



A survey of some zoonotic diseases in cattle slaughtered at local abattoir, Behira Governorate

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ABSTRACT

The current study was carried out to estimate the prevalence of some zoonotic diseases transmitted through meat including; cysticercosis, tuberculosis and brucellosis in slaughtered bovine stock (aged >2 years) at Abo El Matameir abattoir, Behira, Egypt. A total of 1200 Serum samples collected from the slaughter stock were serologically screened for antibodies against brucellosis using Rose Bengal plate test. The same animals were examined for presence of gross lesions of tuberculosis and cysticercosis. Post mortem examination of slaughtered cattle showed a prevalence of, 1.5% (18) for cysticercosis and 1.25% (15) for tuberculosis. In these two zoonoses, a statistically significant difference in infection rates was noted between different breeds. In addition, the overall seroprevalence of animals with brucellosis antibodies were found to be 7.3% (88). The study findings suggested that brucellosis, tuberculosis and cysticercosis were prevalent in the study area therefore restrict preventive and control measures must be put into operation to avoid the zoonotic hazards.

Keywords: Survey, Zoonotic, Diseases, Cattle, Meat

1. Introduction

Infections that are naturally transmitted from vertebrate animals to humans and vice versa are classified as zoonoses (Coleman, 2002). In the livestock sector the specific sorts of farm animals are capable of carrying a broad range of zoonotic pathogens. In the beef sector, zoonotic pathogens are typically current in slaughtered stock, uncooked hides/ skin, blood, meat and the farm environments, however are often difficult to diagnose. Moreover, animals added for slaughter into city areas come from villages the place disease manipulate regimens are weak, uncoordinated and very regularly now not available. There is a in addition risk that many of the slaughtered animals added to the abattoir may be harboring chronic or sub medical infections which are hardly ever detected throughout pursuits ante-mortem examination. Most meat-borne zoonoses are received thru the consumption of infected and underneath cooked meat (Swai and Schoonman, 2009).

Bovine cysticercosis refers to the infection of cattle with metacestodes of the human tapeworm, *T. saginata* (Pawlowski and Murrell, 2001). Mature tapeworm proglottids, typically containing thousands of eggs, are commonly passed in the feces of infected individuals and, under unsanitary conditions, can lead to pasture or water contamination and the infection of cattle. Ingested eggs develop into cysticerci, which can be detected during meat inspection at the routinely inspected localization sites of the parasite, including heart, skeletal muscle, diaphragm, and esophagus (Gracey and Collins, 1992). Differences in geographical isolates of the parasite and in the breed and age of cattle have been advised as feasible factors affecting the distribution of *Cysticercus bovis* (Pawlowski and Murrell, 2001).

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TB is a chronic necrotizing bacterial infection, with wide variety of manifestations, caused by *Mycobacterium tuberculosis* complex group includes: *M. tuberculosis*, *M. bovis*, *M. africanum*, *M. microti*, and *M. canettii* (Rynyon et al. 1980). The term "tuberculosis" generally refers to the infectious disease caused by *M. tuberculosis* and *M. bovis* that cause disease in wide variety of mammals including human, domestic animals, non-human primates and certain exotic hoofed animals. *M. tuberculosis* is the primary causative agent of human tuberculosis, but may also infect animals in contact with infected humans (Michalak et al. 1998).

Brucellosis is caused by Gram-negative, small, non-motile, non-spore forming, rod-shaped (*coccobacillus*) bacteria belonging to the genus *Brucella* (Baek et al., 2003). The dairy animals e.g. sheep, goats, cattle, and camels are considered the main reservoirs of infection (Adam and Moss, 1995). In the dairy animals, uterine discharge and placenta expelled from infected animals are the main sources of transmission to humans and animals. *Brucella* centralizes in the supramammary lymph nodes which continue to excrete them in the milk (Refai, 2003). Human brucellosis is commonly an occupational disease affecting animal caretakers, cattle farmers, artificial inseminators, abattoir workers, meat inspectors and veterinarians due to conventional exposure to contaminated animals, contaminated fetal membranes, and infected materials (Wallach et al., 1994).

The above diseases are of long-standing public health concerns, and are the most widely reported in dairy and traditional cattle sectors. This study was conducted to generate epidemiological data to better understand the public health implication of zoonoses in slaughtered cattle in Abo El-Matameer Behera, Egypt.

2. Materials and Method

2.1. Study area and period:

Samples in the current study were randomly collected from Abo El Matameer abattoir, Behera Province, West Delta, Egypt during the period extended from January 2018 and December 2019. This abattoir provides the daily beef requirements of the inhabitants of Abo El Matameer and neighboring areas. It experiences tropical climatic conditions, typified by hot and humid weather throughout the year. Smallholder mixed farming dominates 80% and livestock is an integral part of the farming system.

2.2. Study population and design:

The study animals were cattle brought for slaughter. Some animals were transported to the abattoir using vehicles and others were trekked in. The study design employed in this work was an active abattoir survey.

2.3. Animal selection and data collection:

Sampled slaughter cattle (for seroprevalence estimates) were selected on two randomly selected days. After arrival to the abattoir, age, sex, breed and origin of the animals were recorded in a purposively designed recording form. The age was determined based on dentition and owner's information. In addition to the collection of abattoir data, 1200 serum samples were collected from slaughtered animals to assess the level of exposure to some of the zoonotic diseases like brucellosis.

2.4. Meat inspection protocol:

Post mortem examinations were carried out by meat inspectors using standard procedures recommended by FAO, (1994) as well as described in the meat hygiene (meat, abattoir and butcheries) regulations under laws of Egypt. Post mortem examination procedure employed visual inspection, palpation, and systematic incision of each carcass, visceral organs particularly the lung, liver, spleen, kidney, and heart and targeted disease

lesions were consistent with *Cysticercus* of *Taenia saginata* (*Cysticercus bovis*) and tuberculosis

2.5. Collection of serum samples:

Approximately 10 mL of blood was collected from the jugular vein of each selected animal using a plain vacutainer tube (Becton Dickson, UK). Each sample was labelled using codes describing the specific animal and owner. The tube was set tilted on a table over night at a room temperature to allow clotting. Next morning, the clotted blood in the tubes was centrifuged at 3000 g for 20 minutes to obtain clear serum. The obtained serum was stored at -20 °C until tested by Rose Bengal plate test (RBPT).

2.6. Rose Bengal plate test:

All sera samples were screened using RBPT antigen (VLA Weybridge, UK). The test procedure recommended by Alton et al., (1988) was followed. Briefly, 30 µL of RBPT antigen and 30 µL of the test serum were placed alongside each other on the plate, and then mixed thoroughly. The plate was shaken for 4 minutes and the degree of agglutination reaction was recorded. The sample was classified positive if any agglutination was observed and negative if no agglutination.

2.7. Data analysis:

Statistical analysis was carried out using Chi2 test for study the prevalences of certain parameters among different studied tests, sex, age and breed according to SAS, (2004).

3. Results and Discussion

Lack of recognition of meat-borne zoonoses can put the lives of farm animals' producers, abattoir people and the standard public at threat from infection. Considering that most outdoor slaughter slabs and abattoirs are now not effectively regulated and given that there is a higher level of contact with raw meat, it can be argued that there is an even larger danger of meat-borne zoonoses in this type of facility.

Therefore, it is critical that cattle owners and butchers are made aware of the dangers posed by way of meat-borne zoonoses that are standard in their areas. The statistics furnished additionally give an explanation for how zoonoses are transmitted in order to allow these at danger to make informed choices as to how they would possibly satisfactory shield themselves (Muchaal, 2001 and van der Merwe et al., 2009).

The recorded data in Table (1) showed that the overall prevalences of the studied diseases were 1.5, 1.25 and 7.33% for cysticercosis, tuberculosis and brucellosis, respectively.

The overall *Cysticercus bovis* prevalence of 1.5% obtained in this study was higher than the reports from the retrospective study of Mellau et al., (2011) who recorded a prevalence of 0.05%. Slaughter inspection for *Cysticercus bovis*, based on 'eye and knife' meat inspection, finds at most between 10% and 20% of the cases if proper inspection is done. It is likely that the reported cases were significantly under-reported, as all predilection sites are not always properly inspected.

Humans are the definite hosts for *Taenia saginata* whose faeces can contaminate cow pastures. People, especially in villages often do not use proper latrines to defecate. Under these circumstances, just one human can be a source of infection for hundreds of cattle. Humans acquire *Taenia saginata* taeniasis by consuming raw or undercooked meat containing cysticerci.

The effect of sex on the prevalence of cysticercosis in slaughtered cattle was illustrated in Table (1). It was found that there was a higher prevalence in females (1.8%) compared to that of males (1.4%) with significant statistical difference between the prevalences.

The effect of age groups on the prevalence of cysticercosis in slaughtered cattle was recorded in Table (2). It was found that there was a higher prevalence in the age group >2 - <5 years (1.7%) followed by the age group ≥10 years (1.6%) and lastly the age group 5 - <10 years (0.9%) with non-significant statistical difference between the prevalences among different age group.

Finally, the effect of breed difference on the prevalence of cysticercosis in slaughtered cattle was tabulated in Table (3). It was evident that there was a higher prevalence in hybrid cattle (1.57%) compared to that of native cattle (1.12%) with non-significant statistical difference between the prevalences.

Tuberculosis remains one of the most prevalent and devastating zoonotic diseases in spite of the great strides made in its control and extirpation. TB is important zoonoses that causes disease in domestic animals as well as infects human and it is of well-known veterinary importance as it may

cause economic losses due to condemnation of positive reactor cattle and an increasing human health problem with reported cases every year.

Concerning tuberculosis, only 1.25% of the carcasses slaughtered cattle showed macroscopic lesions suggestive of tuberculosis. Most of the lesions were of the pulmonary form. The overall detected prevalence of infection in the cattle was nearly similar to that recorded by El Sabban (1992) (1.2 %) and Shirima et al. (2003) (1.3 %), while it was generally lower than observed in other studies e.g. Abd El-Ghany (1996) (33.2 %), Omer et al. (2001) (14.5 %), Kazwala et al. (2001) (13.2 %), Oloya et al. (2007) (46.6%), Ahmed (2008) (30%) and Munyeme et al. (2008) (49.8%). On the other hand, the recorded prevalence in the present study was higher than that recorded by Jiwa et al. (1997) (0.2 %).

It is also possible that a proportion of animals with tuberculous lesions are not detected during the normal routine meat inspection. Shirima et al. (2003) reported more carcasses were found with tuberculous lesions by applying a more intensive inspection procedure which involved multiple slicing and close examinations of selected lymph nodes. Cattle showed tuberculous lesions at slaughter confirmed the presence of tuberculosis in cattle in the study area.

The effect of sex on the prevalence of tuberculosis in slaughtered cattle was illustrated in Table (1). Also, it was found that there was a higher prevalence in females (2.4%) compared to that of males (0.8%) with significant statistical difference between the prevalences.

The effect of age groups on the prevalence of tuberculosis in slaughtered cattle was recorded in Table (2). It was found that there was a higher prevalence in the age group ≥10 years (3.7%) followed by the age group >2 - <5 years (0.9%) and lastly the age group 5 - <10 years (0.6%) with significant statistical difference between the prevalences among different age group. The recorded result agreed with Whiting and Tessaro (1994) who stated that the incidence of tuberculosis increased with increasing age of cattle, while it disagreed with that of Mansy, (1998) and Nossair, (2009) who recorded higher prevalence in the age group 1-5 years.

Finally, the effect of breed difference on the prevalence of tuberculosis in slaughtered cattle was tabulated in Table (3). It was evident that there was a higher prevalence in native cattle (2.24%) compared to that of hybrid cattle (11.07%) with significant statistical difference between the prevalences. This variation in prevalence may be due to lower number of examined native cattle (n=178) compared to higher number of hybrid cattle (n=1022). This finding disagreed with that of Abd El-Ghany (1996), Kazwala et al. (2001), Ameni et al. (2007), Inangolet et al. (2008) and Nossair, (2009) who recorded higher prevalence in hybrid cattle than in native cattle that may be attributed to increased susceptibility of hybrid cattle.

Each year half a million cases of brucellosis are reported worldwide but according to WHO, these numbers are greatly underestimated. Even so, brucellosis is distributed throughout the world wherever livestock is being raised. Although many countries have eradication strategies for counteracting brucellosis, economic losses can be enormous due to infertility, abortion, and subsequent culling so herds should be monitored for the presence of brucellosis. Despite eradication plans, including testing and slaughter, vaccination of the reminder herds, brucellosis remains a major risk worldwide (Baek et al., 2003)

The overall seroprevalence of brucellosis in slaughtered cattle in the current study by RBPT was 7.33 %. This result was nearly similar to that recorded by Muma et al., (2012) (6.0 %) and Assenga et al., (2015) (6.8%). On the other hand, it was higher than that recorded by Awah-Ndukum et al., (2018) (3.4%) and Salama, (2019) (1.44%). On contrary, it was lower than that recorded by Abdalla and Hamid, (2012) (19.7%), Ghoneim et al., (2014) (18.5%), Madut et al., (2018) (31 %) and Ramadan et al., (2019) (8.36%). The variation in the prevalence of brucellosis in cattle may be due to animal population, vaccination status, susceptibility, and the hygienic measures applied in each locality.

Sex-based seroprevalence of brucellosis in cattle was recorded in Table (1). It revealed that the prevalence of brucellosis was 19.5 and 2.7% in females and males, respectively. Chi-square analysis of the obtained result showed a significant relationship between sex and the prevalence of brucellosis in cattle. This result agreed with Assenga et al., (2015), Rahman et al., (2011) and Madut et al., (2018) who found a significantly higher seroprevalence in female than in male cattle. On contrary, it disagreed with that of Ashenafi et al., (2007) and Gul et al., (2014) who

found that sex-related seroprevalence of brucellosis in cattle was non-significant.

Age-based seroprevalence of brucellosis in was tabulated in Table (2). It clarified that the highest seroprevalence was observed in the age group (≥ 10 years) (12.9%) followed by the age group (5 - <10 years) (11.4%) and lastly, the age group (>2 - <5) (3.5%). Statistical analysis showed significant association between age and the prevalence of brucellosis in cattle. This agreed with Muma et al., (2012), Assenga et al., (2015) and Salama, (2019) who found that there was a statistically significant difference in seroprevalence between adult and young cattle.

Finally, the effect of breed difference on the prevalence of brucellosis in slaughtered cattle was tabulated in Table (3). It was evident that there was non-significant statistical difference between the prevalences of hybrid and native cattle.

Relatively higher *Brucella* seroprevalence in slaughtered cattle coupled with sub-standard slaughter premises and negligence in safety precaution during meat inspection can be potent sources of diseases transmission and persistence. This implies greater occupational hazard to butchers and abattoir attendants. These occupational groups are exposed to materials such blood, vaginal discharges, foetus, urine, placentas from infected animals. They are therefore at a higher risk of acquiring infection through broken skin and aerosol (Cadmus et al., 2010).

The apparent high spectrum of zoonotic diseases investigated and detected in this study is of epidemiological and public health significance. Apart from its veterinary and economic importance throughout the world, bovine tuberculosis, brucellosis, cystercercosis are listed and classified by WHO as the zoonoses of world concern (WHO, 2005).

4. Conclusion:

The finding of this study clarified that abattoir and sero-surveys are known to provide valuable disease information, a key component toward designing disease monitoring, control and eradication programmes. Finally, it was concluded that the unhygienic conditions of slaughter slabs and the presence of zoonotic diseases pose a health risk to both meat consumers and the general public. This suggests a want for instantaneous abattoir or slaughter slab sanitary measures, legislation enforcement and a rigorous meat inspection system in order to reduce publicity and to reduce the associated public health risks.

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Table (1): Prevalence of cysticercosis, tuberculosis and brucellosis in slaughtered cattle in relation to sex

Sex	No. of samples	Cysticercosis		Tuberculosis		Brucellosis	
		Positive	%	Positive	%	Positive	%
Males	867	12	1.4	7	0.8	23	2.7
Females	333	6	1.8	8	2.4	65	19.5
Total	1200	18	1.5	15	1.25	88	7.33
Chi ²		6.25**		5.55**		7.25**	

Significant at P<0.01

Table (2): Prevalence of cysticercosis, tuberculosis and brucellosis in slaughtered cattle in relation to age groups

Age groups (years)	No. of samples	Cysticercosis		Tuberculosis		Brucellosis	
		Positive	%	Positive	%	Positive	%
>2 - <5	659	11	1.7	4	0.6	23	3.5
5 - <10	325	3	0.9	3	0.9	37	11.4
≥10	216	4	1.6	8	3.7	28	12.9
Total	1200	18	1.5	15	1.25	88	7.33
Chi ²		3.25 NS		12.44**		8.99*	

**Significant at P<0.01

NS non-significant

Table (3): Prevalence of cysticercosis, tuberculosis and brucellosis in slaughtered cattle in relation to breed

Breed	No. of samples	Cysticercosis		Tuberculosis		Brucellosis	
		Positive	%	Positive	%	Positive	%
Native	178	2	1.12	4	2.24	13	7.30
Hybrid	1022	16	1.57	11	1.07	75	7.33
Total	1200	18	1.5	15	1.25	88	7.33
Chi ²		0.49 NS		4.55**		1.55NS	

**Significant at P<0.01

NS non-significant