



## Some Udder Problems Associated with Productivity in Goats

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**T**HE AIM of this article was study the mastitis of a goat under farmer Egyptian conditions. This work was conducted on a private farm containing 50 goats suffering from symptoms of mastitis. All environmental factors were recorded as housing condition, breeding, health problems, production and feeding. Morphological examination of the udder were carried out. Milk samples of infected goats, were collected for bacterial isolation and sensitivity test. Animals were treated with systemic and local intramammary broad spectrum antibiotic. The results indicated that, 35 cases (70 %) were responded to treatment, and showed normal reproductive and productive performances. 15 cases (30 %) of chronic mastitis do not respond to treatment and breeding. Post-mortem examination of these cases revealed widespread diffused chronic mastitis throughout the affected udder. Tissue specimens of infected udder and supra mammary lymph node were fixed in 10% formalin for histopathological examination. Bacteriological examination revealed isolation of *Staph aureus*, *Corynebacterium pyogenes*, *Salmonella* spp., *E coli* in a single or mixed with other bacteria as *Pasteurella* spp. Fungus suspect *Aspergillus* spp. infection and yeast, suspect *Candida* spp. Pathological examination revealed chronic diffused suppurative and chronic granulomatous mycotic mastitis.

In conclusion, mastitis is an important disease of goats and prevention of infection is the key for disease control. Good environmental and hygienic housing of milking practices are a necessity to minimize the impact of this disease.

**Keywords:** Mastitis, Goat, Fertility and Productivity.

### Introduction

Goats are widely distributed in tropical areas and used primarily for meat production, but also in some regions for milk, fiber and hide production. The world production of goat's milk is around 18.4 million tons per year contributing 2% of total milk production [1]. Goat's milk is superior in quality compared with milk of other domestic species, and the consumption has increased considerably due to its nutritional properties. Goat's milk has a higher content of proteins, minerals and vitamin A, and its smaller fat globules, facilitating the digestion process. It also has lower lactose content and can be consumed by people who are

lactose intolerant or have allergies to milk of other species [2].

Mastitis is an "economic, hygienic, and legal" problem for producers. Although the incidence of small ruminant clinical mastitis typically is less than 5% per year, the problem in herds may have rates of 30% to 50%. Mastitis is still a main topic in veterinary research due to financial losses and food safety concerns over antimicrobial uses. Mastitis is considered important problem for the farmer because of its complex etiology [3]. Bacteria and fungi are believed to be the major cause of mastitis in goats. The incidence of mycotic mastitis appears to be increased, because

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of contamination of animal ration as well as the extensive indiscriminate use of antibiotics. Mastitis occur during lactation either postpartum period or pseudo pregnancy [4]. Mastitis may be localized within a single gland, or a diffuse inflammation in one or more mammary glands. Moreover, mastitis in goat often persists through the lactation and dry periods, and re-infection is common. Self-cure rates for subclinical mastitis during the dry period are 35% to 67% in the ewe and 20% to 60% in the doe [5].

In addition to easy detection of clinical mastitis, early diagnosis of subclinical mastitis, where an increased somatic cells count (SCC) is the only finding [6]. Mastitis is classified, into infectious or non-infectious. Mastitis is a response to the occurrence of infection accompanied by injury of the udder [7]. The pathogenesis of mastitis includes an inflammatory reaction resulting in response to intra-inflammatory infections by microorganisms. Once the mammary gland is affected by pathogens, the innate immune system responds by leucocytes infiltration and production of cytokines at the site of infection [8].

The bacteria that are known to cause mastitis in cows, sheep and goats include *Streptococcus* sp., *Staphylococcus* spp., *Mycoplasma* spp., *Pseudomonas* spp., and coliforms, such as *E. coli* [9]. Retroviruses such as caprine arthritis encephalitis virus (CAE) and ovine progressive pneumonia (OPP) can also cause mastitis in goats [10]. Acute inflammation is characterized by local clinical signs, which may be accompanied by systemic signs. The prevalence of subclinical mastitis in dairy goats ranges between 5 and 30% [9], with Coagulase-Negative Staphs (CNS) being the most prevalent isolates [11,9]. *Staphylococcus aureus* also commonly isolated with its prevalence is lower than that of CNS in the majority of studies [9]. However, *Staphylococcus aureus* appears to induce a higher SCC than most of the CNS species [12] and is considered a major pathogen in goats. Over 100 different micro-organisms can cause mastitis, in particular coliform bacteria, staphylococci and streptococci [13, 14]. Mastitis in does may be acute, subclinical, or chronic [4]. Acute mastitis usually results in abnormal appearance and composition of milk, heat, pain, and swelling in the mammary gland with systemic signs like fever, anorexia as well as altered milk secretion from affected halves. Abnormal secretion in the form of clots, flakes, or watery milk is the clinical sign that most consistently observed. In goats, the

primary causative organisms are *Staphylococcus epidermidis*'s and other coagulase-negative *Staphylococcus* species [9]. The relationship between mastitis and low infertility of goats was detected. Subclinical mastitis disrupts the functioning of the pre ovulatory follicle [15]. A major cause of this disruption is delayed ovulation associated with low follicular steroid production in about one-third of subclinical mastitis; the remaining two-thirds respond normally. During the postovulatory period, mastitis infections may influence the embryo or uterus. One component normally elevated in animals infected by gram-negative pathogens is PGF2 $\alpha$  [16]. An increased sensitivity of the uterus to release of PGF2  $\alpha$  in mastitis during the luteal phase of the estrous cycle and hypothesized that prostaglandins may decrease reproductive efficiency by decreasing luteal life span or by decreasing embryo quality and development [17].

Mastitis also disrupts the developmental competence of the ovarian pool of oocytes at the germinal vesicle stage. Therefore, controlling reproduction of goats is necessary to group kidding over a limited period of time and also to facilitate nutrition adjustments in relation to the physiological stage and lactation needs of batches of animals [18].

An increase in the incidence of mastitis in an animal herd results in increased use of antimicrobials, which in turn increases the potential for antibiotic residues in milk and bacterial resistance to antimicrobials which affected human health and economic loss. Sostudies concern the incidence of mastitis in correlations to productive patterns in goats suffering from mastitis is needed. Therefore, the present study was planned to throw a light on mastitis in goat's farm in relation to goat production.

## **Materials and Methods**

### *Animal and farm report*

A dairy goat herd was studied in a private farm at middle of delta, Egypt. The total number of 50 female baladi breed goats suffering from symptoms of mastitis was recorded. All environmental and hygienic conditions of the farm was examined specially housing, health, vaccination problems, production patterns, and feeding (concentrate feed mixture was of fered 3% from body weight while Berssem fed *ad lib* Table-1). The clinical signs of mastitis in goats was reported with morphological examinations of udder.

*Bacteriological analysis*

In the present study, 100 milk samples were collected from 50 goats suffering from symptoms of mastitis. The collected milk samples from affected quarters were cultured for antimicrobial sensitivity examination by using standard procedure at NRC LAB. Bacteriological isolation and identification using standard procedures [19]. Mycotic examination and identification was carried [20].

The animals were treated with systemic and local intramammary broad spectrum antibiotic according to sensitivity tests results, 35 cases (70 %) were respond to treatment, while, 22 treated does from 35 treated goats showed normal productive performances as confirmed from farm records (Table 2). Only 15 cases (30 %) do not respond to treatment and showed chronic mastitis. The owner of the farm decided to slaughter these group of animals. The morphological examinations of the infected udders in chronic mastitis were reported.

*Histopathological examination*

Post-mortem examination of goats suffering from chronic mastitis revealed, widespread of

chronic suppurative and granulomatous lesions throughout the affected udder glands. Specimens from infected mammary parenchyma and lymph nodes were routinely processed, embedded in paraffin wax, sectioned at 4-5 micron thickness, and stained with Hematoxylin & Eosin (H&E), Gomori Methenamine Silver stain (GMS) and Periodic Acid Schiff (PAS) were used as special stains for yeast and fungi [21].

**Results**

From our observations, the ventilation of the farm was bad and there is no specific clean area for pregnant goats. Also no vaccination programs was carried out in the farm, however the animals in the area of Nobarria was suffering from selenium and vitamine E and Iodine deficiency (unpublished data).

The concentrate feed mixture (CFM) of the farm was reported in Table 1 and Table 2 showed some productive patterns of mastitis treated goats as birth weight, weaning weight, sex and twins production.

**TABLE 1. Chemical analysis (as it is) of Berseem and concentrate feed mixture (CFM) fed to goats.**

Item	Fresh Berseem	Concentrate feed mixture (CFM)
Moisture	84.89	9.05
Organic matter (OM)	13.52	83.50
Crude protein (CP)	2.07	15.41
Crude fiber (CF)	4.38	5.61
Ether extract (EE)	0.29	2.97
Nitrogen free extract (NFE)	6.78	59.51
Ash	1.59	7.45
<i>Cell wall constituents</i>		
Neutral detergent fiber (NDF)	5.24	32.9
Acid detergent fiber (ADF)	3.08	22.38
Acid detergent lignin (ADL)	0.44	3.17
Hemicellulose*	2.16	10.53
Cellulose**	2.64	19.21
Non fibrous carbohydrates (NFC)	5.92	32.21
Gross energy (kcal/kg DM)	607	3853
Digestible energy (kccal/kg DM)	461.5	2928
<i>Nutritive values (%)</i>		
Total digestible nutrients (TDN)	10.42	66.09
Digestible crude protein (DCP)	0.74	10.60

\*Hemicellulose = NDF – ADF

\*\* Cellulose= ADF – ADL.

NFC= 100 – {CP + EE + Ash + NDF} .

Gross energy (kcal/kg DM)). Each g CP = 5.65 kcal, g EE = 9.40 kcal and g (CF & NFE) = 4.15 kcal.

DE (Kcal/ kg DM) = GE x 0.76

TDN % = DE / 44.3

DCP % = 0.85 X<sub>1</sub> – 2.5. , where X<sub>1</sub> = CP% on DM basis.

TABLE 2. Some productive patterns of mastitis treated goats.

Number of ewe	Birth weight kg	weaning weight Kg	sex	Kidding
1	3.30	16.12	Female	Single
2	3.35	15.07	Female	Single
3	4.10	25.28	Male	Single
4	4.20	22.13	Male	Single
5	4.10	18.40	Male	Single
6	4.25	10.50	Male	Single
7	3.00	12.60	Male	Twins
	3.20	11.89	Female	
8	3.30	18.09	Male	Twins
	3.20	15.44	Female	
9	3.35	9.03	Male	Twins
	2.90	11.21	Female	
10	2.45	9.31	Male	Twins
	2.80	6.39	Female	
11	3.90	16.86	Male	Single
12	3.30	15.14	Male	Single
13	2.90	11.72	Male	Single
14	3.12	12.09	Female	Single
15	3.45	14.68	Female	Single
16	4.00	12.75	Male	Single
17	3.75	12.09	Female	Single
18	2.75	11.03	Male	Twins
	2.75	10.76	Female	
19	4.2	17.38	Male	Twins
	4.10	15.33	female	
20	2.32	5.78	Male	Twins
	2.75	8.00	female	
21	3.75	12.59	Male	Single
22	2.200	12.04	Male	Twins
	2.36	dead	Male	

#### *Clinical signs of mastitis*

The highest incidence of mastitis in the farm was detected at 2 to 4 weeks post kidding to weaning. Cases of clinical mastitis are characterized by visible abnormalities in the udder during lactation or dry period. Also, it was noticed an enlarged quarters with no let down of milk and response to pain upon palpation of the udder. Nine animals showed anorexia, dullness and depression. Severe case of clinical mastitis, characterized emaciation and loss of body condition.

#### *Bacteriological investigation*

Hundred milk samples collected from 50 cases of mastitis revealed that, 72 % of the samples were positive for single and mixed bacteria and 28% were negative for bacteria isolates. E coli were isolated from 50% of positive mastitic milk mixed with other bacteria pathogen. The culture-positive samples showing 25 samples (25 %) with Staph aureus, 18 samples (18 %) with Corynebacterium pyogenes,, 14 samples (14 %) with *Salmonella*

*spp.*, 36 samples (36 %) with E coli in a single or mixed with other bacteria and 3 samples (3%) with *Pasteurella spp.*, four samples (4%) with fungus suspect *Asperigillus spp.* infection and only two samples (2%) with yeast, suspect *Candida spp.* infection .

*Sensitivity test* was carried out and the animals were treated with systemic and intramammary broad-spectrum antibiotics, about 35 goats responded for treatment and only 15 cases did not respond to the treatment, 10 cases isolated salmonella *spp.*, two cases isolated staph aureus and two cases mycosis infection and one case yeast infection.

#### *Histopathological examination*

Examination of udder tissues of 15 goats suffered from chronic mastitis showed that, 12 cases had chronic suppurative form of mastitis, due to infection with supportive bacterial characterized by severe enlarged and

progressive induration of the udder or severe enlarged lobulated (Fig.1, 2). Only 3 cases were suffered from chronic granulomatous lesion due to fungus and yeast infection. Histopathological examination of the udder tissues showed dilatation of milk alveoli and infiltration of polymorph nuclear cells in the interstitial tissue and in the lumen of milk acini, and milk ducts, moderate or severe degeneration, necrosis and atrophy of epithelial cells of milk alveoli were seen. Infected mammary parenchymal tissues showed fibrous tissue proliferation and proliferation of neutrophils, macrophages, histiocytes and plasma cells. Many cases the precipitation of calcium in the lumen of most alveoli was seen, corpora amylacea were detected inside alveoli and some of them were calcified. (Fig.3). Necrosis and fibrosis

of the udder tissues was the common changes with large focal areas of suppurative inflammation (Fig.4). Chronic granulomatous form of mastitis was detected in 3 cases due to yeast infection suspect candida *Albicans* and *Asperigillus* spp. The udder tissue showing large granuloma due to yeast infection (Fig.5) the pathogen showing PAS positive yeast infection (Fig.6). Multiple diffused granuloma due to fungus *Asperigillus* spp. infection was seen in 2 cases ( Fig.7,8) the granuloma showed diffused in the udder tissue and the center of granuloma consists of mass of liquifactive necrosis containing massive yeast of candida *Albicans* or hyphae of *Asperigillus* spp. surrounded by inflammatory cells of polymorph nuclear, plasma, lymphocytes and macrophages then fibrous tissues.



Fig. 1. Showing udder of two goats suffering from chronic mastitis (arrows), the infected udder showed severe enlarged and progressive indurated.



Fig. 2. Showing udder of goat suffering from chronic mastitis, the infected udder showed severe enlarged lobulated and progressive induration (arrow).

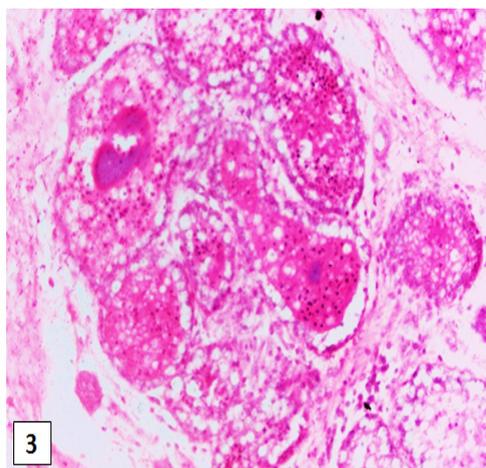


Fig. 3. Photomicrograph of udder tissue showing dilatation of milk alveoli and infiltration of polymorph nuclear cells in the interstitial tissue and in the lumen of milk alveoli also calcification was seen (arrows). (H & E, X 200).

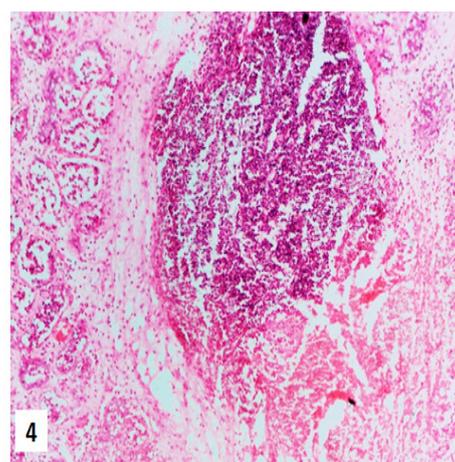


Fig. 4. Photomicrograph of udder tissue showing diffused chronic suppurative inflammation of the udder tissue (H & E, X 100).

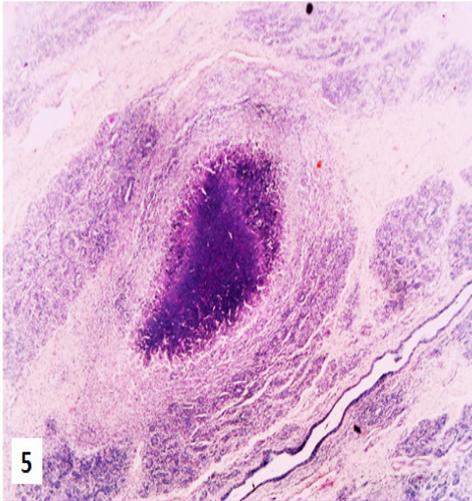


Fig. 5. Photomicrograph of udder tissue showing large granuloma due to yeast infection (suspect *candida albicans*). (H & E, X 100).

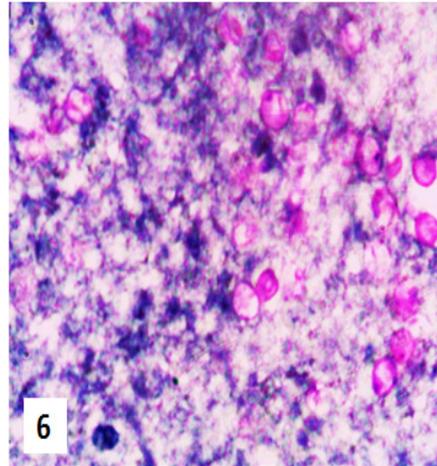


Fig. 6. Photomicrograph of udder tissue showing PAS positive yeast infection (suspect *candida albicans*) (X 400).

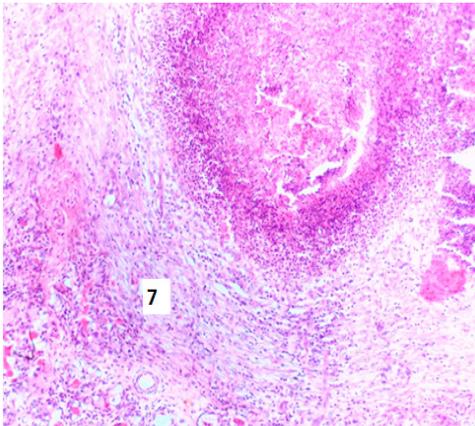


Fig. 7. Photomicrograph of udder tissue large granuloma due to fungus infection. (H & E, X 200).

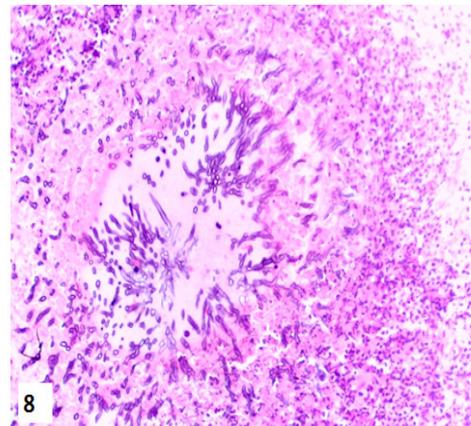


Fig. 8. Higher magnification of Figure 7, showing fungal hyphae (suspect *asperigillus* spp.) infection. (H & E, X 400).

### **Discussion**

Mastitis infection of animals could spread from the contaminated environment through the udder tissue and milk ducts as an ascending infection or hematogenous route. Milk is considered an excellent media for pathogen growth. Many factors as unhygienic condition of the farm, improper management, poor hygiene, teatinjuries are predisposing factors [8]. Also, deficiency of selenium and vitamin E which indirect effect on the immune system of animals in the farm. Misuseantibiotic may lower the immune system and facilitate yeast and fungus to proliferate and induce infection. The inflammatory process in case of mastitis change the characters of milk to be not fit for animal or human conception due to the

great bacterial multiplication, milk acidification, toxin production, tissue damage ,presence of purulent secretion and blood in the milk [22].

The percentage of bacteria isolates were *E coli* (36 %), in a single or mixed form with other bacteria , *Staph aureus* (25%), *Corynebacterium pyogenes* (18%), *Salmonella* spp. (14%), *Pasteurella* spp. (3%), *Asperigillus* spp. (4%) and *Candida* spp. ( 2%). However, 28% of milk samples were negative for bacteria isolates. The use of broad spectrum systemic and local antibiotic gives positive results for 35 goats, and only 15 cases did not respond to treatment may be infected with highly resistant form of bacteria against antibiotics or complicated granulomatous lesion due to yeast and fungus infection.

The suppurative microorganisms were isolated from these cases were Staph, salmonella and *E. coli*. The main pathological lesions were moderate or severe degeneration, necrosis and atrophy of epithelial cells of milk alveoli and proliferation of polymorph nuclear, lymphocytes and histocytes with macrophages. Infected mammary parenchymal tissues showed fibrous tissue proliferation. In many cases the precipitation of calcium in the lumen of most acini was seen and corpora amyloacea were detected, these results due to toxic effects of microorganisms [23,24,25]. Mycotic mastitis was showed in 1 cases of yeast, and 2 cases of filamentous fungi, these cases may be occur due to non-hygienic contamination or after antimicrobial treatment. Similar lesion was recorded by Odds [26]. Suppurative effect of *Candida* and *Asperigillus* spp. may be due to toxic products of these pathogens. The presence of numerous neutrophils in the acini and milk ducts indicated the prime role that neutrophils play in disposing of Candidain fections [27,28]. Both blastoconidia and pseudohyphae forms were observed in the milk acini and ducts at this stage. It is thought that blast conidia adhere to the epithelial/mucosal cells and cause irritation, resulting in congestion, edema and exudation of neutrophils, while, pseudo hyphae are more invasive and may penetrate the epithelial/mucosal barriers to enter the interstitial tissue [29- 30]. The formation of well-defined granulomas composed of macrophages, giant cells, lymphocytes and plasma cells at 10 DPI plays a pivotal role [30-31].

After sensitivity tests result and treatment of animals, 22 animals responds to treatment could successfully get kids (single and twins). From emphasises: veterinarian care good hygienic conditions, specific antibiotic , regular vaccination regime for pregnant dam, and rising immunity by additive supplements for macro and micro elements could controlled the incidence of mastitis and its durable effects on animal and human health .

The existing information indicates that mastitisne gatively affects the reproductive performance in goats as 22 goats respond to mating from 50 infected animals. The adverse effects of mastitis on reproduction are mostly due to increased days to first insemination, days open, and decreased overall CR [32]. Mastitis is also associated with early embryoniclosses, abortion, and culling of animals. Advanced analytical method srevealed that mastitis causes more

adverse effects during some critical period during postpartum.

### **Conclusions**

In conclusion, mastitis is an important disease of goats and prevention of infection is the key for disease control. Good environmental and hygienic housing of milking practices are a necessity to minimize the impact of this disease.

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### *Conflicts of interest*

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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### بعض مشاكل الضرع المرتبطة بالإنتاجية في الماعز

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تهدف هذه الدراسة الى إجراء فحوص ميدانية لمشاكل التهاب الضرع وإنتاجيه الماعز التي تعاني من التهاب الضرع تحت الظروف المصرية. أجريت الدراسة على مزرعة خاصة تحتوي على ٥٥ من الماعز البلدي تعاني من التهاب الضرع الإكلينيكي. تم فحص جميع الظروف البيئية للمزرعة و بشكل خاص الاعاشه والتربية والمشاكل الصحية وحالة الخصوبة والإنتاج والتغذية والفحص المورفولوجي للضرع. تم جمع عينات حليب الماعز المصابة لعزل البكتيريا واختبار الحساسية. تم معالجة الحيوانات بمضادات حيوية موضعية واسعة المجال. أشارت النتائج إلى أن ٥٣ حالة (٠٧٪) استجابت للعلاج، وأظهر الأداء التناسلي والإنتاجي الطبيعي. ٥١ حالة فقط (٠٣٪) لم تستجيب للعلاج وأظهرت التهاب الضرع المزمن. تم فحص الحالات المصابة بالتهاب الضرع المزمن بعد الذبح ووجد التهاب منتشر على نطاق واسع في جميع أنحاء الضرع المصابة. تم حفظ عينات من الأنسجة من الضرع المصابة والغدد الليمفاوية الثديية في الفورمالين ٠١٪ لفحص الأنسجة. وكشف الفحص البكتريولوجي عن عزلة المكورات العنقودية الذهبية والمكورات البكتيريا القشرية والسلمونيلة النيابة والكولاي في واحدة أو مختلطة مع البكتيريا الأخرى، *Pasteurella spp.* الفطر المشتبه به *Asperigillus spp.* والخميرة. كشف الفحص الباثولوجي عن وجود التهاب القيجي منتشر في التهاب الضرع الفطري.

والخلاصة أن التهاب الضرع مرضاً مهماً للماعز والوقاية من العدوى هي المفتاح للسيطرة على التهاب الضرع، والإسكان البيئي والصحي الجيد لممارسات الحلب يعد ضرورة لتقليل تأثير هذا المرض.