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Occurrence of Caecal Coccidiosis Among Broilers in Gaza strip

Hussain Abo Alqomsan [1], Adnan Al-Hindi [2]
[2] Department of Biology, Faculty of Science; The Islamic University of Gaza
Dr. Adnan Al-Hindi, The Islamic University of Gaza, Faculty of Science, Department of Biology, P.O.Box 108, Gaza, Palestine

Abstract

Background: Coccidiosis is a health problem resulting in significant economic losses worldwide. The impacts of disease on animal production include, for example, lost revenues, costs of vaccination, prevention, eradication, decontamination and restocking.

Objective: This study aimed to determine the occurrence of caecal coccidiosis among broiler chiken in Gaza strip.

Subjects and methods: The study was conducted during September (which has recorded the highest prevalence), October and November, 2009 in the Gaza strip governorates, Palestine. Randomly 390 broilers caeca were collected from poultry shops, 10 caeca from every poultry shop were sampled. Test tube flotation for caecal content and direct smear scraping of the caeca lining was done to detect *Eimeria tenella* based on the dimensions of oocysts and schizonts respectively. In addition, postmortem was done to detect the clinical coccidiosis.

Results: The present study came up with the following findings: The prevalence of sub-clinical caecal coccidiosis was 54.4 %. Multi-variable associations were tested between each variable. Middle governorate represented the highest prevalence (80%). Clinical coccidiosis was only found in groups 1.3 to 1.5 and 1.6 to 1.9 kg with prevalence (9.3%) and (6%), respectively.

Conclusions: The prevalence of the infection increased among the older broiler chicken. Absence of clinical signs of disease does not mean the farm is not infected; diagnosis is based on the presence of lesions at postmortem and the identification. With the aid of a microscope, using direct smear scraping is more sensitive and low cost and time. *E. tenella* in the present study was found to cause clinical signs in broilers.

Keywords: Prevalence, Caecal Coccidiosis, *Eimeria tenella*, Broilers, Gaza strip

Hussain Abo Alqomsan , Adnan Al-Hindi

ظهور الكوكسيديا الاعورية في الدجاج اللاحم في قطاع غزة

ملخص

المقدمة: يعتبر مرض الكوكسيديا أحد المشاكل الصحية في قطاع الدواجن ، التي تؤدي لخسارة اقتصادية على مستوي العالم، وتتمثل هذه الخسارة في ضياع الدخل، وتكلفة العلاج، والتحصين، والوقاية، ومكافحة التلوث، والعمل على تربية قطعان جديدة خالية من المرض.

الهدف: تهدف هذه الدراسة إلى تحديد ظهور مرض الكوكسيديا الأعورية في الدجاج اللاحم في قطاع غزة.

الطرق والأدوات: أجريت هذه الدراسة خلال 3 أشهر من عام 2009 ، وهي سبتمبر وأكتوبر ونوفمبر في محافظات قطاع غزة- فلسطين- حيث تم اختيار 390 عينة عشوائية من أمعاء (الأعور) الدجاج اللاحم، وأخذت العينات من محلات بيع الدواجن في أسواق المحافظات، وهي عبارة عن 10 عينات من كل محل بيع للدواجن، حيث اعتبرت العينات ممثلة عن القطيع، لتكون العينات ممثلة" عن39 قطيعاً.وبعد إجراء التشريح على أعور الدواجن، تم أخذ محتوياته، وفحصه باختبار الطفو الأنبوبي؛ للكشف عن بيوض طفيل الإميريا تنيلا، المسبب لمرض الكوكسيديا الأعورية، كما تم عمل مسحة مخاطية عميقة من جدار الأعور باستخدام اختبار المسحة العميقة المباشرة؛ للكشف عن طور الشيزونت لهذا الطفيل، كما تم –كذلك- عمل الصفة التشريحية للأعور؛ للكشف عن الآفات المرضية للمرض التي تسبب الأعراض السريرية.

النتائج: أكدت هذه الدراسة وجود مرض الكوكسيديا الأعورية تحت السريري في الدجاج اللاحم في قطاع غزة- فلسطين بنسبة 54,4% بناءً على العديد من المتغيرات التي تم استخدامها خلال هذه الدراسة، وقد تم تقييم كل متغير على حدة. توصلت الدراسة ان الاميريا تسبب ضرر اكلينيكى يمكن مشاهدته من خلال الفحص التشريحى.

الاستنتاجات:

الكلمات المفتاحية: نسبة الشيوع، الكوكسيديا الاعورية، الاميريا تينيلا، الفراريج، قطاع غزة.

Introduction

Coccidiosis remains one of the major disease problems of poultry in spite of advances made in prevention and control through chemotherapy, management and nutrition. *E. tenella* and *E. necatrix* are the most pathogenic species in addition the disease causes high mortality, morbidity and adverse effects on the growth of infected birds [1-2]. Coccidia of the genus *Eimeria* are predominately host-specific; each species occurs in a single host species or a group of closely related hosts, infection by coccidia should be in sufficient numbers to produce clinical manifestations of disease that is named coccidiosis. Differential identification of each species is dependent upon the following characteristics; zone of intestine parasitized, gross appearance of the lesion, oocyst morphology, minimum sporulation

time, minimum prepatent time, schizont size, location of parasite in the host intestinal epithelium and Cross-immunization tests [3]. *E. tenella* infections are found only in the caeca and it is called caecal coccidiosis [4]. In addition it can be recognized by accumulation of blood in the caeca and by bloody droppings. Caecal cores, which are accumulations of clotted blood, tissue debris, and oocysts, may be found in birds surviving the acute stage [5-6]. Caecal coccidiosis causes decreasing of production and economic losses, which can be significant [7].

Animal production sector is one of the most important sectors of Palestinian agriculture. Its importance comes from the increasing investments in the livestock sector. The share of animal production sector of the total agricultural value had increased from 36% to 49% in the West Bank in the seventies and nineties of 20th century respectively. Similar trend occurred in the Gaza strip, as livestock sector share increase from 20% to 30% at the same periods. Now Palestinian farmers in Gaza strip breed more than 15 million broilers per year which hatched locally through importing fertilized eggs from Israel and from abroad. Palestinians consume all that in addition to different types of poultry meat such as turkey, ducks, and imported frozen poultry products [8].

For control of avian coccidiosis, some of the alternatives reviewed include acids, vitamins, probiotics, mushrooms, amino acids, nonsteroidal anti-inflammatory agents, natural feed additives, essential oils and botanicals [9]. Another control approaches have been proposed like; management of poultry house, prophylactic application of anticoccidials, live, attenuated strain based vaccines, immunoprophylaxis [10]. In Gaza strip control strategies are just focused in using anticocccidial drugs in breeding farms.

There is no available data on the occurrence of *E. tenella* in Gaza farms, this study will focus on the occurrence and prevalence of *E. tenella* to provide significant information due to its importance from both economic and veterinary health viewpoints.

The aim of the present study was to determine the occurrence of caecal coccidiosis among broilers in Gaza strip.

Subjects and Methods

The study design

The study design was cross sectional which was carried out on live birds in Gaza Strip.

Demography of Gaza strip

The Gaza strip lies on the coast of the Mediterranean. It is bordered by Egypt to the south-west. Climate in Gaza governorates varies from mild

winters, dry and warm to hot summers; It is about 41 kilometers long, and between 6 and 12 kilometers wide, with a total area of 360 square kilometers. The population is estimated to be 1,644,293 inhabitants [11]. High population density, limited land access, and strict internal and external security controls have kept economic conditions in the Gaza strip, the smaller of the two areas under the Palestinian Authority even more degraded than in the West Bank [12].

The study population

The community of the study consisted of all broilers in which were distributed in the five governorates of Gaza strip; Rafah, Khanyonis, Middle, Gaza city and Gaza North. The study period was in the three months of September, October and November in the year 2009. Farmers breed 1.5 million broilers per month that is 4.5 million in 3 months period.

The sampling

The present study was a cross sectional because the prevalence of coccidiosis in chicken farms has not been reported in Gaza strip, the prevalence of infection in each farm was assumed to be 50%. The calculated sample size was 385; using a 95%, level of confidence and 5% desired absolute precision [13]. In the present study, random sampling was used to collect 390 intestinal gut samples (caeca) of broilers from different poultry shops in the markets of Gaza strip. For each shop, 10 birds were collected, which represents a farm. Table1. shows the distribution of the samples among governorates and Table 2. by months.

Table 1. The distribution of the collected samples in Gaza governorates

Group	Frequency	Percent
North	60	15.38
Gaza	150	38.46
Middle	60	15.38
Khanyounis	60	15.38
Rafah	60	15.38
Total	390	100

Table 2. The distribution of collected samples by month

Group	Frequency	Percent
September	40	10.26
October	200	51.28
November	150	38.46
Total	390	100

Examination and identification of *E. tenella*

All the collected caecae were kept in an icebox for 8 - 12 hours in the laboratory at 4-8 °C. All samples were examined by qualitative techniques according to recommended standard methods [14].

Clinical disease using postmortem for each bird was recorded. The caeca of gastrointestinal tract was grossly examined carefully.

Qualitative techniques

A large number of different procedures are available for demonstrating coccidia oocysts in poultry faeces. Two methods, which provide qualitative or at the most semi quantitative results will be described below. The most widely used principle for concentration of parasite eggs is flotation [14].

First test: Direct smear scraping

All the caecae were opened, their contents were evacuated, and direct scraping for caecal mucosa was done.

A deep scraping was done of the suspected mucosa with one end of the slide. The material was spread in a very thin layer on a new slide and covered with a cover slip and the thin smear was examined microscopically using 100 x magnification.

Second test: Test tube flotation

All the caecae were opened and their contents (faeces) were collected in a beaker. The faeces were macerated and the suspension was filtered through a muslin cloth and allowed to float. The oocysts in the flotation were separated by flotation method in saturated sodium chloride and sugar solution. They were examined microscopically and the species were identified on the basis of shape and size of oocysts [15].

Clinical coccidiosis

Using postmortem examination, *E. tenella* infections are found only in the caeca and can be recognized by accumulation of blood in the caeca and by bloody droppings. Caecal cores, which are accumulations of clotted blood, tissue debris and oocysts, may be found in birds surviving the acute stage. In this study, chicken that showed caecal core were recorded as clinical cases

Identification of *E. tenella* using measurement of oocysts

Length and width were measured for 50 oocysts to determine the shape and size of oocyst using Eyepiece graticules, stage micrometers and recording for each positive case.

The statistical analysis

Data were collected and computed by using version 11 Statistical Package for Social Science, (SPSS). Frequencies, mean, standard deviation and chi square were the main statistical treatments made in the present study.

Results

Parasites detection

Prevalence

Frequency, percent, direct smear scraping to detected *Eimeria tenella* schizont and test tube flotation to detected *E. tenella* oocysts (Figure 1.) were used to determine the prevalence of caecal coccidiosis.

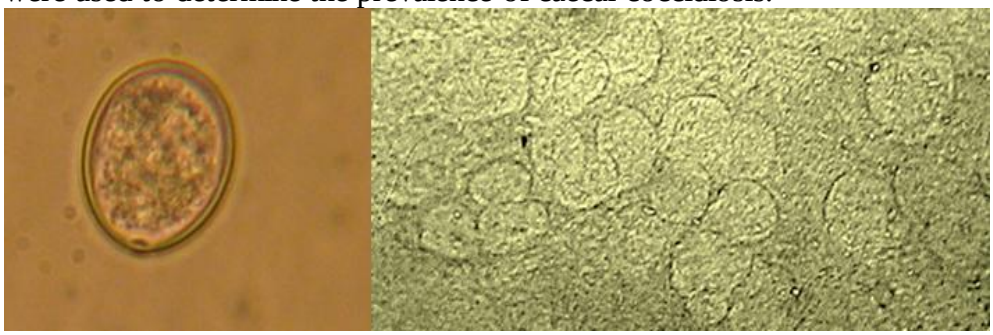

Figure 1. *E. tenella* oocyst 100 (left) x and shizonts 10 x (right)

From 390 broilers caecal samples examined, 212 (54.4%) and 129 (33.1) were infected as shown by direct smear scraping and test tube flotation respectively. In addition, clinical coccidiosis was observed in 14 broilers (3.6 %). From 39 stocks, it was found that 22 (56.4%) stocks and 17 (44.7 %) were positive by using direct smear scraping and test tube flotation respectively, while clinical coccidiosis appeared in four stocks only (10.3 %) (Figure 2.).

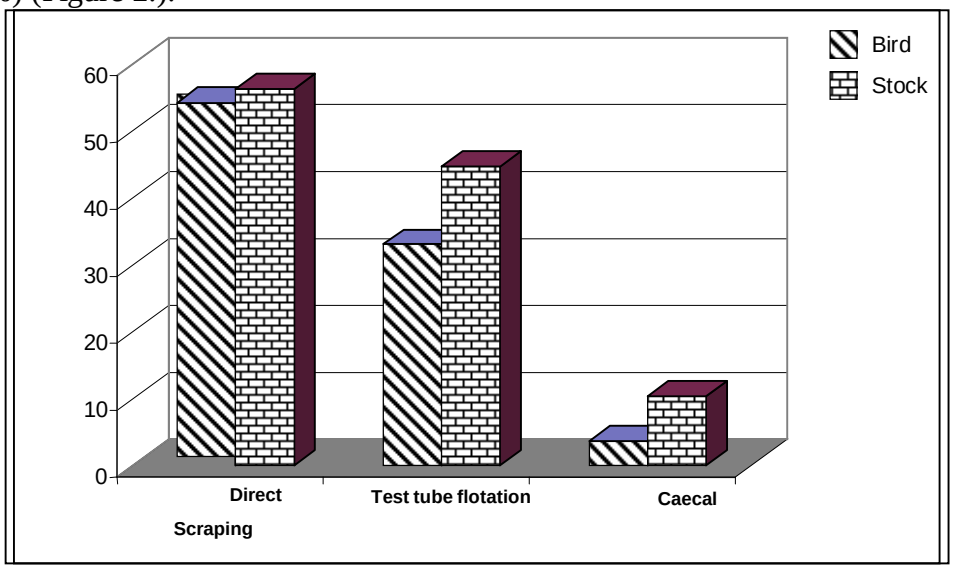

Figure 2. Prevalence using direct smear scraping, test tube flotation and clinical coccidiosis

Accumulation of blood in caecae was seen in infected birds of clinical coccidiosis (Figure 3.).

Figure 3. Clinical coccidiosis using postmortem

Differences of prevalence among Gaza governorates

Chi-square test was used to determine the differences of prevalence between Gaza governorates. Middle governorate represented the highest prevalence (80%), while in North governorate the prevalence was (66.7%), Khanyounis governorate (50%), Rafah governorate (45%) and Gaza city governorate (44.7) using direct smear scraping. North showed the highest prevalence (43%), Gaza city (42%), Middle (35%), Khanyounis (20%) and Rafah (11.7%) using test tube flotation. Clinical coccidiosis which was found in 14 birds shows that the North governorate had the highest prevalence 10 (16.7%), Gaza city governorate 3 (2%) and the Middle governorate 1 (1.7%) (Table 3.).

Table 3. Differences of prevalence among Gaza governorates

Test	Place	Infected		Not-infected		Total	Pearson Chi-Square	P-value
		Count	%	Count	%			
Direct smear scraping	North	40	66.7	20	33.3	60	27.821	0.01
	Gaza	67	44.7	83	55.3	150		
	Middle	48	80.0	12	20.0	60		
	Khan-Younis	30	50.0	30	50.0	60		
	Rafah	27	45.0	33	55.0	60		
Test tube flotation	North	26	43.3	34	56.7	60	25.407	0.01
	Gaza	63	42.0	87	58.0	150		
	Middle	21	35.0	39	65.0	60		

	Khan-Younis	12	20.0	48	80.0	60		
	Rafah	7	11.7	53	88.3	60		
Caecal core	**North**	10	16.7	50	83.3	60	35.851	0.01
	Gaza	3	2.0	147	98.0	150		
	Middle	1	1.7	59	98.3	60		
	Khan-Younis	0	0.0	60	100.0	60		
	Rafah	0	0.0	60	100.0	60		

Differences of prevalence due to weight

Chi-square test was used to determine the differences of prevalence due to weights after dividing the broilers to four groups. It was found that broiler group from 1.6 to 1.9 kg of weight showed the highest prevalence (63.9%) followed by 1.3 to 1.5 kg (62.1%) and the 1 to 1.2 kg (20%) and no prevalence in 2 kg of weight using direct smear scraping. Broiler group from 1.3 to 1.5 kg of weight showed the highest (45%) followed by 1.6 to 1.9 kg (31.1%) and the 1 to 1.2 kg (20%) and no prevalence in 2 kg of weight using test tube flotation. Clinical coccidiosis was only found in groups 1.3 to 1.5 and 1.6 to 1.9 kg with prevalence (9.3%) and (6%) respectively (Figure 4.).

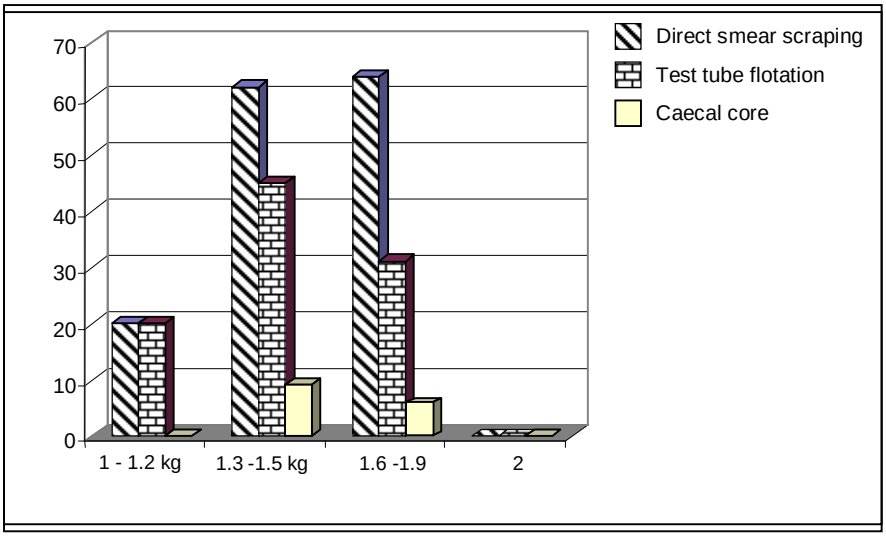

Figure 4. Differences of prevalence due to weight Differences of prevalence during collection period in Gaza strip

Occurrence of Caecal Coccidiosis Among Broilers

Chi-square test was used to determine the differences of prevalence during the collection period, where the disease was observed during the entire period of the study in Gaza strip. The prevalence was noted high in September (75 &72.5%), October (66 & 31.5%) and November (33.3 & 24. 7%) using direct smear scraping and test tube flotation respectively. Clinical disease found only in October (14 cases 7%) (Figure 5.).

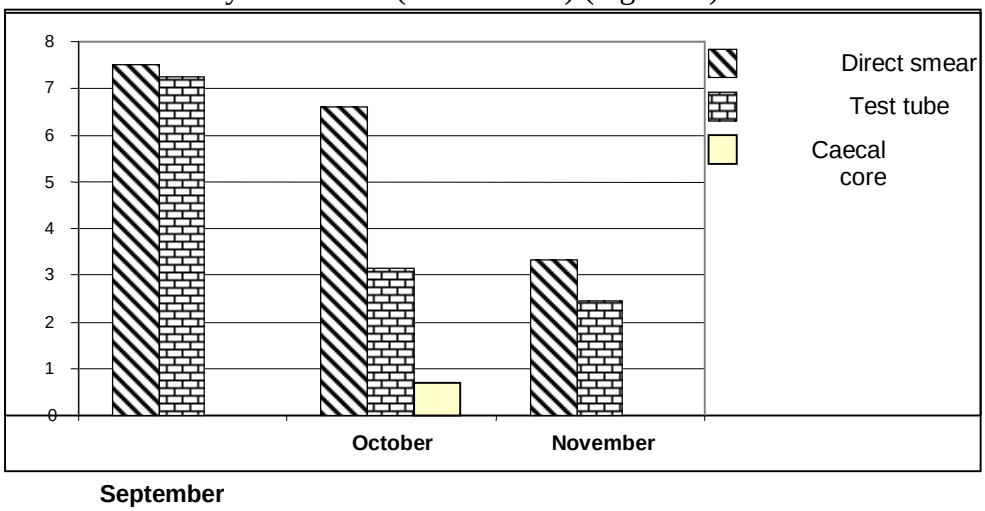

Figure: 5. Differences of prevalence during collection period in Gaza strip

***E. tenella* oocyst size**

Minimum value, maximum value, mean and standard deviation were used in identification of *E. tenella* oocysts using Eyepiece graticules, stage micrometers to determine the size of oocysts; *E. tenella* oocysts size are varied and the mean is 17.8 x 22.2 µm.

Table 4. Minimum value, maximum value, mean and standard deviation of *E. tenella* oocyst

Measurement/µm	N	Minimum	Maximum	Mean	Std. Deviation
Length	50	19.50	26.00	22.220	1.648
Width	50	16.50	21.00	17.830	1.043

Discussion

Parasite detection

Approved technique

Direct smear scraping test, is more sensitive than test tube flotation to detect sub-clinical coccidiosis because the first was used to detect the parasite stage in the caecal mucosa and the second one detects the parasite oocysts in faeces or intestinal contents. Oocyst might be absent during certain periods of the disease, the test tube flotation may give false negative results [16]. In this study, the prevalence using test tube flotation was lower than in direct smear scraping. This may be explained by the fact that the timing of inspection was not appropriate to discover the oocysts.

Prevalence in individual birds and herds

The prevalence in the present study in individual sample and in all herd as one sample was comparable (54.4%) and (56.4%) respectively which give significance of this study to determine the prevalence of the disease using both methods because the birds in same farm are homologous. Clinical disease which was recognized by caecal cores. *E. tenella*, the well-known cause of caecal or bloody coccidiosis invades the two caecae and in severe cases may also parasitize the intestine above and below the caecal junction. Only 14 cases, which were diagnosed, might be due to the marketing before this stage, which appears on the fifth to seventh day of infection.

Differences of prevalence among Gaza governorates

There was a decrease in the prevalence in the samples collected from north to south and which can be referred to early rainfall during the study period and percent of rainfall, which is more in the North which played a role in the high level of moisture which is important for oocyst sporulation [17]. The appearance of highest prevalence of clinical disease in North governorate which were 10 from 14 birds found in the study site support this hypothesis.

Differences of prevalence due to weight

The results of this study showed that the prevalence of the infection increased among the older chicks. Whose weight was 1.7 kg and age from 6–7 weeks. It was found that the prevalence increased with the weight except the weight of 2 kg which might be due to the use of medication [18]. Also, genetically different chicken lines in each study and resistant to infection can't be neglected. The Excystation of *E. tenella* sporozoites was more rapid in chicks aged 4, 5, and 6 weeks than in those 0, 1, 2, and 3 weeks [19].

This result was in agreement with a study in Northwest of Iran which recorded that the prevalence of infection was increased with the age of the

chickens, chickens with 5 weeks of age showed the highest prevalence of infection [20]. On the other hand, the result here was contradicted with a study in Saudi Arabia which recorded that the younger chicks were more susceptible to the infection than the older ones [21]. This disagreement may be due to the fact that the older chickens may develop immunity due to their exposure to subclinical infection from the contaminated environment. Or genetic difference birth/weight the chicken lines.

Moreover, birds may vary in resistance or susceptibility to infection, phenotypes which are related to immunity and probably genetically determined.

Differences of prevalence during collection period in Gaza strip

The results of this study showed that the disease was observed in all the period of the study in Gaza strip, the prevalence was highest in September because oocyst sporulation may be better in drier, rather than wetter, litter [22]. Moreover, coccidiosis generally occurs more frequently during warmer (May to September) than colder months (October to April) of the year [18].

***E. tenella* oocyst size**

Characteristics of *Eimeria* spp. were useful in the identification of species and location of parasites in tissues in the intestine, oocyst size, shape, and color. *E. tenella* is easy to be recognizing because of the characteristics of oocysts, length 19.5 to 26 and width 16.5 to 22.8. The result of this study showed that the mean of *E. tenella* oocyst size was 17.8 x 22.2 µm, (length 19.5 to 26) and width (16.5 to 21) µm. The findings are more or less similar to others [23].

It is concluded that:

In the present study, the prevalence of sub-clinical caecal coccidiosis among broilers in Gaza strip was 54.4%. There is no commitment to the withdrawal period of anticoccidial drugs among broiler farms.

Agriculture, Health, and Economy Ministries, Municipalities, Universities and Veterinarians must cooperate specially in poultry production sector by: Controlling the illegal and misuse of drugs. Proper legislation must be proposed and implemented in Gaza strip. Preventing antibiotics used for human therapy to be used for growth promotion purpose of poultry birds. Coccidiosis vaccine not available in Gaza strip; it is important to be used in both layers and broilers. Changing the strategy of poultry handling in Gaza strip by changing the poultry slaughter shops into stores of poultry meat and all slaughtering must be in central slaughterhouse and distribute the products by cooler vehicles. This step will put all poultry products under

control and inspection and will protect us from the risks of contamination through the distribution the live birds. Conducting research on the economic significance of the poultry diseases and the hazards or drugs residues in the poultry products is in need.

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