International Scholars Journals

International Journal of Microbiology Research and Reviews ISSN 2329-9800 Vol. 6 (2), pp. 197-204, February, 2017. Available online at www.internationalscholarsjournals.org © International Scholars Journals

Full Length Research Paper

Bacterial isolates from poultry litters and their antimicrobial susceptibility patterns in Gondar, Northwest Ethiopia

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Accepted 12 November, 2014

Poultry wastes or litters are generally added to the soil as a fertilizer. The final step in the poultry farming management strategy entails a big risk for the environment due to the nutrients and microorganisms contained in high concentrations in these waste materials. The objective of this study was to isolate bacteria from poultry wastes and test their antimicrobial susceptibility patterns. A cross sectional study was conducted. Forty four samples were analyzed from five poultry farms, in Gondar town from February, 2012 to March, 2012. A total of 52 bacterial pathogens were isolated from 44 samples of poultry wastes. Gram-negative bacteria were more prevalent 35 (67.3%) than Gram-positive bacteria 13(32.5%). Isolated organisms having public health importance include *E.coli, S.aureus, Proteus vulgaris, Klebsiella pneumonia, Serratia spp., Enterobacter cloacae, Enterobacter aerogenes*, *Coagulase negative staphylococci (CNS), Citrobacter diversus* and other *Citrobacter spp,*. The most commonly isolated bacteria were *E. coli* 24 (46%) followed by *S. aureus* 10 (19%), *CNS 7(13.5 %)*, *Enterobacter aerogenes 3(5.8), Enterobacter cloacae 2 (4%), Serratia spp., 2(4%) and others 4(7.7%).* All bacterial isolates demonstrate multi-drug resistant for tested antimicrobials. High antimicrobial resistant was observed for ampicillin (94%), penicillin (92%), tetracycline (64%), erythromycin 56%), whereas, Low antimicrobial resistance was seen for Kanamycine (2%), Ciprofloxacilin (4%), and chloramphinicol (11%). no resistant was observed for Vancomycin and methicillin. Medically important multidrug resistance species were isolated from poultry litters and some of the bacterial isolates are potentially pathogenic for humans and animals. The present study recommends proper information dissemination to farmers and poultry feeds producers about the public health importance of proper poultry litter disposal.

Keywords: Multidrug resistance, poultry litter, susceptibility.

INTRODUCTION

The poultry industry is one of the largest and fastest growing agro-based industries in the world. This can be attributed to an increasing demand for poultry meat and egg products. However, a major problem facing the poultry industry is the large-scale accumulation of wastes including manure and litter which may pose disposal and pollution problems unless environmentally and economically sustainable management technologies are evolved (Bolan NS et al., 2010).

Poultry wastes (litter & excreta) are generally added to the soil as a fertilizer. The final step in the poultry farming management strategy entails a big risk for the

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environment due to the nutrients and microorganisms contained in high concentrations in these waste materials (El-Jalil MH et al., *2008*). The continued productivity, profitability, and sustainability of the poultry industry will likely be dependent on the formulation of best management practices to mitigate environmental consequences associated with air and water quality parameters that are impacted by land application, and the development of cost-effective innovative technologies that provide alternative to land application of poultry wastes (Szogi AA and Vanotti MB, 2009).

Poultry litter contains antimicrobial residues and resistant bacteria; when applied as fertilizer, the level and effects of these pharmaceuticals and antimicrobial-resistant bacteria in the environment are of concern (Ali AM et al., *2009*). A variety of foods and environmental sources harbor bacteria that are resistant to one or more antimicrobials used in human or veterinary medicine and in food-animal production (Arathy DS et al., 2011).

A wide variety of antibiotics are routinely added to animal feed in sub therapeutic doses for growth promotion of animals produced for human consumption. Approximately 8,164,662 kg of antibiotics are used annually in animal farming (70% of which is used for non therapeutic purposes such as growth promotion and disease prevention) compared with only 1,363,636 kg per year used in human medicine (Sridevi DT et al., 2009).

Widespread use of antimicrobials in the primary sector has benefits for producers but also contributes to the increasing emergence of antimicrobial resistant (AMR) bacteria (Aarestrup FM et al., 2009). Factors that can influence bacterial resistance in farms are numerous and vary depending on flock health status, farm management and environment (Acar JF et al., 2006). This practice may lead to a selection of resistant microbial populations (including pathogens) in the native microbiota of the animal and the local environment due to shedding in the feces (Sridevi DT et al., 2009).

The presence of AMR bacteria in primary production represents a high risk for humans since AMR bacteria of animal origin can be transmitted from animals to humans through the food supply, water or by direct contact with animals. Sometimes resistance genes can even be transferred from animals through human pathogens that are normally human-specific (Ramchandani M et al., 2006; Funk JA et al., 2006). Moreover, resistant bacteria are shed in faces, where they can share extra chromosomal antibiotic resistance plasmids (R-plasmids) with native bacteria and may also be disseminated to other animals. Antibiotics accumulate in the tissues of animals and hence, can be ingested by consumers whose own resident micro flora may become resistant. Hence, this is an important means of dissemination of resistance in humans through the food chain (Ittoo D et al., 2010). Contaminated food of animal origin is one source of human bacterial infections; therefore, the presence of antibiotic-resistant strains in food animals such as poultry has raised concerns that the treatment of human infections will be compromised (Kilonzo-NA et al., 2008).

A study conducted on antibiotic-resistant enterococci (ARE) recovered from animal production, food products and non-hospitalized patients during the 1990s raised concern about the medical consequences of selection of resistance caused by the use of antibiotics for growth enhancement in animal production. This fear has led to the progressive ban of antibiotic growth promoters in the European Union (Novais C et al., 2005).

Awareness of the prevalence of AMR in food animals provides baseline data in order to implement an integrated AMR surveillance system and also facilitates the evaluation of interventions used to control the AMR (Ramchandani M et al., 2006; Funk JA et al., 2006) . So it is very important to monitor the resistance to antibiotics not only in human bacterial pathogens but also in pathogenic and commensal bacteria of animal origin. There is no much information about the bacteriological profile of poultry wastes and their drug susceptibility patterns particularly in North West Ethiopia. Therefore, this study is aimed to isolate bacteria from poultry litters and asses the antimicrobial susceptibility patterns of the isolates.

MATERIALS AND METHODS

Study area, Design and Periods

A cross-sectional study was conducted at Gondar town from February, 2012 to March, 2012. Gondar is one of the ancient historic towns in Ethiopia located 737 Kms North from the capital city, Addis Ababa. Gondar town has 300,000 populations and there are 5 small poultry farms.

Study population

All poultry farms found in Gondar town were the study population

Sampling and Specimen collection

There are 4 private and 1 government farms in Gondar town which are functional at the time of sample collection, and the farms reared around 5,432 chickens in all farms average of 1,086 chickens in one farm. All the poultry farms were included in the study. Since there are different laying places in each house three places were selected by lottery method per poultry farm or poultry house. Nine samples from each farm were collected. The samples were collected at week 0, week 2 and week 4 for each farm. Poultry litter was collected at the same places for each week. A total of 45 samples were collected but 44 were analyzed 1 sample was discarded since its

container was damaged during sample transportation. Samples were collected using sterile spatulas and kept in to a sterile plastic bags (pharmid Ethiopia) to transport in the Medical Microbiology laboratory, University of Gondar, School of biomedical and laboratory sciences. The samples were processed with in 2 hrs of collection following standard procedure.

Specimen Processing

Isolation of microorganisms

One gram of each thoroughly mixed poultry litter was suspended in 10 ml of nutrient broth (oxoid) and kept for 30 minutes at room temperature to homogenize the suspensions (Chees BM,2000) . Aliquots of each suspension was evenly spread plating on nutrient agar (oxoid), MacConkey agar (oxoid) and blood agar (oxoid). The plates were incubated for18-24 hrs at 37^0C aerobically and growths of the colony were characterized and representative colonies were selected and purified by successive sub-culturing. Identification of bacteria was done based on their morphological, Gram staining, cultural, and biochemical tests. Different biochemical tests used for gram negative include triple sugar iron agar, indole, urea, simon's citrate agar, lysine iron agar, and motility. Gram positives were identified based on their different physiological tests such as catalase, coagulase and haemolysis following standard procedures (Chees BM,2000) .

Antimicrobial susceptibility testing

Susceptibility patterns of bacterial isolates were assessed following the standardized single disc diffusion method developed by Bauer et.al (Bauer AWet al., *1966.* Young bacterial cultures were prepared and the inocula were compared using a 0.5 McFarland standard. The antimicrobial susceptibility testing was performed against ampicillin (10 mg), chloramphinicol (30 mg), ciprofloxacin(5 mg), erythromycin (15mg), gentamycin (10mg), methicillin (5mg), vancomycin (30mg), tetracycline(30mg), penicillin(10mg), sulphamethroxazole (25mg) and kanamycine (30mg). The sensitivity discs were carefully placed on the surface of Muller-Hinton agar previously inoculated with a broth culture of the test organisms. The plates were incubated aerobically at 37°C for 24 hours. Zones of inhibition around each disc were measured and recorded as Susceptible and Resistant.

Quality assurance

Culture media was tested for sterility and performance. International Control of bacterial strains of *Escherichia coli* ATCC 25922 and *S. aureus* ATCC 25923, all-sensitive reference strains, was used as a quality controlstrains for checking the performance of culture media and antibiotic discs. 0.5 McFarland standard was used for inoculums density of bacterial suspension (Andrews, J.M al., *2004*) .

Data management and analysis

Data were entered into a database designed using MS Excel spreadsheet and analyzed using SPSS statistical software package (version 16). Study findings were explained in words and tables. Proportions for categorical variables were compared using chi-square test. In all cases *P-value* less than 0.05 was taken as statistically significant.

Ethical consideration

The study was conducted after ethical approval is obtained from Research and Publication committee of the School of Biomedical and Laboratory Sciences, University of Gondar. Permission was obtained from the respective owners of poultry farms.

RESULT

A total of 44 poultry litters samples from 5 poultry farms were processed for the presence of clinically important bacteria. All of the poultry farms have only one chicken house. The duration of these farms ranges from 3 month to 4 years. Two farms used poultry litter as fertilizer while the other three poultry farms discard poultry litter anywhere. Two of the farms cleaned the poultry houses daily while the others irregularly, two farms use antimicrobials for therapeutic uses only the other three use antimicrobials for different purposes. Among 44 samples 38 samples were positive and a total of 52 bacterial isolates were recovered.

Among a total of 52 bacterial isolates Gram-negative bacteria were more prevalent 35 (67.3%) than Gram-positive bacteria 13(32.5%). Most of the organisms are of public health importance and include species of *E.coli, S.aureus, Proteus vulgaris, Klebsiella pneumonia, Serratia spp., Enterobacter cloacae. Enterobacter aerogenes*, *Coagulase negative staphylococci (CNS), Citrobacter diversus* and other *Citrobacter spp,.* The most commonly isolated bacteria were *E. coli* 24 (46%) followed by *S. aureus* 10 (19%),CNS 7(13.5 %), *Enterobacter aerogenes* 3(5.8), *Enterobacter cloacae* 2 (4%), *Serratia* spp., 2(4%)and others4(7.7%) (Table 1).

The highest bacterial isolates were observed from poultry farms near to TiwldAmare School, 15 (28.8%) followed by Tseda, 12(23.1) with the list of university veterinary farm and farm near to Gondar teachers college 8 (15.4%) (Table 2). Most of the isolates were recovered from poultry farms managed by non-professional owners and cleaned irregularly (Table 3).

Table 1. Frequency of bacterial isolates from poultry litters (N=52)in Gondar town poultry farms, from February, 2012 to March, 2012.

Bacterial isolates	Total (%)
E.coli	24 (46)
Enterobacteraerogenes	*3(5.8)*
Enterobactercloacae s	*2 (4)*
Serratia spp.,	*2(4)*
S. aureus	10 (19)
CoNS	*7(13.5)*
Others*	*4(7.7)*
Total	**52(100)**

**Klebsiellapneumoniae* (n=1), *Proteus vulgaris* (n=1, *Citrobacterdiversus* (n=1), other *Citrobacter* spp. (n=1)

Table 2. Frequency of bacterial isolates from poultry litters at Gondar town 2012(n=52) from February, 2012 to March, 2012.

Farms	Number of bacterial isolates	%
Elphora	9	17.3
University veterinary farm	8	15.4
Tiwldamare	1	28.8
College	8	15.4
Tseda	12	23.1
Total	52	100

Table 3. Effect of cleaning practices, owner's profession and poultry laying materials verses frequency of bacterial isolates (n=52) at Gondar town poultry farms, from February, 2012 to March, 2012.

Cleaning habit of poultry houses	**Bacterial isolates**	**X^2**	**p- value**	**Total**
Daily cleaned	17(33%)	0.001	0.975	52
Irregularly cleaned	35(67%)			
Professional of farm owners				
Related profession with poultry health	17(33%)	0.001	0.975	52
Non-related profession with poultry health	35(67%)			
Types of poultry laying materials				
Metals	25(48%)	2.678	0.102	52
Woods	27(52%)			

Antimicrobial susceptibility patterns of bacterial isolates.

Bacterial isolates from poultry litter showed different patterns of antimicrobial resistance. Antimicrobial resistant ranges from 0% to 94%. High antimicrobial resistant was observed for ampicillin (94.2%), followed by penicillin (92%), tetracycline (73 %), erythromycin (66%) and the lowest resistance was observed for kanamycin (2%). However, no isolates were found to be resistant to vancomycin and methicillin.

E. coli was 100%, 96%, 71%, 54%, 25%, 16.6% and 4% resistantfor penicillin, ampicillin, erythromycin, tetracycline gentamycin, sulphamethroxazole and chloramphinicol respectively. *Serratia* species were 100% resistant to tetracycline, ampicillin, penicillin and erythromycin, 50% resistant to gentamycin and ciprofloxacilin, no resistant isolates for kanamycin, sulphamethroxazole and chloramphinicol.

Enterobacter aerogenes were 100% resistant for gentamycin, tetracycline, sulphamethroxazole, ampicillin, penicillin and erythromycin, 67% resistant for chloramphinicol, 33% resistant for ciprofloxacilin and kanamycin. *Enterobacter cloacae* isolates were 100% resistant for gentamycin, tetracycline, penicillin, ampicillin and erythromycin, 50% resistant for chloramphinicol and sulphamethroxazole, no resistant isolates for ciprofloxacilin and kanamycin. Other isolates of *enterobacteriaceae* are also multi drug resistants. (Table 4)*S. aureus* were 80%, 70%, 60%, and 10% resistant for ampicillin, penicillin, tetracycline, and ciprofloxacilin, sulphamethroxazole respectively. *Coagulase negative staphylococcus species* were 100%, 86%, 57% and 14% resistant for ampicillin, penicillin, tetracycline and rythromycin, chloramphinicol respectively, no resistant isolates were observed for Vancomycin, and methicilin (Table 5).

Table 4. Antimicrobial susceptibility pattern of Gram-negative bacteria isolated from poultry litter (N=31 at Gondar town, from February, 2012 to March, 2012.

Bacterial isolate	Total No.	Pattern	Antimicrobial agents tested										
			VAN	METH	GEN	ERT	PEN	AMP	CHLO	CIP	SULP	TTC	KAN
			No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	No.(%)	**No (%)**
E. coli	24	R			6(25)	17(71)	24(100)	23(96)	1(4)	0(0)	4(16.7)	13(54)	0(0)
		S			18(75)	7(29)	0(0)	1(4)	23(96)	24(100)	20(83.3)	11(46)	24(100)
Enterobacteraerogenes	3	R			3(100)	3(100)	3(100)	3(100)	2(66.7)	1(33.3)	3(100)	3(100)	1(33.3)
		S			0(0)	0(0)	0(0)	0(0)	1(33.3)	2(66.7)	0(0)	0(0)	2(66.7)
Enterobactercolacae	2	R			2(100)	2(100)	2(100)	2(100)	1(50)	0(0)	1(50)	2(100)	0(0)
		S			0(0)	0(0)	0(0)	0(0)	1(50)	2(100)	1(50)	0(0)	2(100)
Serratia species	2	R			1(50)	2(100)	2(100)	2(100)	0(0)	1(50)	0(0)	2(100)	0(0)
		S			1(50)	0(0)	0(0)	0(0)	2(100)	1(50)	2(100)	0(0)	2(100)
Total	31	R			**12(38.7)**	**24(77.4)**	**31(100)**	**30(96.8)**	**3(9.7)**	**2 (6.4)**	**8(25.8)**	**20(64.5)**	**1 (3.2)**
		S			19(61.3)	7(22.6)	0(0)	1(3.2)	28(90.3)	29(93.6)	23(74.2)	11(35.5)	30(96.8)

Table 5. Antimicrobial susceptibility pattern of Gram-positive bacteria isolated from poultry litter (N=17 at Gondar town, from February, 2012 to March, 2012.

Bacterial isolate	Total No.	Pattern	Antimicrobial agents tested										
			VAN	MET	GEN	ERT	PEN	AMP	CHLO	CIP	SULP	TTC	KAN
			No.(%)	No.(%)	No.(%)	No. (%)	No.(%)	No. (%)	No. (%)	No. (%)	No.(%)	No. (%)	No (%)
S.aureus	10	R	0(0)	0(0)	0(0)	0(0)	7(70)	8(80)	0(0)	1(10)	1(10)	6(60)	0(0)
		S	10(100)	10(100)	10(100)	10(100)	3(30)	2(20)	10(100)	9(90)	9(90)	4(40)	10(100)
CNS	7	R	0(0)	0(0)	0(0)	1(14)	6(86)	7(100)	1(14)	0(0)	0(0)	4(57.1)	0(0)
		S	7(100)	7(100)	7(100)	6(86)	1(14)	0(0)	6(86)	7(100)	7(100)	3(42.9)	7(100)
Total	17	R	0(0)	0(0)	0(0)	1(5.9)	13(76.5)	15(88.2)	1(5.9)	1(5.9)	1(5.9)	10(58.8)	0(0)
		S	17(100)	17(100)	17(100)	16(94.1)	4(23.5)	2(11.8)	16(94.1)	16(94.1)	16(94.1)	7(41.2)	17(100)

Multiple drug resistance patterns of the isolates

All bacterial isolates exhibit multi-drug resistant for tested antimicrobials. Minimum for 4 antimicrobials resistants were showed for each organism. As Table 4 and 5 indicates antimicrobial resistance patterns of Gram-positive bacteria ranges from 0 % for Vancomycin and methicilin to 94.2 % for ampicillin. *Enterobacter cloacae* isolates were 100% resistant for gentamycin, tetracycline, penicillin, ampicillin and erythromycin, 50% resistant for chloramphinicol and sulphamethroxazole, no resistant isolates for ciprofloxacilin and kanamycin. Other isolates of *enterobacteriaceae* are also multi drug resistant (figure 1)

High antimicrobial resistant bacterial isolates were found from poultry farms which used antimicrobials for different purposes, purchase antimicrobials from local veterinary pharmacies and feed their poultries with left over cafeteria foods (Table 6).

DISCUSSION

Fifty two bacteria were isolated from the five poultry litter sample. The predominant organisms isolated in this study were *E. coli* 24 (46%) followed by *S. aureus* 10 (19%), *CNS* 7(13.5 %), *Enterobacter aerogenes* 3(5.8%), *Enterobacter cloacae* 2 (4%), *Serratia spp.,* 2(4%)and others 4(7.7%). This finding is similar to a report from Morocco and Nigeria (El-Jalil MH et al., *2008;* Olawale OA et al., *2009*).

Gram-negative bacteria were more prevalent 35 (67.3%) than Gram-positive bacteria 13(32.5%). Comparable findings have been reported inCzech Republic 67.6% gram negative and 32.4 % gram positive (Kolar M et al., *2002*). This result disagree with report from India, the predominant organisms were *Staphylococcus* (29.1%), *Streptococcus* (25%), and *Micrococcus* (20.8%), which are all grampositive organisms (T. Sridevi Dhanarani et al., *2009*) and Canada, a similar report for chicken

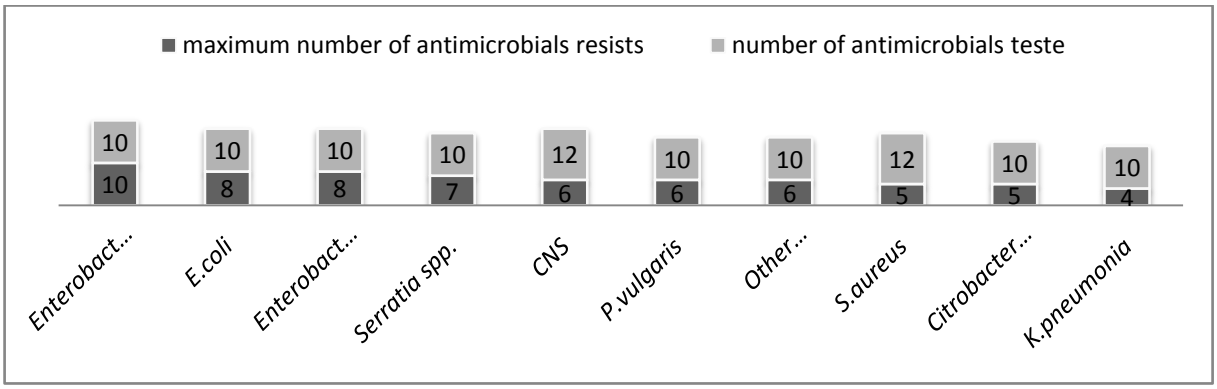

Figure 1. Antimicrobial susceptibility patterns of bacterial isolates from poultry litters at Gondar town (n=52) February, 2012 to March, 2012.

Table 6. Effect of antimicrobials usage, sources of antimicrobials and feeding practices of poultries for drug resistance at Gondar town poultry farms, from February, 2012 to March, 2012.

	Purpose of antimicrobials uses		Sources of antimicrobials		Feeding practices of poultries		
Antimicrobials	Therapeutic	therapeutic &non therapeutic	Purchased fromlocal pharmacy	Supplied by organizations	-leftover foods, vegetables, grains	bone,fruska, lime grains, stone	Total resistant isolates
GEN	5(33%)	10(67%)	13(87%)	2(13%)	9(60%)	6(40%)	15
TTC	8(24.2%)	25(75.8)%	30(91%)	3(9%)	12(36%)	21(64%)	33
AMO	7(29%)	17(71%)	21(88%)	3(12%)	11(46%)	13(54%)	24
PEN	16(33%)	32(67%)	40(83%)	8(17%)	16(33%)	32(67%)	48
CHL	2(33%)	4(67%)	6(100%)	0%	1(17%)	5(83%)	6
ERY	10(34.5)	19(65.5%)	24(83%)	5(17%)	11(38%)	18(62%)	29
CIP	0	2	2	0	1	1	2
SULP	3(33%)	6(67%)	7(78%)	2(22%)	4(44%)	5(56%)	9
KAN	0	1	1	0	1	0	1
AMP	16(32.7%)	33(67.3%)	41(84%)	8(16%)	16(32.7%)	33(67.3%)	49

Keys to abbreviations or symbols
GEN=Gentamycin,TTC=Tetracycline,AMO=Amoxicillin,PEN=Penicillin,CHL=Chloramphinicol,ERYErythromycin,CIP=Ciprofloxacilin,SULP=Sulphamethroxazole,KAN=kanamycin,AMP=Ampicillin

intestinal microflora also demonstrated that the predominant organisms were gram-positive(G. Gong, J et al., *2002*).

Out of 44 samples analyzed, 54.5 % samples were positive for *E.coli*. A similar finding was reported from Bangladesh 58% (Muhammad AA et al., *2009*). *E. coli* was the most predominant pathogen with over all isolation rates of 46%. This finding is lower than a report from Morocco, 55.5 % [2], Bangladesh, 58% (Muhammad AA et al., *2009*) , Czech Republic, 61.3% (Kolar M et al., *2002*), Belgium, 92.3 % (Persoons D et al., *2011*). *E. coli* is a normal inhabitant of the gastrointestinal tract of humans and animals; however, some strains are known to be pathogenic. In humans, pathogenic *E. coli* can cause several diseases including urinary tract infections, septicemia, and neonatal meningitis (Amara A et al.,*1995;* Ewers C et al., *2004*). The avian intestines have been considered as a reservoir of potential *E. coli* with zoonotic potential that could be transferred directly from birds to humans (Johnson TJ et al., *2008*) .

S. aureus was the second most prevalent species in this study (19%). This is in agreement with report from India(T. Sridevi Dhanarani et al., *2009*). *Salmonella* was not isolated in any of the samples in the present study.However, this doesnot exclude the presence of *Salmonella* in low numbers; coliforms can overgrow *Salmonella*speciesand render their isolation hard (El-Jalil MH et al., *2008*).

In the present study, Bacterial isolates were high in poultry farms which are cleaned irregularly, not cleaned daily and managed by non-related professionals with poultry health. This may be due to the accumulation of

microorganisms in poultry laying materials and the microbial ecosystem of broiler litter is undoubtedly influenced by management practices including feeding (Persoons D et al., *2011;* Furtula V et al., *2010*)).

Isolated bacterial species are highly resistant to antimicrobials agents used for both human and non-human subjects which are given or not given to poultries in the studies sites. High antimicrobial resistant was observed for ampicillin (94.2%), followed by penicillin (92%), tetracycline (73 %), erythromycin (66%) and the lowest resistance was observed for Kanamycin (2%). However, no isolates were found resistant to Vancomycin and methicillin. This finding disagrees with report from Nigeria with gentamycin (0%), ampicillin and tetracycline (100%) resistance (Olawale OA et al., *2009*) . A report from India indicated that 50% of isolates were susceptible to ampicillin, 57% to erythromycin, 25% to tetracycline, 4% to chloramphenicol, and 40% to kanamycin(T. Sridevi Dhanarani et al., *2009*).High resistant to commonly given antimicrobials may be due to low dosage or sub therapeutic uses of antimicrobials in study farms and easily adapted for the antimicrobials (Persoons D et al.,*2011*).

S. aureus were 80%, 70%, 60%, and 10% resistant for ampicillin, penicillin, tetracycline, and ciprofloxacilin, sulphamethroxazole respectively. In the present study, no resistant isolates were observed for Vancomycin, methicilin, gentamycin, Chloramphinicol, erythromycin and kanamycine. Similar reports from Northeastern Georgia showed that *S.aureus* isolated from clinical poultry (David G et al., *2003*)was 100% susceptible to Vancomycin, chloramphinicol and gentamycin. This finding is different from results from Iraq which showed 100% resistance for methicilin, Vancomycin and sulphamethroxazole, 90% resistant for gentamycin,80% resistant for chloramphinicol, 55% resistant for erythromycin, 45% resistant for ciprofloxacilin and 60% resistant for penicillin (Shareef AM et al., *2009*). This result is also inconsistent with result from Czech Republic which shows higher resistant to erythromycin 39% and lower resistant to tetracycline 14% (Kolar M et al., *2002*) .

Multiple drug resistance patterns of the isolates

Multiple drug resistance bacterial isolates were common in this study and all the isolates were resistant to four or more antibiotics tested. This result is similar with results from many corner of the world (Muhammad AA et al., *2009;* (Muhammad AA et al., *2009*;Guerra B et al., *2003*;Khan A et al., *2002*;Rahman M et al., *2008*;ZS et al., *2005*). The reason may be due to indiscriminate use of antimicrobial agents that may serve as a selective pressure for killing the sensitive strains and may ultimately replace the drug sensitive microorganisms to be eliminated and favor the wide spread of drug resistance strains in the environment (Muhammad AA et al., *2009*).

CONCLUSION AND RECOMMENDATION

The present results provide evidence that poultry litter can serve as an environmental reservoir for multiple antibiotics resistant bacteria and hence can serve as potential route for the entry of multidrug resistant zoonotic pathogens into human population. This has very important implications for human health, as multidrug resistant infections are difficult to treat and often requires expensive antibiotics and long term therapy. This can substantially increase the cost of treatment and even mortality. The study therefore recommends proper information dissemination to farmers and poultry feeds producers about the public health importance of proper poultry litter disposal.

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