Sero and media culture prevalence of Salmonellosis in local and exotic chicken, Debre Zeit, Ethiopia

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The main constraints to the development of indigenous chicken production in rural Ethiopia includes diseases, inadequate feed, predator, poor housing system and to a lesser extent limitation on financial and knowledge on management. In Ethiopia, the current rates of mortality due to diseases from day old to adult chicken are estimated to be 20-50%. Among the diseases: Fowl typhoid and pullorum disease are mentioned to cause heavy losses which are similar to other African countries. A cross sectional study was conducted from November 2011 to March 2012 with the objectives of determining the prevalence of poultry *Salmonellosis* by serology and media culture isolation from sero positive chicken of different eco-types kept under intensified production system. From one hundred and fifty (150) intensively managed chickens from different eco-type of local and one exotic breed screened, fourteen (14) chickens (9.33%) were positive to *S. gallinarum* and/or *S. pullorum* antibodies. From fifty (50) exotic chickens teated, 3(6%) chickens gave positive result up on serum agglutination test. The remaining one hundred chickens from three eco-type of local breeds namely Cheffe, Horro and Jarso, were identified to be positive on agglutination test with 6(13.6%), 2(6.45%), 3(12%) prevalence respectively. Five of 14(35.7%) sero-positive cloacal swab samples collected from four eco-types chickens were culture positive for *S. gallinarum/S. pullorum*. Of the 6 cloacal swab samples collected from Cheffe 3 (50%) and of the 3 cloacal swab samples collected from Jarso 2 (66%) were positive for S. *gallinarum/ S. pullorum*. The seropositivity and isolation of *Salmonella* in this study indicates the existence of fowl typhoid and pullorum disease in local and exotic breeds. The existence of the diseases especially in these local breeds of Ethiopia is of great concern as the diseases have the potential for horizontal and vertical transmission. The detection of such economically important diseases both in the indigenous and exotic chickens demands detail epidemiological and bacteriological investigations so as to put appropriate control strategies in place

Key words: Chicken, prevalence, *S. gallinarum, S. pullorum*.

INTRODUCTION

The main constraints to the development of indigenous chicken production in rural Ethiopia include diseases, inadequate feed, predator, poor housing and to a lesser extent there is limitation on financial and knowledge on management. In Ethiopia the current rates of mortality due to diseases from day old to adult chicken are estimated to be 20-50% (Tadele and Yilma, 2004). Among the diseases: fowl typhoid and pullorum disease are mentioned to cause heavy losses which are similar to other African countries (Bouzoubaa et al., 1992; Chrysostome et al., 1995).

Chickens are the natural hosts for the highly host adapted biovar *S. gallinarum* and *S. pullorum*. Fowl typhoid is per acute, acute or chronic form of disease affecting mostly adult chickens, whereas pullorum disease affects the very young chickens of mostly 2−3 weeks of age

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(Shivaprashad, 1997). *S. gallinarum* can produce lesions in chicks, which are indistinguishable from those associated with pullorum disease (Shivaprashad, 1997). Oral route of infection represents the main route of infection (Brito et al., 1995). Confirmatory diagnosis depends on the isolation of the organism while serological tests are satisfactory for establishing the presence and estimating the prevalence of infection within a flock (OIE, 2008).

Domestic poultry constitutes large single reservoir of salmonella organisms existing in nature. The two relatively host specific and naturally non-motile members of the genus *S. pullorum* and *S. gallinarum* are causative organism of pullorum disease that cause paratyphoid infections (Hofstad et al., 1978). Pullorum disease and fowl typhoid frequently infect the reproductive organs of adult chickens establishing a chronic infection with direct passage of the organisms into the egg as formation takes place (Hofstad et al., 1978). With the great expansion of poultry industry, the wide spread occurrence of avian *Salmonellosis* has ranked as one of the most important egg-born bacterial disease of poultry (Gast and Beard, 1993). Therefore, the main objectives of this study were to determine the seroprevalence of Poultry *Salmonellosis* in different eco-types and to isolate Salmonella organism from cloacal swab of seropositive chickens.

MATERIALS AND METHODS

Study Area and animals

The study was conducted from November 2011 to March 2012 at Debre Zeit. The study animals were chickens from three local chicken eco-types namely Chefe (central Ethiopia), Horro (Western Ethiopia) and Jarso (South Western Ethiopia) originated from different ecological areas of Ethiopia and one imported Egyptian breed (Fayoumi) at campus research center.

Study Design

A cross sectional study was designed with simple random sampling of all chickens for serology and seropositive chickens for cultural isolation. A total of 150 chickens among which 44 chicken of Chefe, 31 chicken of Horro, 25 chicken of Jarso and 50 chicken of Egyptian (Fayoumi) ecotype were included in the study for both the detection of *Salmonella* antibodies in the sera samples and *Salmonella* cultural isolation from cloacal swab samples.

Sample Collection

For serology

Approximately 2ml of blood was drawn from the wing vein aseptically using 3ml sterile disposable springs with 19 gauge and 11/4 needle size. Blood samples were kept in slant position and allowed to clot at room temperature. Serum samples were collected using sterile Pasteur pipettes, labeled and stored frozen at –20°C until tested.

For culture

Samples were collected according to the recommendations of OIE (2008). Cloacal swab samples were collected from Seropositive Chickens for bacteriological culture from live chickens using sterile cotton tipped swabs moistened with buffered peptone water (AES, (Combourg, France). The swabs were kept in properly plugged sterile test tubes and transported as soon as possible on ice to the laboratory where they were inoculated into appropriate culture media.

Serological and laboratory culture test

Serological test was done by using crystal violet stained antigen of salmonella (*S. pullorum* and/ or *S. gallinarum*) by serum slide agglutination test. Serological test was done by using crystal violet stained antigen of salmonella (*S. pullorum* and/ or *S. gallinarum*) by serum slide agglutination test (in house test or commercial test). Any degree of agglutination was taken as evidence for the disease of Salmonellosis (Awoke, 2005). The methods used in the culture and isolation of salmonellae were according to the techniques recommended by the International Organization for Standardization (ISO 6579, 1998; Quinn et al., 2000). The cloacal swabs were directly plated on XLD agar and the plates were incubated at 37°C for 24 to 72 h. Suspected colonies from the selective media were subcultured on Rambach agar and incubated at 37°C for 24 h. Colonies with characteristic bright red color on Rambach agar, which would likely be Salmonella, were subjected to successive biochemical tests after culturing pure colonies on nutrient agar. The data collected was analyzed by SPSS version 17 for descriptive statistics and possible comparisons.

RESULTS AND DISCUSSION

From chicken of different eco-type screened, 14/150 (9.33% chickens were tested positive while 3/50 (6%) of exotic breed chickens screened were positive for the agglutination test to *S. gallinarum/ S. pullorum* antibodies (Table 1). 5/14 (35.7%) seropositive cloacal swab samples collected from four eco-types of the project farm chickens were positive for *S. gallinarum/ S. pullorum* (Table 2). *Salmonella* was isolated from only two eco-types namely Cheffe and Jarso of the four eco-types investigated through cloacal swab samples. 3/6 (50%) of the cloacal swab samples collected from Cheffe and 2/3 (66%) of the cloacal swab samples collected from Jarso were positive for salmonella (Table 2).

The major diseases of poultry in Africa that have been prominently identified in commercial poultry flocks are Newcastle disease, Infectious Bursal Disease (IBD) or Gumboro, Marek's disease (MD), Fowl typhoid, Cholera, Mycoplasmosis and Coccidiosis (Adene ,1997). Unlike avian paratyphoid Salmonella serotypes, Salmonella enteric serotypes *gallinarum* and *pullorum* are not frequently excreted in chicken faeces, but infected chicks tend to produce humoral response (Barrow et al., 1992). Breeding flocks must be free of *Salmonella gallinarum* and *pullorum*; therefore, it is very important to detect them as soon as possible to prevent both disease and dissemination.

The current study revealed that 9.3% of the total examined chickens were found to be sero-positive for fowl typhoid and/or pullorum diseases in the study sites which is comparable to Melese (1992) who reported 10.05% sero-prevalence in layers and pullets in Debre-Zeit and Addis Ababa poultry farms. But it disagrees with a 35.9%

Table 1. Percentage prevalence of *S. gallinarum/S. pullorum antibodies* in chickens among two breeds of different eco-type under the same management systems.

Eco-type	Type of chick	Number of chick tested	positive	% prevalence
Cheffe	local breed	44	6	13.60%
Horro	local breed	31	2	6.45%
Jarso	local breed	25	3	12.00%
Egypt	Exotic breed (Fayuomi)	50	3	6.00%

Table 2. Number and percentage of chicken tested culture positive for *Salmonella* cloacal swab samples.

Eco-type	Number of chicks tested	Positive	Percentage (%)
Cheffe	6	3	50%
Horro	2	0	0%
Jarso	3	2	66%
Egypt	3	0	0%

prevalence of Berihun (2007) and 1.5% prevalence of Dereje (2002) in east showa, Ethiopia. Our result also disagrees with the works done in Plateaus State of Nigeria by Onunkwo (1978) who reported 3.2% prevalence. This disagreement could be due to differences in environmental contamination, management systems used, smaller sample size, breed and parent stock difference of chickens used in the present and those done by other researcher. With respect to echo-type the present study revealed 13.6, 6.45 and 12% prevalence of Cheffe, Horro and Jarso local breed chickens respectively. This is similar to study done in Benin City, Nigeria by Adesiyun et al. (1984) who reports 10% and 9.3% prevalence at Von and Bukuru area local breed chickens.

But the findings of the present study with the eco- type is lower than the findings of Bouzoubaa et al. (1992) who in Morocco reported 58% prevalence and Adesiyun et al. (1984) who in Nigeria reported 43% prevalence of the disease in village chickens. This could be due to the smaller sample size used in the present study. There is no doubt that the disease plays an important role in local breeds of different eco-type in Ethiopia.

The cultural prevalence of *Salmonella* among seropositive chicken in our study revealed 35.7% which is higher than Kassaye et al. (2010) from southern Ethiopia, Hawassa. This is because the present study uses serological test for screening and increases the sensitivity of isolating the organism; additionally the breeds here are of different eco-type of local breeds with free ranging parents except the Fayuomi breed. The cultural prevalence is lower than the reports of Mdegela et al. (2000) from Tanzania and Islam et al. (2006) from Bangladesh who used only cloacal sampling. The difference in prevalence might partly be due to use of sero-screening in the present study compared to directly taking cloacal swab sample and processing in others. Moreover, *S. Pullorum and S. Gallinarum* are not excreted extensively in the feaces (Berchieri et al., 1995; Proux et al., 2002).

The seropositivity and isolation of *Salmonella* in this study serum samples and cloacal swab samples in local chickens indicates the existence of fowl typhoid and pullorum disease in local breeds of different eco-type and Fayuomi breed in the project farm. The existence of the diseases especially in these local breeds of Ethiopia is of great concern as the diseases have the potential for horizontal and vertical transmission. The prevalence might have gone even higher if the sample size was increased and samples were taken from dead chickens. The result of this study may indicate that challenge of free ranging village poultry production and intensive poultry production may face in future the country from fowl typhoid and /or pullorum disease unless due attention is given to the prevention and control of these diseases.

Therefore based on the above conclusion the following recommendations were forwarded: Organized national regulatory survey programs should be established for both free ranging village chicken and intensively produced chickens to reduce the losses and to control the diseases, Farmers should be advised and educated on the use of salmonella free parents.

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