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A Study on Pathological and Microbiological Conditions in Goats in Slaughterhouses in Jordan

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Abstract: During the period between January 2003 and May 2006, 1432 carcasses of slaughtered goats were examined for the presence of any pathological condition and their incidence. The most prevalent problems were gastrointestinal parasitism (45%), caseous lymphadenitis (19%), *Oestrus ovis* (8.1%), liver abscesses (19%), hydatid cysts (11%), mange due to *Sarcoptes* sp. and *Psoroptes* sp. (28.5%) and accumulation of plastic foreign bodies in the rumen (14.8%). Bacterial pneumonia were detected in (6.6%) while verminous pneumonia in 4.7% of slaughtered goats. This study suggested that internal parasitism is the most prevalent pathological condition seen in goat slaughterhouses in Jordan despite the rigorous parasite control practiced by farmers. Both caseous lymphadenitis and liver abscesses are of major important conditions.

Key words: Diseases, goat, slaughter houses, Jordan

INTRODUCTION

Abattoir, or slaughterhouse, surveillance has been an important component of infectious diseases control and eradication programs worldwide. In addition, slaughterhouse inspection is an extremely useful tool to monitor disease incidence rates and to confirm diagnosis of suspected diseases.

As a member of the developing countries, Jordan suffers from many infectious diseases that affect the small ruminant livestock. The most prevalent of those infectious diseases are: brucellosis, foot and mouth disease, peste des petite ruminants, enterotoxemia, caseous lymphadenitis and internal parasitism. The epidemiology of some of those infectious diseases has been studied in Jordan and risk factors associated with high prevalence have been elucidated. However, all these studies concentrated on investigating the seroprevalence on live animals which may not reflect the actual pathological picture of diseases.

The most likely diseases to disrupt growth in small ruminants are pneumonia (Ackermann and Brogdon, 2000), viral/bacterial enteritis and gastrointestinal parasitism (Thomas *et al.*, 2002). In some occasions, ruminants are pushed on concentrate feeds, which increases the risk for rumen acidosis (Van Metre *et al.*, 2000), enterotoxaemia (Uzal *et al.*, 1998) and liver abscesses (Rosa *et al.*, 1989; Al-Qudah and Al-Majali, 2003). Conditions which could cause condemnation of small ruminant carcasses at slaughterhouses, such as caseous lymphadenitis, are very common in Jordan (Al-Rawashdeh and Al-Qudah, 2000). Intramuscular injection of drugs and vaccines causes some muscular inflammation and cellulitis (Radostitis *et al.*, 2000), which might lead to total or partial carcass condemnation. Slaughterhouse inspection as a diagnostic tool for food animal diseases can provide information on the efficacy of parasite control measures, the presence of subclinical pneumonia, the efficacy of vaccination programs and the occurrence of injection site abscesses, superficial and visceral caseous lymphadenitis and hydatid disease.

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Slaughterhouse surveys in Jordan are few and the published literature concentrated entirely on parasitic diseases (Abo-Shehada and Abo-Farieha, 1994; Al-Yaman *et al.*, 1985; Kamhawi *et al.*, 1995; Abo-Shehada *et al.*, 2003; Maraqa *et al.*, 2005). The objective of this study is to provide more detailed information about the endemic goat diseases seen in main slaughterhouses in Jordan.

MATERIALS AND METHODS

Four major slaughterhouses in Jordan were visited during the period between January 2003 and May 2006. A total of 1432 carcasses of goats were examined. Data were collected on the pathological conditions found in slaughtered goats. Ages of these slaughtered goats ranged from 10 months to 9 years, 1131 (79%) males and 301 (21%) females. The post-mortem examination was done by visual observation of all exposed surfaces and palpation of the superficial inguinal, precrucal, prescapular, lumbar, iliac and popliteal lymph nodes. In addition, a thorough examination for the abdominal and thoracic organs was performed, including palpation of the lungs, heart, liver and their related lymph nodes. Incisions of affected organs (liver, lung, intestine and lymph nodes) were done. The number and type of pathological conditions observed during examination of carcasses were recorded. Specimens from affected organs were collected and placed in sterile plastic containers and shipped to the laboratory on ice for bacterial culturing. Identification of aerobic and anaerobic bacterial isolates was done using standard procedures (Lennette *et al.*, 1985). Fecal samples and adult worms were also submitted to laboratory for parasitic identification using the concentration technique to concentrate worm eggs or larvae from the feces, which include direct smear, flotation and fecal sedimentation. Parasites were identified to the genus level according to standard procedures (Thienpoint *et al.*, 1986). Direct skin examination and scraping to identify psoroptic and sarcoptic mange was performed using the digestion-concentration technique by adding five per cent of potassium hydroxide and saturated sucrose solution to recover mites that cause epidermal hyperplasia (Coles, 1986). *Trichophyton verrucosum* as a cause of ringworm was diagnosed by direct microscopic examination of hair and keratin using a 20% of potassium hydroxide (Scot, 1988). Mammary glands in slaughtered females (n = 301) were examined directly and palpated to detect any physical changes in the udder.

RESULTS

A total of 416 (29%) goats were affected. Table 1 represents the disease conditions and their incidence percentage. The most common disease conditions were internal parasitism (Trichostrongylosis, Haemonchosis, Dictyocaulus filarial, Echinococcosis, Coccidiosis). In about 67.6% of the examined carcasses multiple parasite species were found.

Caseous lymphadenitis was detected in 19% of slaughtered goats. *Oestrus ovis* was present in 8.1% of examined carcasses and liver abscesses were detected in 19% of livers examined. *Fusebacterium necrophorum*, *Clostridium perfringens*, *Escherichia coli* and *Arcanobacterium pyogenes* were the major bacterial isolates from abnormal livers. Bacterial pneumonia was detected in 6.6% of the examined goats. Among the most important isolated bacteria from the pneumonic lungs were: *Pasturella* sp. (n = 29), *Corynebacterium pseudotuberculosis* (n = 34), *F. necrophorum* (n = 14), *Staphylococcus* sp. (n = 8), *Clostridium* sp. (n = 4), mixed bacterial infection (n = 23). Hydated cysts due to *Echinococcus granulosus* were detected in 11% of the examined lung tissues. Mange due to *Sarcoptes scabiei* was detected in 28.5% of the 43 goats scraped; affected animals showed alopecia with some secondary bacterial contamination. Plastic foreign bodies were seen in 14.8% of examined ruminants. Seventeen females (5.6%) suffered from different lesions in their mammary glands such as hardness of the udder due to fibrosis resulted from chronic mastitis. Staphylococcal impetigo was seen in 5 cases as a numerous pustules on teats and udder. Other diseases observed included, arthritis, pink

eye, goiter, foot rot, orchitis and papillomatosis. Out of the 203 organs infected with different disease conditions, 80.7% whole organs were condemned while 19.3% portions were salvaged. Four whole carcasses were condemned because of generalized caseous lymphadenitis. The results of bacterial cultures and parasite examination are shown in Table 2 and 3, respectively.

Table 1: Disease conditions observed in (1432) slaughtered goats in Jordan

Diseases condition	Prevalence (%)
Caseous lymphadenitis	19.0
Mastitis	5.6
Pneumonia	6.6
Gastrointestinal parasites	45.0
Dictyocaulus filarial	4.7
Hydatidosis	11.0
Oestrus ovis	8.1
Mange (n = 43)*	
<i>Sarcoptic</i> sp. (n = 9)	
<i>Psoroptes</i> sp. (n = 3)	28.5*
Liver abscess	19.0
Rumenitis	1.6
Orchitis	0.2
Ringworm	1.2
Foot rot	1.2
Enteritis (Coccidiosis)	1.6
Papillomas	0.2
Arthritis	0.6
Pinkeye	0.3
Goiter	0.5
Contagious ecthyma	1.4
Foetal wastage	2.7
Plastic foreign bodies	14.8
Cellulites (sight of intramuscular injection)	3.5

*: Percentage calculated out of (43) the scraped suspected cases. Twelve animals were confirmed, 9 cases of *Sarcoptic* sp. and 3 cases of *Psoroptes* sp.

Table 2: Bacteria cultured from condemned organs of slaughtered goats in Jordan

Type of bacteria	Organ
<i>Corynebacterium pseudotuberculosis</i>	L. N., lung
<i>Staphylococcus aureus</i>	Udder, lung
<i>F. necrophorum</i>	Liver, lung
<i>Clostridium perfringens</i>	Lung, liver
<i>E. coli</i>	Intestine, liver
<i>Bacillus</i> sp.	Udder, liver intestine
<i>Pasturella</i> sp.	Lung
<i>Arcanobacterium pyogenes</i>	Liver
<i>Brucella melitensis</i>	Intestine
<i>Salmonella</i> sp.	Intestine, liver
<i>Eubacterium</i> sp.	Intestine, liver

Table 3: Parasites identified from condemned organs of slaughtered goats in Jordan

Type of parasite	Organ
Gastro intestinal tract parasites	
<i>Trichostrongylus</i> sp.	Small intestine, abomasum
<i>Haemonchus contractus</i>	Abomasum
<i>Moniezia expansa</i>	Small intestine
<i>Chabertia ovine</i>	Large intestine
<i>Cooperia curticei</i>	Small intestine
<i>Marshallagia marshalli</i>	Abomasum, small intestine
<i>Emeria</i> sp.	Large intestine
Respiratory tract parasites	
<i>Dictyocaulus filarial</i>	Lung, bronchi
<i>Oestrus ovis</i>	Nasal cavity, sinuses
External parasites	
<i>Psoroptes capri</i>	Ears
<i>Sarcoptes scabiei</i>	Head

DISCUSSION

The prevalence of gastrointestinal parasites reported in this study was higher than that observed by Abo-Shehada and Abo-Farieha (1994) and markedly different from those reported in Greece (Theodoropoulos *et al.*, 2002). Similar species of gastrointestinal parasites have been reported in Egypt (Michael *et al.*, 1979), Turkey (Umur and Yukari, 2005), Iraq (Altaif, 1979) and Saudi Arabia (El-Azazy, 1995). Previous reports suggested that presence of gastrointestinal parasites and the body condition of slaughtered animals were very much correlated (Altaif, 1979; El-Azazy, 1995).

High prevalence of caseous lymphadenitis was reported in this study. Similar findings were reported in sheep based on serological investigation (Al-Rawashdeh and Al-Qudah, 2000). The majority of lesions were confined to superficial lymph nodes. Lesions in internal lymph nodes were seen only in 5% of the examined cases, which agrees with previous studies (Hein and Cargill, 1981). Few cases of infected goats were severely emaciated with ruptured abscessed lymph nodes mainly located in the neck and shoulder regions.

Pneumonic lesions were detected in cold season during December to early March; these lesions were variable in the extent but mostly were multifocal in distribution involving both lungs. Pulmonary hydatid cyst involvement was seen in 11% of examined goats, these results are higher than what has been previously reported (Al-Yaman *et al.*, 1985; Kamhawi *et al.*, 1995). Several cases of pulmonary congestion, emphysema and atelectasis were also seen. Verminous pneumonia was detected (n = 68) in goats, where the *Dictyocaulus filaria* lungworms occluded the air passages of the affected animals. A previous study in Jordan showed that 3.8% of slaughtered local sheep were affected with *Dictyocaulus filarial* (Maraqa *et al.*, 2005). In this study, the incidence of *Dictyocaulus filarial* was slightly higher (4.7%). However, Dhar and Sharma (1987), believes that goats are more susceptible to lung worm infestation than sheep.

The main risk factor that has been associated with the high prevalence of liver abscesses in ruminants is grain overload, which is a very common problem in Jordan due to lack of pasture (Al-Qudah and Al-Majali, 2003). The grain overload will cause steep reduction in the rumen pH leading to ruminal acidosis and atony and damage to the rumen wall which will allow some of ruminal bacteria to reach the portal vein and eventually to the liver causing abscesses (Radostitis *et al.*, 2000). This study shows higher incidence rate of liver abscessation compared to what have been reported in other Middle Eastern countries (Johnson *et al.*, 1999; Tadayon *et al.*, 1980). It is clear that lack of pasture due to lack of water is behind the high prevalence of liver abscesses, since grain feeding is more practice in Jordan to compensate the lack of green feed.

Presence of foreign bodies in the rumen, especially plastic, had been investigated previously in Jordan and the incidence rate was reported to be 11% (Hailat *et al.*, 1998). Rations with low minerals and vitamins are believed to be correlated with presence of plastic foraging bodies in the rumen (Hailat *et al.*, 1998).

The prevalence of *Oestrus ovis* infestation in Jordan was lower (8.1%) in our study than what has been reported previously (Abo-Shehada *et al.*, 2003).

Cellulites and muscular abscesses resulted from intramuscular injections of drugs were reported in 3.6% (n = 51) slaughtered goats indicating poor management. Subcutaneous injection is preferred to avoid the occurrence of injection site abscesses (Smith and Sherman, 1994).

Two bucks with swelling of the testes were tested for brucellosis using rapid slide agglutination test and were found positive. The epidemiology of brucellosis in goats in Jordan was studied by Al-Majali (2005) and the prevalence was found to be 27.7%. Regular screening of bucks for brucellosis is a crucial step in any successful *Brucella* control program.

Foot rot was diagnosed in (1.2%) of slaughtered goats, it appears as interdigital necrosis and longitudinal fissures with some purulent foul-smelling discharges. It is well known that *Bacteroides nodosus* is responsible for this disease (Claxton and O'Grady, 1986).

Eimeria sp. was detected in goats with signs of congestion and hemorrhage by examining their feces for the presence of oocyst. Several *Eimeria* sp. were identified in Jordan including *E. arloingi*, *E. ninakohalyakimovae* and *E. christenseni* (Abo-Shehada *et al.*, 2003).

It is worth mentioning that few of the disease findings are diseases that have zoonotic implications such as brucellosis. *Brucella* present danger, not only to consumers, but also to slaughterhouse workers (Al-Majali, 2005). Other zoonotic potentials are carcasses and organs contaminated with foodborne pathogens, such as *Escherchia coli*. Typing and characterization of such bacteria is essential to determine the risk presented to meat consumers.

In conclusion, results of this study shed lights on the most important slaughterhouse disease findings in Jordan. In addition, the findings of this study should be used during the yearly evaluation of the country disease control strategies.

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