Study On The Prevalence Of Some Bacterial And Parasitic Pathogens In White Ibis

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ABSTRACT

This is a field survey to study the prevalence of some bacterial pathogens among free living white Ibis revealed a recovery of 82 isolates from 193 different internal organs derived from 55 apparently healthy Ibis. *E. coli* and *Salmonella species* were isolated from these birds with percentage of 43.6 and 14.5 respectively. They revealed 100% mortalities in day old chicks.

Bacterial pathogens were isolated *Shigella spp.* (34.5%), *Enterobacter spp.* (21.8%), *Citrobacter spp.* (18.1%), *Klebsiella spp.* (16.3%), *Staphylococcus aureus* (10.9%) and *Proteus spp.* (7.2%). Experimental infection of day old chicks by *Klebsiella* or *Proteus Spp.* through subcutaneous route revealed 40% mortalities for both. Other bacterial isolates reflected no clinical disease. The antibiogram proved that, all isolates were highly sensitive to Ciprofloxacin. Enrofloxacin, Trimethoprim and the Penicillin was more sensitive for *Staphylococcus aureus.*

Histopathological results showed a picture of hepatitis. Gall bladder had cholangitis, cholicystitis which may be due to trematode infestation. Kidneys showed also multible parasitic cysts of trematods Non suppurative interstitial nephritis was also observed.

Gastrointestinal tract examination revealed the detection of one nematode spp. beside the detection of 3 trematodes spp. Other trematode were detected in enlarged gall bldder and kidney lesions.

This study reflect the role of white Ibis which living near the poultry population have the potential to transmit some pathogens to poultry.

INTRODUCTION

The spread of some bacterial pathogens and its persistence in the environment may be enhanced by wild birds which, in view of their considerable mobility and the high carrier rate of them, have been identified one possible reservoir or source of bacterial infections to domestic poultry ***(1 & 2)***.

White Ibis was increased significantly since 1983. They frequently observed in close contact with people ***(3)***. This has led to concern that Ibis may transmit pathogens that threaten poultry industry and public health. The prevalence of different bacterial isolates in white Ibis was documented by isolation of *Pseudomonas, E. coli, Salmonella, Proteus and Pasteurella haemolytica* ***(4)***. Also the same pathogens were isolated in addition to *Streptococcus faecalis, Arizona hydrophila and Staphylococcus aureus* by ***(5)***. *E.coli* was isolated from different internal organs in six septicemic cases of young Crested Ibis ***(6)***. *E. coli* and *Salmonella spp.* were isolated from free living passerines ***(7)***. *Salmonella spp.* has also been reported in free living wild birds ***(1, 2, 8-11)***.

Salmonella spp. was commonly found in the intestine of wild birds. They appear to be relatively resistant to disease but may serve as effective carriers of salmonella as well as harbor it in fecal dropping and thus are a source of infection for other domestic poultry ***(12)***.

The upper respiratory tract of healthy birds can harbor *Klebsiella* microorganism which act as opportunistic pathogens and may cause localized or systemic infection in poultry and other birds ***(13)***.

Little is known about the incidence of these enteropathogens in wild birds near poultry facilities or their transmission to poultry. The objective of this study was to study the prevalence of common avian pathogens in clinically healthy free-living white Ibis and to document its pathogenicity for commercial chicks.

MATERIALS AND METHODS

Birds

Fifty five live apparently healthy white Ibis were collected by hunting from different localities in Sharkia province.

Necropsy and sampling

Birds were examined clinically and then, subjected to post mortem examination. The specimens (heart blood, lung, liver, spleen, kidney and ovary) were taken under aseptic necropsy technique for bacteriological and histopathological investigation.

Bacteriological examination

Samples were inoculated in Nutrient broth and Brilliant green bile broth and incubated at 25 °C and 37 °C for 24 hours. Then subcultured into differential and specific media such as Eosin-methylene blue (EMB) agar, Xylose-xysine-deoxy-cholate (XLD) agar, MacConkey agar, Brilliant green bile agar, Mannitol salt agar and Nutrient agar. The inoculated plates were incubated at 37°C for 24 hours. Colonies with characteristic growth of any bacteria were fully phenotypic identified by using gram stain and standard biochemical testes ***(14)***. These testes included lactose, indol, methyl red, citrate utilization, urease, hydrogen sulphide gas production, Voges-Proskauer and motility.

Antimicrobial sensitivity test

All isolates were used for disc sensitivity testes National Committee for Clinical Laboratory Standards (NCCLS) ***(15)*** using available commercial antibiotic discs (Oxoid Lab.). The inhibition zones were measured after 24 hours of growth and the recommendation given by the sensitivity discs manufacturer manual were used for classifying these isolates into sensitive or resistant.

Parasitological examination

Examination of the gastrointestinal tract content of freshly necropsied Ibis was done for detection of different enteric parasites.

Histopathological examination

Specimens with characteristic lesions from liver, gall bladder and kidneys were collected, fixed in 10% neutral buffered formalin solution and embedded in paraffin wax. Then cut to 5 µm and stained with Hematoxylin and Eosin (H&E) for microscopical examination ***(16)***.

Pathogenicity of bacterial isolates

Ninety five one day old White Highline male chicks (American Breeds) were obtained from Egypt Poultry Company and used to study the pathogenicity of the different isolated bacteria. Five chicks were randomly scarified and submitted for bacteriological examination which proved that they were free from bacterial pathogens.

The chicks were divided into 9 groups each contained 10 chicks. They were inoculated via S/C route with 0.25 ml suspension of $0.1X10^{3.3}$ CFU of different bacterial isolates/chick ***(17)***. The last group was kept without inoculation as control group. Daily observation of the chicks for clinical signs was done for ten days. Dead and scarified chicks were subjected for post mortem lesions and bacteriological re-isolation.

RESULTS AND DISCUSSION

Although the hunted white Ibis appeared apparently healthy, the post mortem examination revealed a picture of septicemia in internal organs of 55% examined Ibis. In addition to, greenish discoloration, with subcapsular hemorrhages and necrosis were detected in liver of some cases, at the same time, gall bladders were severely enlarged and distended with bile. The kidneys in two cases were detected with severe enlargement and nodular appearance as well as the ureters were

filled urate. Proventriculus showed severe enlargements with thickening in many cases. Gastrointestinal tract showed congestion in many cases with hemorrhagic spots on intestinal walls and some cases had severe thickening in the mucosa. Enlargement of some testies with hemorrhagic spots were observed. Few ovaries had missed shape and greenish discolored ovum. These observation is consistent with previous studies ***(5,6)***. In wild birds *Salmonellosis* may appear with congested swollen crumbly with small reddened or pale spots if the course of disease have been prolonged ***(18)***.

Records of bacterial isolation from 55 white Ibis and its recovery from different organs were represented in Tables 1 , 2.

Table 1. Record of different bacterial pathogens isolated from 55 wild Ibis.

Bacterial isolates	Number of positive	Percentage %
E.coli	24	43.6
Salmonella	8	14.5
Shigella	19	34.5
Proteus	4	7.2
Citrobacter	10	18.1
Enterobacter	12	21.8
Klebsiella	9	16.3
Staphylococcus	6	10.9
Total	82	

N.B.: Mixed infection was recorded.

Table 2. Incidence of isolated bacteria from different organs.

Organs	Heart Blood		Liver		Lung		Kidney		Ovary		Total
Isolates	N	%	N	%	N	%	N	%	N	%	
E.coli	11	23.4	6	12.8	15	32	7	14.8	8	17	47
Salmonella	9	30	8	26.7	7	23.3	1	3.3	5	16.7	30
Shigella	3	14.3	6	28.6	9	42.8	3	14.3	-	-	21
Proteus	2	25	3	37.5	2	25	1	12.5	-	-	8
Citrobacter	11	32.4	10	29.4	9	26.5	3	8.8	1	2.9	34
Enterobacter	9	22.5	17	42.5	11	27.5	2	5	1	2.5	40
Klebsiella	7	30.4	5	21.7	6	26.1	2	8.7	3	13.1	23
Staphylococcus	1	16.7	2	33.3	3	50	-	-	-	-	6
											115

N: Number of isolates

The highest percentage of bacterial isolation was recorded for *E. coli* (43.6%) followed by *Shigella* (34.5%), *Enterobacter* (21.8%), *Klebsiella* (16.3%), *Salmonella* (14.5%), *Staphylococcus aureus* (10.9%) and *Proteus* (7.2%). High rate of isolates recovery was detected from lungs, heart blood and liver. *E. coli* (58.3%), *Salmonella spp.* (20.8%) and *Proteus spp.* (0.83%) were isolated from white Ibis ***(4)***. Also *E.coli* (35 %), *Salmonella spp.* (5 %), *Protues spp.* ((10 %) and *Staph. aureus* (10 %) were isolated ***(5)***. But those authors could not isolated *Klebsiella spp.* from Ibis, at the same tim, *Klebsiella spp.*was isolated from Crow, Hoopoe, Sparrow, Doves, Quails and Gulls ***(5)***. *E. coli* were successively isolated

from six cases of septicemic young Crested Ibises *(6)*. Also *E.coli* and *Salmonella spp.* could be isolated from wild birds found near broiler chicken houses by *(1, 2, 19-21)*.

Result of biochemical identification of the different bacterial isolates was summarized in Table 3.

Table 3. Biochemical identification of the different bacterial isolates.

Biochemical test	Bacterial isolates								
	E.coli	Citro.	Shigella	Sal.	Proteus	Pseudo.	Staph.	Kl.	Entero.
Lactose	+	-	-	-	-	N	N	+	+
Indol	+	-	-	-	+	-	N	+	-
Citrate	-	-	-	+	N	+	N	+	+
Urea	-	+	-	-	+	-	N	+	-
H_2S	-	+	-	+	-	N	N	N	N
M.R	+	+	+	+	N	+	N	-	-
V.P.	-	-	-	-	N	-	N	+	+
Motility	+	+	-	+	+	+	-		-
Coagulase	N	N	N	N	N	N	+	N	N

Citro: Citrobacter spp. Sal: Salmonella spp. Pseudo: Pseudomonas spp. Staph.: Staphylococcus aureu
Kl: Klebsiella spp. Entero: Enterobacter spp. (+): positive. (-): negative. (N): not done.

The successful isolation of *Salmonella spp.* on XLD agar was carried out. This method is extremely sensitive for detection of *Salmonella spp.* even for samples highly contaminated with other *Enterobacteriace (22)*. At the same time, it has been suggested that the natural occurrence of Salmonella in healthy birds during migration in Sweden may be low *(23)*. Therefore, the Salmonella incidence is probably also low for most wild bird. These results support the low number of *Salmonella spp.* isolates in our samples in comparison to the other bacterial isolates.

Table 4 showed mortality observed from 12 to 72 hours following experimental infection of 1 day old chicks inoculated subcutaneously with different bacterial isolates.

Table 4. Mortality associated with intermental dosage of different bacterial agents administer via s/c to 1 day old chicks.

Isolates	E.coli		Salmonella		Klibsella		Protues		Enterobacter		Citrobacter		Shigella		Staph.		Control	
Hours PI	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%	Dead	%
12	5/10	50	10/10	100	2/10	20	3/10	30	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0
24	4/10	40	0/10	0	2/10	20	1/10	10	1/10	10	1/10	10	0/10	0	2/10	20	0/10	0
48	1/10	10	0/10	0	0/10	0	0/10	0	1/10	10	0/10	0	0/10	0	0/10	0	0/10	0
72	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0	0/10	0
Cumulative Total	10/10	100	10/10	100	4/10	40	4/10	40	2/10	20	1/10	10	0/10	0	2/10	20	0/10	0

Dead: Dead number. **PI:** Post inoculation.

All chicks experimentally infected with *Salmonella spp.* isolates were dead within 12 hours post inoculation without showing premonitory signs and with only sever picture of septicemia. Its pathogenicity were 100% in baby chicks. Also *E. coli* isolates produced 100% mortalities in baby chicks after 48 hrs. PI respectively indicating their virulence to day old chicks with clinical and postmortem picture of depression and off food before death, beside generalized congestion in visceral organs, air saculitis and hydroprecardium, in addition to bloody cecum (24, 48 hrs. PI). Experimental infection of *Klebsiella* or *Protues spp.* isolates to day old chicks proved their pathogenicity and

mortality reached 40% for each in day old chicks. In contrast, other *bacterial isolates* showed lower pathogenic effect (between 10:20%) mortality. There were no any clinical signs, mortality, bacteriological isolation was recorded in the control group from all scarified chicks during the experimental period. Bacterial re-isolation was successively obtained from heart blood and visceral organs of dead inoculated chicks.

Mortalities in day old chicks post orally exposure with *E.coli, Salmonella, Klebsiella spp.* and *Protues spp.* Were (100%, 80%, 40%, 20%) ***(5)***. The pathogenicity of *Salmonella enterica Typhimurium* isolated from white Ibis in 3 day old chicks infected by oral route were 100%), 60% for *E. coli* infection and 40% for *Protues spp.* infected group ***(4)***. Our pathogenicity study showed high susceptibility of day old chicks to exposure with either *E.coli* or *Salmonella spp.* (100%) which was higher than that recorded by previous mentioned authors ***(4)***, which may be due to the difference in route of infection. Subcutaneous route was highly effective with mortality rate 40% in the experimental infection of 3 day old chicks with *Klebsiella pneumoniae* isolates while oral route of infection with the same organism gave only 20% mortality***(13)***.

Regarding to the antibiogram sensitivity pattereren of different bacterial isolates is shown in Table 5.

Table 5. Antimicrobial sensitivity of bacterial isolates using disc diffusion method.

Isolates	Mean zones of inhibition (mm) with each respective compound							
Antibiotic disc	E.coli	Sal.	Prot.	Shig.	Entero.	KI.	Citr.	Staph.
Ciprofloxacin 10 µg	23 ± 1.7	24 ± 2.0	19.2 ± 2.3	20 ± 2.1	21.2 ± 1.9	11 ± 0.8	18 ± 1.5	11 ± 0.8
Enrofloxacin 5µg	21.2 ± 1.9	25.6 ± 2.6	20.4 ± 2.5	14.8 ± 1.5	19.2 ± 2.1	22.1 ± 2.8	16 ± 1.7	16.4 ± 1.9
Trimethoprim 25 µg	18.9 ±1.9	22.7 ± 1.6	15 ± 1.3	9.6 ± 0.9	10 ± 0.6	16 ± 1.3	13.8± 1.5	8 ± 0.8
Norfloxacin 10 µg	14.5± 1.7	19.2 ± 2.2	12.4 ±1.6	16.8 ± 1.8	13 ± 0.8	15.3 ± 1.6	14 ± 0.6	21.5 ± 2.4
Amoxycillin 10 µg	12.9± 0.5	20 ± 1.7	13.6 ± 1.7	14 ± 1.4	13.2 ± 1.3	13.2 ± 1.7	14.2± 1.5	24 ± 1.9
Gentamycin 10 µg	14.5± 0.0	11 ± 0.9	12 ± 0.7	14 ± 1.4	8 ± 0.4	-ve	10.6 ± 1.1	-ve
Pencillin 10 µg	12± 1.1	17.5 ± 1.3	12.4 ± 1.6	-ve	-ve	-ve	-ve	18 ± 1.5
Streptomycin 10 µg	11 ± 1.4	15.3 ± 1.8	9.6 ± 1.4	9.2 ± 0.9	8.8 ± 0.3	9 ± 0.7	7.8 ± 0.3	13.3±1.5
Oxalinic acid 30 µg	16.8± 1.8	23 ± 1.9	-ve	10 ± 0.5	10 ± 0.5	10 ± 0.5	13 ± 0.6	16 ± 1.1
Flumoquine 10 µg	13.8± 1.4	19 ± 1.6	-ve	17 ± 1.7	-ve	9 ± 0.7	10.4 ± 0.5	-ve
Oxytetracyclin 30 µg	11 ± 1.3	11 ± 0.9	14 ± 1.6	14 ± 1.4	12 ± 1.1	16 ± 0.8	14.1 ± 1	14 ± 0.7
Kitasamycin 70µg	9 ± 0.5	20 ± 1.7	9 ± 0.7	8 ± 0.4	10.7 ± 0.8	-ve	8.4 ± 0.8	10 ± 0.6
Neomycin 30µg	17± 1.3	23 ± 2.1	18.8 ± 2.2	12 ± 1.6	-ve	10 ± 0.5	15 ± 0.7	-ve

Resultes of sensitivity showed that, most of these isolates were highly sensitive to Ciprofloxacin, Enrofloxacin, Trimethoprim, Norfloxacin and Amoxycillin. At the same time, *Salmonella spp., E. coli* and *Protues spp.* isolates were also sensitive to Neomycin, Oxalinic acid, and streptomycin. Our results are in agreement to some extent with previous study ***(5)*** except Amoxycillin, which their isolates were resistant to it. *Klebsiella spp.* isolates were highly sensitive to Gentamycin and less sensitive to Pencillin ***(13)***. These finding were disagreed with our results in which *Klebsiella spp.* was resistant to them. Antibiotic sensitivity test to isolated *enterobacterecea* may differ according to the phenomena of drug loading ability of the microorganism.

Microscopical examination of gastrointestinal tract lavage revealed detection of 3 types of trematodes *(Echinochasmus spp.; Apatemon spp. and Patagifer spp.);* beside the presence of nematode *(Porroceacum spp.).* These finding explain the presence of severe congestion of gastrointestinal tract with thickening of the mucosa and hemorrhagic spots in some cases. The histopathological results detected trematode *(Echinostomatidae spp.)* in distended gall bladder which represented in fig (5&6). This parasite was detected in the gall bladder of Ibis ***(26)***. At the

same manner, trematode cysts in kidney with nodular lesion (Fig. 11) was observed in some cases and these results were supported by previous work ***(28).*** These parasites could be considered as a potential source of infection to poultry stocks.

Histopathological examination of liver showed massive areas of fatty change (Fig. 1). Coagulative necrosis of hepatocytes, congestion, hyperplasia of bile duct with infiltration of macrophages, lymphocytes and heterophils were observed (Fig. 2). Multifocal areas of mononuclear cell infiltration mainly macrophages and lymphocytes with necrotic changes and degeneration of hepatocytes were also observed (Figs 3&4). These lesions are associated with bacterial infection mainly salmonella and E. coli. Our results supported several previous studies ***(6, 24& 25).***

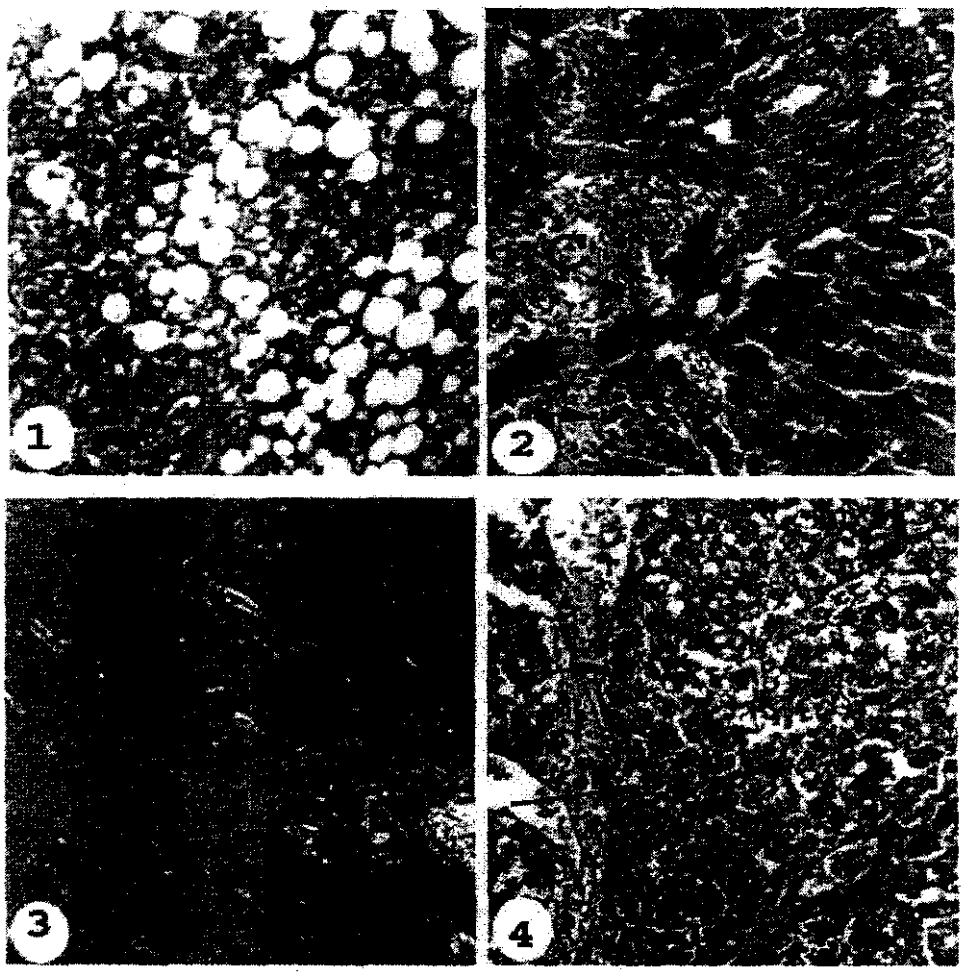

Fig 1. liver, showing fatty change of hepatocytes (arrows). H&E. X 4oo.

Fig 2. Photomicrograph of the liver, showing , congestion of blood vessels (C) , hyperplasia of bile duct along with leucocytic infiltrations with lymphocytes and heterophils (arrows). H&E. X400.

Fig 3. Photomicrograph of the liver, showing, multifocal areas of leucocytic infiltrations (arrows), along with focal necrosis. H&E. X 100.

Fig 4. Photomicrograph of the liver, higher magnification of (fig. 3) showing vacuolar degeneration of hepatocytes, necrotic changes of hepatocytes and infiltrations with lymphocytes and few heterophils. H &E.X400.

Severe cholangitis and cholecystitis were observed in close association with the parasites in the gall bladder and bile duct (figs 5 & 6). Biliary necrosis, severe hyperplasia, eosinophilic and mononuclear cell infiltrations and fibrosis were also detected. Multifocal areas of mainly eosinophilic cell infiltration and some lymphocytes with degeneration and necrosis of hepatocytes were seen in some cases (Figs. 7 & 8). These aggregations of eosinophiles may be due to larva migration through the hepatic tissue. The presence of parasite within the gall bladder and bile duct thought to be a trematod *(Echinostomatidae)* as that recorded by ***(26)*** who found *Echinostomatidae* (*Pegosomum spp.)* in the lumen of gall bladder and bile ducts of Bubulcus Ibis. Also the same histopathology picture was recorded in several investigation ***(27,28)***.

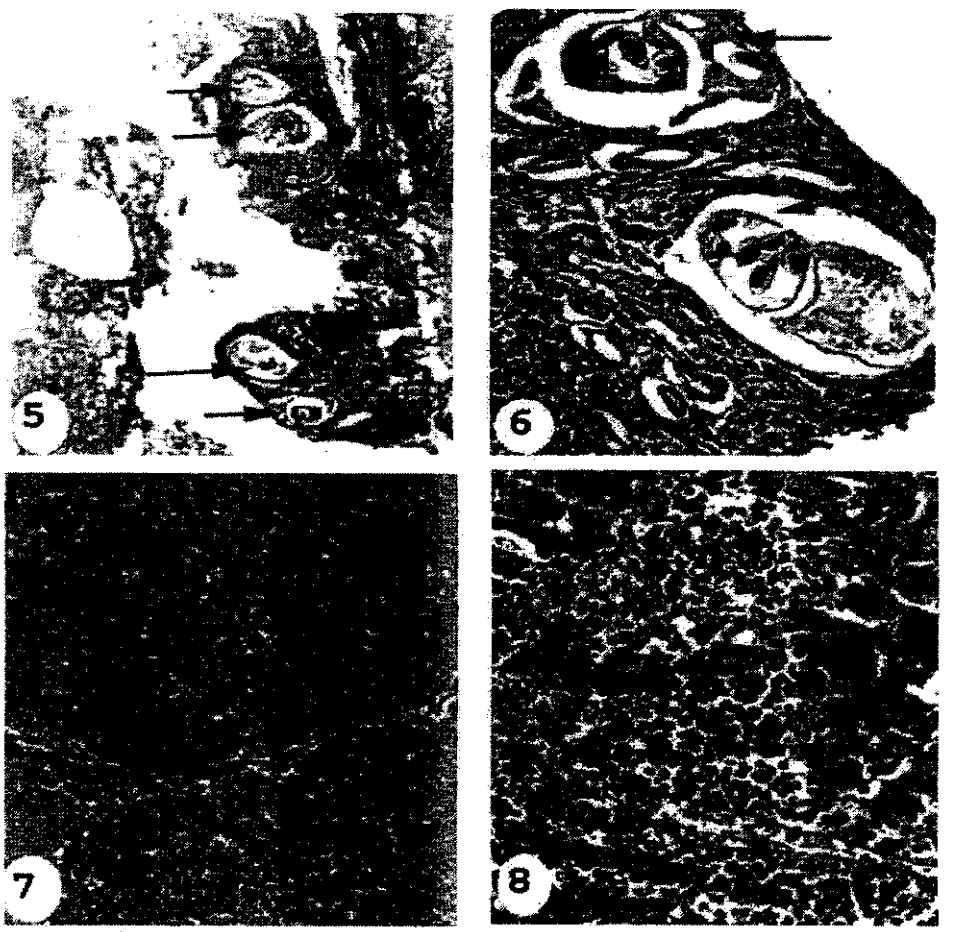

Fig 5. Photomicrograph of the gall bladder, showing severe cholangitis and cholecystitis with association of the parasites in the bile duct (arrows). H&E. X 100.

Fig 6. Higher magnification of fig 5 showing the cross sections of the parasites along with massive lymphocytic infiltrations. H&E. X 400.

Fig 7. Photomicrograph Photomicrograph of the liver showing multifocal areas of leukocytic infiltrations mainly with eosinophils. H&E. X 100.

Fig 8. Photomicrograph of the liver higher magnification of fig. 7, showing massive infiltrations mainly with eosinophils and some lymphocytes. H&E. X 100.

The kidney showed typical picture of nephritis, there were multiple large gravid fluke in distended collecting ducts that thought to be a trematodiasis. The adjacent tissues were compressed and focally infiltrated with few lymphocytes (Figs 9-11). Areas of mononuclear cell infiltration mainly lymphocytes and few macrophages along with degenerative changes were also seen (Fig.12). Those sections of the trematode parasite were similar to that described previously *(27,29)*. Interstitial nephritis represented by mononuclear cell infiltration of lymphocytes and macrophages could be attributed to the bacterial infection.

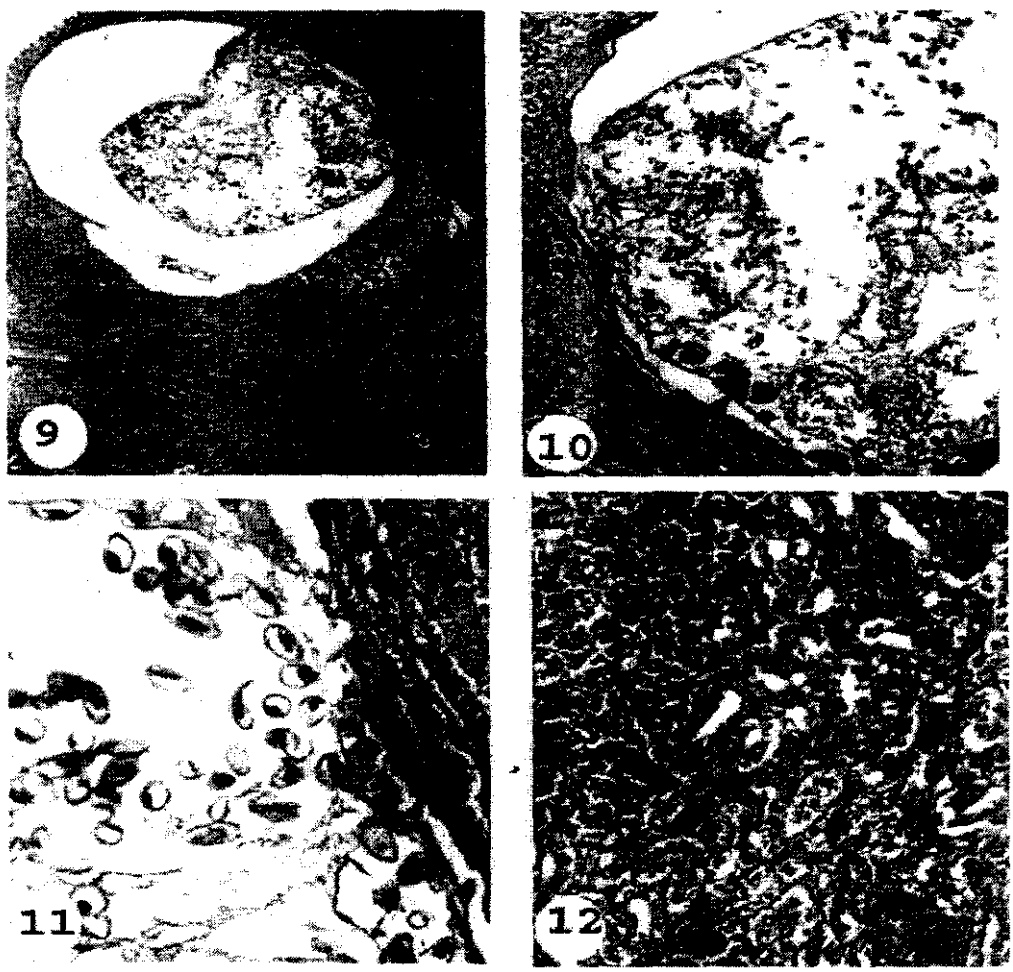

Fig 9. Photomicrograph of the kidney showing large cyst embedded in the parenchyma of the renal tissues looks like a section of a parasite with minimal tissue reaction. H&E. X 100.

Fig 10. Higher magnification of the parasitic cyst in the kidney showing sections of parasite internal organs and oval nucleated bodies. H&E. X 200.

Fig 11. Higher magnification of fig. 10 showing a minimal tissue reaction consists of few lymphocytic infiltrations. H&E. X 400.

Fig 12. Photomicrograph of the kidney showing focal interstitial nephritis mainly with lymphocytic infiltrations and few lymphocytes. H&E. X 400.

Our results reflected the potential role of white Ibis to transmit these pathogens to domestic poultry.

So, continuous growth and geographic expansion of Ibis populations in rural and urbanized settings provides more opportunity for Ibis to interact with humans and livestock which may represent an increased risk of pathogen transmission. Further investigation still needed to give us more information about the role of other wild birds in transmission of pathogens to domestic birds.

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الملخص العربى

دراسة على مدى انتشار بعض الامراض البكتيرية و الطفيليه فى طائر ابو قردان

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** المعمل التشخيصى لأمراض الطيور بمستشفى كلية الطب البيطرى جامعة الزقازيق.

تم اجراء دراسة حقلية لتبين مدى انتشار بعض الأمراض البكتيرية التى تصيب طائر ابو قردان والتى اسفرت عن عزل ٨٢ عزلة من ١٩٣ عضو داخلى من ٥٥ طائر حى بحالة جيدة. وكانت النسبة المئوية لعزل ميكروبات الاشيريشيا كولاى والسلمونيلا (٤٣،٦ ، ١٤،٥) على التوالى والتى اسفرت عن نسبة نفوق ١٠٠% فى كتاكيت عمر يوم عندما اجريت لها العدوى الأصطناعية عن طريق الحقن تحت الجلد. وكذلك تم عزل ميكروبات الشيجيلا (٣٤،٥%) و الأنتيروباكتر (٢١،٨%) و الستروباكتر (١٨،١%) و الكليبسيلا (١٦،٣%) و الاستافيلوكوكس (١٠،٩%) وكذلك البروتيس (٧،٢%). وباجراء العدوى الأصطناعية كانت نسبة النفوق ٤٠% لكل من ميكروب الكليبسيلا والبروتيس وأما باقى البكتيريا فلم تظهر أهميه كبرى بالقياس بباقى العزلات.

و باجراء اختبار الحساسية تبين ان كل هذه العترات كانت شديدة الحساسيه للسيبروفلوكساسين ويليه الانروفلوكساسين والترايميسوبريم وقد سجل البنسلين اقل نتيجة.

وباجراء الفحص الهستوباثولوجى تبين وجود التهابات فى الكبد وكذلك تم مشاهدة طفيليات مفلطحه فى الحويصله المراريه والتى ادت الى وجود التهابات فيها وكذلك القناه المراريه. وبفحص الكلى تبين وجود حويصلات لطفيل لم يتم تصنيفه والذى ادى الى ظهور التهابات فيها.

وباجراء الفحص الميكرسكوبى لمحتويات الأمعاء امكن تحديد الاصابه بثلاث انواع من الديدان المفلطحه ونوع واحد من الديدان الاسطوانيه.

وتعكس هذه الدراسه الدور الذى يمكن ان يقوم به طائر ابو قردان فى نقل هذه الأمراض الى الطيور التى تعيش بالقرب منه.