Article

Microbial assessment of different samples of ostrich (*Struthio camelus*) and determination of antimicrobial susceptibility profiles of the isolated bacteria

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Abstract: The study was conducted to monitor the microbial assessment in oropharyngeal swab, cloacal swab and faecal samples of ostrich and also update knowledge on antimicrobial sensitivity of isolated organisms. The study was performed at Hajee Mohammad Danesh Science & Technology University (HSTU) ostrich farm from January to June, 2016. A total 75 samples were randomly collected from 8 ostriches at different age of which 25 oropharyngeal, 25 cloacal swabs sample and 25 were faeces samples. The organisms were isolated by using standard microbiological method. The result revealed that the average microbial load in plate count agar was highest in faeces ($1.48 \times 10^9 \pm 0.27$ CFU) than oropharyngeal swab ($1.36 \times 10^9 \pm 0.38$ CFU) and cloacal swab ($1.28 \times 10^9 \pm 0.34$ CFU). Among 75 samples, 29 (38.66%) *Escherichia coli*, 21 (28%) *Salmonella* spp., 20 (26.67%) *Staphylococcus* spp. and 5(6.6%) *Bacillus* spp. were identified. In 25 oropharyngeal swab samples, *Staphylococcus* spp. was found highest 15 (60%) than other organisms but *Escherichia coli* were found highest both in cloacal 11(44%) and faecal 12(48%) samples. On antibiogram study *Escherichia coli*, *Salmonella* spp., *Staphylococcus* spp. and *Bacillus* spp. were more sensitive to Levofloxacin, Azithromycin, Nalidixic Acid and Amoxicillin respectively. While more resistant to Azithromycin, Penicillin, Chloramphenicol and Erythromycin respectively. The obtained results indicated that ostrich excreta are one of the most important sources of *Escherichia coli, Staphylococcus* spp., *Salmonella* spp., *Bacillus* spp. in ostrich farms. Finally, it may be concluding that the logical use of antibiotics must be adopted in ostrich farms reared in Bangladesh for prevention of the appearance of multidrug resistance bacteria. Moreover, proper measures should be taken to aware off zoonotic diseases in peoples who are involved in ostrich farming.

Keywords: ostriches; cloacal swabs; oropharyngeal swabs; antibiotic resistance

1. Introduction

The ostrich *(Struthio camelus)* is the largest and heaviest living bird. The natural home of the ostrich is Africa. Large numbers of ostriches were exported from Africa in the latter half of 19th century to Australia, New Zealand, Europe, North and South America (Osterhoff, 1979; Bertram, 1992). Ostrich feather was ranked fourth in value after gold, diamonds and wool, on the list of exports from the then Union of South Africa. Farm ostriches are called *Struthio camelus var. domesticus* (Hallam, 1992; Hildebrandt and Raucher, 1999). Ostrich farming has been rapidly expanded in Worldwide to produce usable products such as meat, hides, feathers, and

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eggs. Ostrich raising needs experience and information from farmers and the successful ostrich farming is largely dependent on the ability of farmers to rear sufficient numbers of viable and healthy chicks (Christensen and Nielsen, 2004). The main products obtained from ostriches are plumes (feathers), ostrich skin and a variety of meat products, for example, the liver, the heart and fresh meat,health care products (ostrich fat) (Jones *et al.,* 1997). Feathers are used in the household and motorcar industries as feather dusters (Hastings, 1991). Ostriches are being explored for medical and medicinal purposes (Odendaal, 2000). Ostrich environment and its microbial load play a significant role in influencing the growth performance of ostrich and thus affect the quality of ostrich product. Ostrich meat and other products can be sources for human infections and may get contaminated through handling, processing, cooking, packaging and storage. Meat quality is dependent on the entire meat production chain from the farm where animals are conceived to the consumer (Monin and Ouali, 1991). Housing design also contribute to the level of microbes in ostrich bodies as ostriches penned on cement or tiles are restless and defecate readily when compared to those penned on sand. Cement or tiled flooring becomes wet and soiled and when ostriches lie down, expensive body feathers are soiled with faeces and urine (Burger *et al.,* 1995). The environment of a farm as heavy soil and poor drainage often result in animals arriving at the abattoir with muddy feet and abdomens. Dirty skins provide major sources of microbial contamination for the carcase (Edwards *et al.,* 1997). The bacterial pathogens most frequently involved in infectious enteritis of ostriches are: *Escherichia coli, Salmonella* spp. (Doneley, 2006). Ostrich are susceptible to a number of infectious agents which are common to other avian species (Huchzermeyer, 1998; Cooper and Mahroze, 2004). *Salmonella* was isolated from ratites birds 5 days to 4 years of age (Vanhooser and Welsh, 1995). Bacterial infections are an important issue in intensive ostrich breeding. The most important thing is a high level of ostriches infection with *Escherichia coli, Salmonella* spp*., Pseudomonas* spp*.* (Wieliczko and Kuczkowski, 2000). Bacteria isolated from respiratory disease in ostriches include *Staphylococcus* spp., *Pasteurella haemolytica, Pseudomonas aeruginosa, Bordetella* spp., *Haemophilus* spp*., Streptococcus viridans, Mycoplasma* spp. and *Chlamydia psittaci* (Huchzermeyer 1994). Most of the published reports come from research done with poultry from unknown healthy conditions or from sick birds that were sent to diagnostic centers where, *Salmonella* spp. was reported to cause mortality in ostrich chicks (Shivaprasad, 1993; Verwoerd, 2000). However, it was reported that immunosuppressed adult ostriches may shed *Salmonella* spp., contributing to contamination of products during slaughtering process (Karama *et al.,* 2003). Now a day's antimicrobial resistance that's occurs for microbes of animal origin, including food-producing animals, pet and companion animals, fish and other aquatic animals as well as wild animals, has gained particular attention (Schwarz *et al.,* 2010). There are only some specific study was applied on the antimicrobial resistance for isolated microbes from ostriches in Bangladesh. Due to the global expansion of ostrich farming and lack of information about the prevalence of microbes in commonly reared ostrich flock. The present study was designed to assess the bacterial load in oropharyngeal swabs, cloacal swabs and feces of ostrich and to determine the antibiotic susceptibility profiles of identified isolates.

2. Materials and Methods

2.1. Sample collection

The present study was undertaken at HSTU ostrich farm in Dinajpur District of Bangladesh. Samples were brought to the microbiology laboratory of the Department of Microbiology, Hajee Mohammad Danesh Science and Technology University, Dinajpur, during the period from January to June 2017 for laboratory analysis. A total of 75 samples comprising oropharyngeal swab (25), cloacal swab (25) and faeces (25) were collected from different age ostriches with pre-sterilized cotton swab and immediately transferred into test tube with foil paper containing PBS (phosphate buffer solution). Thermo flask containing ice was used to transport the samples from the collection site to Microbiology laboratory for analysis.

2.2. Experimental layout

The entire study is divided into three steps. The first step includes the total viable counts of the collected samples. The second step includes isolation and identification of the bacteria from the samples by cultural, morphological and biochemical test. Third step includes evaluation of antibiotics sensitivity against the isolated bacteria.

2.3. Microbial assessment of the collected samples

Samples were collected and each of the samples were diluted with distilled water as $10^{-1}10^{-2}10^{-3}10^{-4}10^{-5}10^{-6}10^{-7}10^{-8}$ and 10^{-9}. Then 1ml sample was taken and spread in Plate count agar (PCA) plate following the spread-plate

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method and incubate at 37ºC for 24 hours. The number of organisms per ml of original culture is calculated by multiplying the number of colonies counted by the dilution factor:

Number of cells per ml=number of colonies $\times$ reciprocal of the dilution factor.

2.4. Cultivation and isolation of organisms

Samples were collected and each of the samples diluted with distilled water as 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4}, 10^{-5} and 10^{-6} and inoculated into nutrient agar. Then the petri dishes were marked properly and incubated at 37 ^{o}C for 24 hours aerobically in bacteriological incubator. Then sub-cultured onto the MacConkey, SS agar, MSA agar and nutrient agar by streak plate method (Cheesbrough, 1985) to observe the colony morphology of *E. coli*, *Salmonella* spp., *Staphylococcus* spp. and *Bacillus* spp. These bacteria were repeatedly sub-cultured onto MacConkey, SS agar, MSA agar and nutrient agar until the pure cultures were obtained. Bacteriological examinations were carried out using standard method for aerobic bacteria (Brown, 2005). Pure cultures were achieved as per procedures described by OIE (2000), Merchant and Packer (1967).

2.5. Identification of associated bacteria

Isolated organisms were subjected to various biochemical tests (Sugar fermentation test, Oxidase test, Catalase test, Indole test, MR Test, Voges-proskauer test, Simmon's citrate, Triple sugar iron agar, Mortility Indole Urease test and Selenite broth) as per the standard methods described by Cheesbrough (1985).

2.6. Antibiotic sensitivity test against isolated microbes

To determine the drug sensitivity and resistance patterns of isolated organisms, we used different types of commercially available antimicrobial discs (Mast diagnostics Mersey side, UK.). The antibiotic resistance was determined by Kirby-Bauer disc diffusion technique using Mueller-Hinton agar (Difco), according to the recommendations of National Committee for Clinical Laboratory Standards (CLSI 2011). After overnight incubation at 37 °C, the diameter in millimeters of the zones of inhibition around each of the antimicrobial discs was recorded and categorized as resistant or sensitive in accordance with company recommendations. *E. coli, Salmonella* spp*., Staphylococcus* spp., and *Bacillus* spp. isolates were tested for sensitivity to Levofloxacin (5µg), Penicillin (10 units), amoxicillin (30 µg), Cefxime (5 µg), Feridoxin (10 µg), Ceftriaxone (30 µg), Chloramphenicol (30 µg), Gentamicin (10 µg), Nalidixic acid (30 µg), Vancomycin (30 µg), Azithromycin (15 µg), Eryhromycin (15 µg) and tetracycline (30 µg).

2.7. Statistical analysis

Data were analyzed using SPSS version 21. The chi-square (χ2) test was used to assess statistical differences between the groups. A p-value less than 0.05 were statistically considered significant.

3. Results

3.1. Microbial assessment of collected samples by total viable counts

During the study period a total 75 (25 orapharyngeal swab, 25 cloacal swabs and 25 feces) samples were collected from different ages of ostrich for total viable counts expressed as CFU which were shown in Table 1. In every case the average colony (CFU) were counted at 30 days interval. In case of orapharyngeal swab the average colony count on 90 days (3 months) were $1.87\times10^{9}\pm0.037$ followed by 120 days were $1.52\times10^{9}\pm0.054$, 150 days were $1.38\times10^{9}\pm0.029$, 180 days were $1.38\times10^{9}\pm0.029$ and 210 days were $0.9\times10^{9}\pm0.04$ respectively. In case of cloacal swab the average colony count on 90 days (3 months) were $1.54\times10^{9}\pm0.022$ followed by 120 days were $1.52\times10^{9}\pm0.054$, 150 days were $1.39\times10^{9}\pm0.01$, 180 days were $1.30\times10^{9}\pm0.04$ and 210 days were $0.69\times10^{9}\pm0.019$ respectively. In case of feces swab the average colony count on 90 days (3 months) were $1.13\times10^{9}\pm0.027$ followed by 120 days were $1.29\times10^{9}\pm0.038$, 150 days were $1.52\times10^{9}\pm0.027$, 180 days were $1.62\times10^{9}\pm0.03$ and 210 days were $1.83\times10^{9}\pm0.04$ respectively.

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Table 1. Total viable counts expressed as CFU for 75 samples (orapharyngeal swab, cloacal swab and faeces) of ostriches in different age group.

Sample and sample size	Age of ostriches					Mean± SEM N=25	t test	P value
	3 months n=5 (Mean± SEM)	4 months n=5 (Mean± SEM)	5 months n=5 (Mean± SEM)	6 months n=5 (Mean± SEM)	7 months n=5 (Mean± SEM)			
Oropharyngeal swab (n=25)	1.87×10^9 ±0.037	1.52×10^9 ±0.054	1.38×10^9 ±0.029	1.11×10^9 ±0.024	0.9×10^9 ±0.04	1.36×10^9 ±0.38	8.10	0.001
Cloacal swab (n=25)	1.54×10^9 ±0.022	1.47×10^9 ±0.057	1.39×10^9 ±0.01	1.30×10^9 ±0.04	0.69×10^9 ±0.019	1.28×10^9 ±0.34	8.39	0.001
Faeces (n=25)	1.13×10^9 ±0.027	1.29×10^9 ±0.038	1.52×10^9 ±0.027	1.62×10^9 ±0.03	1.83×10^9 ±0.04	1.48×10^9 ±0.27	12.02	0.00

[SEM means Standard Error Mean]. P value <0.01 means significant at 1% level of significance

3.2. Results of isolation of bacteria

The results of isolation of bacteria from ostrich oropharyngeal swab, cloacal swab and faeces were shown in Tables 2, 3, 4 and 5. During the study period a total 75 (25 oropharyngeal swab, 25 cloacal swabs and 25 feces) samples were collected from different ages of ostrich for isolation of bacteria. In case of oropharyngeal swabs, 15 (60%) *Staphylococcus* spp., 3 (12%) *Salmonella* spp., 6 (24%) *Escherichia coli* and 1 (4%) *Bacillus* spp. were identified. In case of cloacal swabs, 3 (12%) *Staphylococcus* spp., 8 (32%) *Salmonella* spp., 11 (44%) *Escherichia coli* and 3 (12%) *Bacillus* spp. were identified. In case of feces, 2 (8%) *Staphylococcus* spp., 10 (40%) *Salmonella* spp., 12 (48%) *Escherichia coli* and 1 (4%) *Bacillus* spp. were identified. Among 75 samples, 29 (38.66%) *Escherichia coli*, 21 (28%) *Salmonella* spp.*,* 20 (26.67%) *Staphylococcus* spp. and 5 (6.6%) *Bacillus* spp. were identified. In 25 oropharyngeal swab samples, *Staphylococcus* spp. was found higher 15 (60%) than other organisms but *Escherichia coli* were found higher both in cloacal 11 (44%) and faecal 12 (48%) samples.

Table 2. Distribution of bacterial isolates identified on oropharyngial swab, clocal swab & feaces of ostrich.

Bacterial isolets	Oropharyngeal swab	Cloacal swab	Feacal swab	Percentage (%)
Staphylococcus spp.	15 (60%)	3 (12%)	2 (8%)	26.67
Salmonella spp.	3 (12%)	8 (32%)	10 (40%)	28
Escherichia coli	6 (24%)	11 (44%)	12 (48%)	38.66
Bacillus spp.	1 (4%)	3 (12%)	1 (4%)	6.67
Total number of isolates identified	25	25	25	100

Table 3. Bacterial species isolated from oropharyngeal swab samples of ostrich.

Sample size	Isolated bacteria	Positive isolate	Prevalence (%)	χ^2 value	P value
25	*Staphylococcus* spp.	15	60	24.48	0.00
	Salmonella spp.	3	12		
	Escherichia coli	6	24		
	Bacillus spp.	1	4		

P value <0.01 means significant at 1% level of significance

Table 4. Bacterial species isolated from Cloacal swab samples of ostrich.

Sample size	Isolated bacteria	Positive	Prevalence (%)	2χ value	P value
25	*Staphylococcus* spp.	3	12	9.97	0.019
	Salmonella spp.	8	32		
	Escherichia coli	11	44		
	Bacillus spp.	3	12		

P value >0.01 means significant at 5% level of significance

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Table 5. Bacterial species isolated from faces samples of ostrich.

Sample size	Isolated bacteria	Positive isolate	Prevalence (%)	χ^2 value	P value
	Staphylococcus spp.	2	8		
	Salmonella spp.	10	40		
25	*Escherichia coli*	12	48	19.79	0.00
	Bacillus spp.	1	4		

P value <0.01 means significant at 1% level of significance

3.3. Identification of bacteria by different bacteriological methods
3.3.1. Results of cultural examination
The cultural characteristics of *E. coli, Salmonella* spp., *Staphylococcus* and *Bacillus* spp., on various selective media are presented in Table 6.

Table 6. The results of cultural characteristics of the bacteria isolated from oropharyngeal swab, cloacal swab and faeces of ostrich.

Serial No.	Name of bacteria	Name of media	Colony characteristics
01	*E. coli*	Nutrient Agar	Large, mucoid, white colony
		MacConkey's Agar	Produce large mucoid rose pink colony
		EMB agar	Metallic sheen(greenish black) colony
02	*Staphylococcus* spp.	Nutrient Agar	Black colour/ non-colour smooth, glistening colony
		Staphylococcus Agar No.110	Yellow colony
		Blood Agar	β-hemolytic colony
03	*Salmonella* spp.	MacConkey agar	Small, white, translucent dew drop like colony
		SS agar	Opaque, smooth, round with black centered colony
04	*Bacillus* spp.	Nutrient Agar	Grayish white color with Medusa head colony
		Soft Agar	Thick, grayish white or cream colored colony

3.3.2. Results of biochemical tests of samples isolated from oropharyngeal swab, cloacal swab and faeces of ostrich
The results of biochemical tests of isolated bacteria are shown in Table 7.

Table 7. Results of biochemical tests for the representative isolates.

Serial No.	OXI	CT	Ind	MR	VP	SC	TSI	MIU	SB	Result
1	-	+	+	+	-	-	YY	+	+	*E. coli*
2	-	+	-	+	+	+	YR	+	+	*Salmonella*
3	-	+	-	+	-	-	YR	+	_	*Staphylococcus* spp.
4	-	+	-	-	-	-	YR	+	_	*Bacillus* spp.

[Legends: + = positive, - = negative, OXI= Oxidase, CT= Catalase, Ind= Indole, MR= Methyl Red, VP= Voges-Proskaur, SC= Simmons Citrate, TSI= Triple Sugar Iron, MIU= Motility Indole Urease, SB= Selenite broth]

3.4. Results of antibiotic sensitivity test
A total of four isolates such as *E. coli*, *Salmonella* spp., *Staphylococcus* spp. and *Bacillus* spp. obtained from oropheryngial swab, clocal swab and feces samples of ostrich were subjected to antibiotic sensitivity assay as shown in Tables 8 and 9.

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Table 8. Antimicrobial susceptibility profile of *E. coli* and *Salmonella* spp.

Antimicrobial agents	*E. coli*		*Salmonella* spp.	
	Diameter of of zone inhibition (mm)	Interpretation	Diameter of zone of inhibition (mm)	Interpretation
Levofloxacin	17	S	-	R
Amoxicillin	-	R	-	R
Feridoxin	-	R	-	R
Cefxime	-	R	-	R
Chloramphenicol	-	R	-	R
Gentamicin	24	I	-	R
Nalidixic acid	-	R	-	R
Azithromycin	-	R	18	S
Erythromycin	22	S	-	R
Tetracycline	-	R	-	R
Ceftriaxone	-	R	-	R
Vancomycin	15	S	-	R

Note: S=Sensitive, R=Resistant, I=Intermidate.

Table 9. Antimicrobial profile of *Staphylococcus* spp. and *Bacillus* spp.

Antimicrobial agents	*Staphylococcus* spp.		*Bacillus* spp.	
	Diameter of zone of inhibition (mm)	Interpretation	Diameter of zone of inhibition (mm)	Interpretation
Levofloxacin	18	S	18	S
Penicillin	-	R	-	R
Amoxicillin	-	R	-	R
Feridoxin	-	R	-	R
Cefxime	19	S	19	S
Chloramphenicol	-	R	-	R
Gentamicin	14	S	14	S
Nalidixic acid	-	R	-	R
Azithromycin	-	R	-	R
Erythromycin	22	S	22	S
Tetracycline	-	R	-	R
Ceftriaxone	-	R	-	R
Vancomycin	17	S	17	S

Note: S=Sensitive, R=Resistant, I=Intermidate.

4. Discussion

Ostrich farming system is not common in Bangladesh. At HSTU ostrich farms they fed many type of food items like vegetables, leaves, tubewell water which are contaminated with different type of microorganisms leading to frequent infections. Perhaps this was the first study about ostrich in Dinajpur, Bangladesh to monitor the microbial assessment in oropharyngeal swab, cloacal swab and fecal samples of ostrich and also update knowledge on antimicrobial sensitivity of isolated organisms. In the present study, the result of total viable counts was expressed by CFU (colony forming unit). In every case the average CFU was counted at 30 days interval. The mean colony counts in oropharyngeal swab, cloacal swab and feces samples were $1.36\times10^9\pm0.38$, $1.28\times10^9\pm0.34$ and $1.48\times10^9\pm0.27$, respectively. The present findings revealed that the total viable count recorded in oropharyngeal swab and cloacal swab shown higher in three (3) months age group and gradually lower in 7 months age. On the other hand, the results of total viable count was increased in feces samples with the increased age of ostrich.

In a previous study there were very little information about total viable colony count in ostrich and the result was aggred with Cook *et al*. (1997). In Newzeland detected a maximum areas viable count was log 2.11 for ostrich carcass. But in USA shown that counts was about log 6.0 for ostrich carcass (Sofos *et al*., 1999). Gill *et*

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al. (2000) estimated log mean APC numbers of ostriches and emus were greater than the corresponding values estimated for beef carcasses. In this study, the results shown that ostriches were potential reservoirs for *Salmonella* spp., *E. coli*, *Staphylococcus* spp. and *Bacillus* spp. These bacteria are important pathogens for human and other animals. Overall cultural prevalence of *E. coli* isolates were 29 (38.66%) which was lower than the observation of Gill and Jones (1996). *E. coli* was the most frequently isolated bacterium in the study. This finding correlates with the observation that *E. coli* is the predominant enteric bacteria isolated from ostrich chicks suffering from enteritis (Verwoerd *et al*., 1998). In the present study, overall cultural prevalence of *Salmonella* spp. was 20 (26.67%). More (1996) and Welsh *et al*. (1997b) studied in 3 different serotypes of *Salmonella* isolated from ostriches. Concerning the occurrence of *S. aureus* which is not usually detected in the intestinal tract of ostrich (Notermans *et al*., 1982) but in this study *Staphylococcus* spp. 3(12%) observed in cloacal swab. In this study, the overall cultural prevalence of *Bacillus* spp. was 5 (6.6%) which was little lower than the findings of Hassan *et al.* (2016).

On antibiogram study isolated *Escherichia coli* were more sensitive to Levofloxacin, while more resistant to Tetracycline, Penicillin, Chloramphenicol, Erythromycin, Feridoxin, Amoxicillin, Gentamicin, Ceftriaxone, Nalidixic acid, Azithromycin, Vancomycin. Sahinduran (2004) stated in his study that isolated *Escherichia coli* were the most susceptible to amoxycillin and clavulanic acid combinations. In this study isolated *Salmonella* spp. were sensitive to Azithromycin, while resistant to Tetracycline, Penicillin, Chloramphenicol, Erythromycin, amoxicillin, Amoxicillin, Gentamicin, Ceftriaxone, Nalidixic acid, Levofloxacin and Vancomycin. But in a previous study by Yadav *et al*. (2017) at Chittagong, Bangladesh *Salmonella* isolates from ostriches were found resistance to Amoxicillin, Ampicillin, Oxytetracycline, Cotrimoxazole, Azithromycin and Erythromycin followed by Colistin sulfate 83.33%, Pefloxacin 38.88%, Enrofloxacin 38.88%, Gentamycin 11.1% and Ceftriaxone 0% which was relevant to the study. In a previous study by Hassan *et al*. (2014) at Chittagong, Bangladesh, *Salmonella* isolates from layer poultry were found 100% resistant to Amoxicillin and Tetracycline followed by Enrofloxacin (87.5%), Ciprofloxacin (87.5%), Pefloxacin (87.5%), Doxycycline (50%), Colistin (50%) and Kanamycin (50%) and isolates showed high sensitivity (100%) to Gentamicin and Neomycin are similar to our findings. In this study, isolated *Staphylococcus* spp. and *Bacillus* spp. were more sensitive to Levofloxacin, Azithromycin, Cefxime, Erythromycin, Vancomycin and Erythromycin respectively while more resistant to tetracycline, Penicillin, Chloramphenicol, amoxicillin and amoxicillin, respectively. Sahinduran (2004) also stated that on his antibiogram results, isolated microbial agents were the most susceptible to amoxycillin and clavulanic acid combinations. In present study, a range of bacterial flora was isolated from the samples, indicating the presence of these organisms in the healthy ostriches that living in HSTU ostrich farm. These findings was in accordance with some reports about birds and ruminant that reported as potential pathogens for humans and animals (Bengmark, 1998).

In order to obtain the appropriate microbial assessment in different samples of ostrich, this study should be continued by high population in different farms with defined variable into the future.

5. Conclusions

The results collected during this study indicate that ostriches are susceptible to a number of microbial agents which are common to other avian species. Ostrich oropharyngeal swab is one of the most important sources of *Staphylococcus* spp, cloacal swab and feacal samples are the sources of *E. coli* and *Salmonella* spp, few percentage of *Bacillus* spp found every sample in ostrich farm. These isolated organisms may be transmitting to human. The prevalence of these microorganism in ostrich environment depend mainly on the degree of the hygienic measures used in each farm. Poor sanitation and handling of captive ostrich could be a source of contamination. Antibiotic resistance of isolated organisms are also considered as an important problem. Proper choice of antimicrobials and strict bio-security measure should be relevant for the ostrich farms. As ostrich farming is gaining attention as an emerging industry in Bangladesh, therefore this type of study will be beneficial for the stockholders and prescribers and also ostrich owners. Finally, it may be concluding that the logical use of antibiotics must be adopted in ostrich farms reared in Bangladesh for prevention the appearance of multidrug resistance bacteria. Moreover proper measures should be taken to ward off zoonotic diseases in peoples who are related to ostrich farming.

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Conflict of interest
None to declare.

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