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Microbial Quality of Poultry Drinking Water in Some Poultry Farms in Bauchi, Nigeria

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ABSTRACT

Microbial quality of poultry drinking water from wells and borehole was assessed from four major poultry farms in Bauchi, Nigeria. Water sample was collected from each farm prior to distribution in the poultry drinkers, in to a sterile sample bottles labeled A, B, C and D for easy identification of the respective farms and samples. Lactose broth medium was used to detect lactose fermenting bacteria and to determine the most probable number (MPN) of coliform present per 100ml of water. Plates of lavine EMB agar, yeast extract agar and violet red bile agar were used for isolation and identification of the bacterial isolates in the water sample. The results revealed that 2100 MPN coliform/100ml were found in A, B and D while 30 MPN coliform/100ml was encountered in the water sample C. *Escherichia coli* and *Klebsiella sp* were found in all the water samples, with sample B and C having *Streptococus fecali* as an additional isolate. It was concluded that poultry drinking water in the four poultry farms studied was not safe enough for containing above safety limit of 350 coliform/100mls and presence of potentially pathogenic bacteria. Use of water sanitizers, improvement of water quality and monitoring were recommended.

Key words: Microbial quality, poultry, drinking water, Bauchi metropolis, Nigeria

INTRODUCTION

Water is the most abundant and most important constituents of animal tissue (Campbell *et al*., 1994). Animals die more quickly from lack of water than from lack of any other dietary substances (Geldreich, 1989). Large amount of water is needed by animal most especially poultry to perform their function of eggs and meat production (Campbell *et al*., 1994).

A clean portable water, balanced nutrition and good housing are "*sin quanon*" to any profitable poultry production (Sauer, 1991). Water is described as portable if it is free from the odor, color or taste (Henry, 1978; APHA, 1992). It is also a known fact that water is one of the commonest vehicle for disease transmission in poultry industry indicating to the importance of ensuring it as being free from infectious agents. This will not only improve the profit margin of the enterprise but will also ensure its sustainability. The aim of this study therefore is to investigate the microbial quality of some poultry drinking water with a view to suggesting ways of improving its quality.

MATERIALS AND METHODS

Water sample collection

Fifty milliliters (50 ml) of poultry drinking water was collected from each of the four major poultry farms in Bauchi prior to the distribution of water into the poultry drinkers. The water was collected in to a sterile sample bottles labeled A, B, C, and D, for the respective farms and conveyed to Abubakar Tafawa Balewa University/Zero Emission Research and Initiative (ATBU/ZERI) Centre, Microbiology Laboratory for analysis. Farms A, B and D use mostly wells water and farm C uses borehole as an alternative to municipal water supply which is always erratic. All these farms are not practicing water sanitation.

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Water sample analysis

The microbial quality of the water samples was determined using multiple tube fermentation method to achieve presumptive, confirmed and completed tests as described by APHA (1992) and Benson (1998).

The water sample from each farm was inoculated into a tubes consisting of 3 sets of 3 tubes of lactose broth containing Durham's tubes at the rate of 10 ml, 1.0 ml and 0.1 ml, respectively. The tubes were incubated at 37°C for 24 hours. The tubes with evidence of gas production were recorded as positive and the tubes without gas as negative. The number of positive tubes in each set was tallied and the set of numbers were applied to statistical tables to estimate the most probable number (MPN) of coliforms as per the method of APHA (1992).

The positive tubes from lactose broth were inoculated on to the plates of Levine Eosine methylene Blue (EMB) to confirmn the presence of coliform organism. Yeast Extract Agar and violet red bile agar (Difco Laboratories, Detroit, Michigan USA) were used and incubated at 37°C for 24 hours. The isolates were biochemically tested and identified as per the method described by Benson (1998) and Buchannan and Gibbons (1974).

RESULTS

The result of this study confirmed the presence of gas producing lactose fermenters in all the water samples (Table 1). The estimated most probable number of coliforms per 100 ml of water were 2100 for farm A, B, C and D; while farm C has the low MPN of 430 coliforms/100 ml of water.

Table 1. Coliform load (MPN) of sampled poultry drinking water in major poultry farms in Bauchi, Nigeria

Farm	Source of water sample	Number of positive lactose broth tubes			MPN*
		△3 tubes (10 ml)	3 tubes (1.0 ml)	3 tubes (0.01 ml)	
A	Well	3	2	2	2100
B	Well	3	2	2	2100
C	Borehole	3	1	0	430
D	Well	3	2	2	2100

△ = double strength lactose broth MPN* = most probable number

The result of positive broth culture on three different media to confirm the type of organism present in water samples that were presumably positive for lactose fermenting organisms is presented in Table 2.While sample B and D yielded 5 (71.43%) positive tubes out of the 7 tubes, sample A has 4 (57.14%) out of the 7 tubes and sample C has 5 (100%) positive tubes out of the 4 tubes that were presumably positive for coliform.

Table 2. Confirmed coliform positive water samples from the positive tubes of presumptive test

Farm	Source of water sample	No. of inoculated broth sample	No. positive (%)
A	Well	7	4 (57.14)
B	Well	7	5 (71.43)
C	Borehole	4	4 (100.00)
D	Well	7	5 (71.43)

The coliform organisms isolated and identified in each water sample are presented in Table 3. In all the water samples, *Escherichia coli* and *Klebsiella* spp. were isolated and identified. Water sample B and C have *Streptococus faecalis* as an additional isolate.

DISCUSSIONS AND CONCLUSION

The result of this study revealed the presence of gas producing lactose fermenters in all water samples from the selected poultry farms as well as presence of coliform counts exceeding the recommended standard of 2.2 cfu/100 ml (APHA, 1992). The implication of this findings suggested that the water in farms studied is unsafe for poultry consumption. Junaid *et al*. (2003) reported that over 89% of the well water in some wards in Sokoto city was not safe for human consumption and other domestic uses as the coliform in them exceeded the recommended standard. Earlier report by Alabi and Adesiyun (1986) indicates that drinking water in some part of Nigeria was of poor quality .

Table 3. Coliform organisms isolated and identified in poultry drinking water samples

Farm	Source of water sample	Organism isolated
A.	Well	*E. Coli* *Klebsiella spp*
B.	Well	*E. Coli* *Klebsiella spp* *Streptococus faecalis*
C.	Borehole	*E. Coli* *Klebsiella spp* *Streptococus faecalis*
D.	Well	*E. Coli* *Klebsiella spp*

Although it was recommended that water for livestock and poultry should not contain less than 350 coliform organism per 100 ml, faecal coliform should be near zero (Crawford and Cole, 1999).In this present study the three organisms isolated; *E. coli, S. faecalis* and *Klebsiella* spp. has further confirmed the contaminated nature of the poultry drinking water of those farms. Presence of *E. coli* and *S. faecalis* which were classified as good sewage indicators (Benson, 1998), indicates that faecal material might have contaminated the sources water supply of the farms. It can be reasonably speculated that since all the poultry farms studied uses well water as an alternative to either bore holes or municipal water supply (pipe borne water), the wells used in those farm might not be properly protected. The reservoir tanks for keeping the poultry drinking water also contains water from all sources, this may be a cause for concern. Pipe borne water is considered safer but not always available, the result of this study strongly indicated that a lot need to be done, as three (A, B, D) of the poultry farms use well water and farm C uses borehole in addition to pipe borne water. Probably that's why farm C have the lowest MPN as compared to other farms. These findings were positively supported by many workers (Bryd *et al*., 1992; Clarck and Pagel, 1977 and Mcfeters *et. al.*, 1986) who advanced several possibilities for microbial contamination of public water supply and suggested regular monitoring as a means for ruling out those possibilities. It was reported that shallow dug wells without good surface drainage away from the well may be subject to infiltration of contaminants (Junaid *et al*., 2003) .The presence of coliform bacteria in a well is an indication that surface water is finding its way into the well. Most part of Bauchi city is known of having very low water table pointing to the strong possibility of microbial contaminants getting access to the wells most especially in the areas where those poultry farms are situated.

In conclusion an attempt should be made to identify and eliminate the source of poultry water contamination at all times and continuous monitoring should be advocated. In the interim the use of water sanitizers would prove beneficial and would definitely improve the profit margin of the enterprise most especially in the poultry farms studied.

Authorities concerned with public water supplies should also pay extra attention to monitor the microbial quality of water for public consumptions. Due to paucity of data on the economic effect of water quality on poultry performance, it is recommended that such studies be carried out by some interested scholars.

REFERENCES

Alabi, D.A. and Adesiyun, A. A. (1986). Studies on microbial quality of filtered water in household of a university in Nigeria. *J. Hyg.* 96: 239-248

APHA (1992). *Standard Method for the Examination of Water and Waste Water*, 18th ed. American Public Health Association Inc., Washington DC, USA. 608pp.

Benson, H. J. (1998). *Microbiological Application: Laboratory Manual in General Microbiology*. McGraw-Hills, Co. Inc., NY, USA. pp. 221-228.

Buchannan, R. E. and Gibbons, N. E. (1974). *Bargeys Manual of Determinative Bacteriology*. Williams and Williams, Baltimore, USA. 124pp.

Byrd, J. J., Xu, H. S. and Colwell, R. R. (1992). Viable but non-culturable bacteria in drinking water. *Appl. Environ. Microbiol. J*. 57: 875-878.

Campbell, J. R., Kenealy, M. D. and Campbell, K. L. (1994). *Animal Science*, 4th ed. McGraw-Hill Co. Inc., NY, USA. 314pp.

Clarck, J. A. and Pagel, J. E. (1977). Pollution indicators bacteria associated with municipal raw and drinking water supplies. *Can. .J. Microbiol.* 23: 36-42.

Crawford, R. J., Jr., and Cole, E. (1999). Effect of water source and quality on water intake and performance of cows and calves grazing tall fescue. S. M. A. R. and E. C. Research Report. pp. 2-8.

Geldreich, E. E. (1989). Drinking water microbiology- New direction towards water quality enhancement. Int. *J. Food Microbiol.*. 9: 295-313.

Henry, A. W. (1978). Water quality criteria and standard in the UK and EEC. Current and foreseeable problems. *J. Roy. Soc. Hlth.* 9: 116-121.

Junaidu, A. U. Gulumbe, M. L. and Salihu, M. D. (2003). Bacteriological quality of well water in Sokoto Nigeria. *Nig. Vet. J.* 24(3): 97-99.

McFeter, G. A., Kippin, J. S. and Lehevallier, M. W. (1986). Injured coliforms in drinking water *Appl. Environ. Microbiol.* 51: 1-5.

Sauer, P. (1991). Status of intensive and extensive poultry production in the development process. *Anim. Res. Devel. J.* .34: 36-42.