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Bacteriological profile and antibiogram of *Staphylococcus aureus* isolated from sheep and goats' abscess

Ashraf A. Abd El Tawab[1], Amira M. Rizk[1], Samia. E. Afifi [2] and Shimaa R. Mohamed[2]

[1]*Bacteriology, Immunology and Mycology Department, Faculty of Veterinary Medicine, Benha University, Egypt.*

[2]*Microbiology, Directorate of Veterinary Medicine, Beni-Suef, Egypt.*

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ABSTRACT

Sheep and goat in Egypt are at risk of being affected by abscess disease, a pyogenic infection causes pyogenic abscess formation in superficial lymph nodes, emaciation and wasting of the animal bodies necessitating culling of the animal from the herd and partial or complete carcass condemnation in the abattoir. *Staph aureus* is one of the main causative agents of abscess formation. The present study was designed to throw light on the prevalence of *Staph aureus* (S. aureus) causing abscess disease in sheep and goats in Beni-Suef governorate in Egypt. This study was conducted on 200 pus swab samples collected from many flocks in Beni-Suef Governorate from the period of (March 2016 - April 2017) include 165 living Balady sheep and 35 living goat (6 month -3 years old). Out of 200 samples, S. aureus (30 isolates), 26 from sheep (15.75%) and 4 (11.4%) from goat in a total prevalence of 15% were recovered and identified. Full antibiogram of all recovered isolates proved the sensitivity of S. aureus being (90%) to ciprofloxacin, (93.3%) to gentamicin and (60%) to rifampicin. The isolates show high resistance to other antibiotics as their sensitivity were only (6.7 %) to penicillin G and vancomycin and (10 %) to spectinomycin. These results recommend using of ciprofloxacin, gentamicin and rifampicin for the treatment of *S. aureus* infection.

1. INTRODUCTION

The abscess in sheep and goat is pyogenic subcutaneous infection in the superficial lymph nodes or their close vicinity (Szaluś-Jordanow et al., 2013). This pyogenic abscess formation is caused mainly by *Staphylococcus aureus subsp. Anaerobius* characterized by anaerobic growth and lack of catalase activity (De la Fuente et al., 2010). Sheep and goat industries worldwide suffer significant economic losses due to culling of infected animal from breeding flocks due to poor physical condition or decreased fertility, and partial or total carcasses condemnation at abattoirs (Connor et al., 2000;Hassan et al., 2011). After entry of the organism through scratches orcuts in the skin, bacterium becomes able to survive and establish itself within the lymph node, leading to abscess development thus the microorganism becomes encased in thick fibrous capsule which protects it from antibodies as well as antibiotics (Dorella et al., 2009). Abscesses often result after a subcutaneous infection by a variety of bacteria including: *Staphylococcus aureus, Staph.epidermidis, Pseudomonas aeruginosa,Actinomyces pyogenes, Rhodococcus equi, Corynebacterium pseudotuberculosis* and *Moraxella species* (Ashfaq and Campbell, 1979).
Caseous lymphadenitis caused by *C. pseudotuberculosis* is considered as the most important disease producing abscesses in small ruminant all-over the world (Alharbi et al., 2011). However, other microorganisms such as *Streptococcus*, *Staphylococcus*, *and Pseudomonas*—have been also isolated from sheep and goat abscesses as well (Hatem et al., 2013). Many pyogenic organisms may be involved including species of the genera *Streptococcus*, *Staphylococcus*, *Corynebacterium*, *Pseudomonas* and others (Richard et al., 1979). *S.. aureus* is one of the main causes of abscess disease in sheep and goats.Therefore, this study was designed to investigate the prevalence of *S. aureus* in superficial lymph node abscesses in sheep and goats and to build a documented clear antibiograms that can help in planning of efficient program for treatment and control abscess disease spread in small ruminant in Beni-Suef Governorate, Egypt.

2. MATERIAL AND METHODS

2.1. Collection of samples(Quinn et al., 2002)
Out of 1130 animals (760 sheep and 370 goat), 200 pus swabs were collected from 165 living Balady sheep and 35 living goats in Beni-Suef Governorate. The sampling period extended from March 2016 to April 2017. These samples were obtained from suppurating lymph nodes (93, 15 Mandibular, 58, 10 Parotid, 8, 6 Prescapular and 6, 4 Prefemoral lymph nodes) abscesses of sheep and goats, respectively. The external surface of the affected lymph node was wiped with 70% alcohol before collection, pus contents were aspirated using sterile syringe and transferred

* Corresponding author: .**Shimaa Ragab Mohamed.** Microbiology, Directorate of Veterinary Medicine, Beni-Suef, Egypt.

in ice box within an hour to the laboratory to be bacteriologically examined.

2.2. Isolation and identification of Staphylococci: (Sneath et al., 1986):
The collected swabs were streaked onto 5% sheep blood agar plates, Baired-Parker agar as well as mannitol salt agar plates and incubated aerobically at 37°C for 24hrs. The suspected colonies were purified onto slope of nutrient agar and identified morphologically by staining with Gram's stain then biochemically (Mac Faddin, 1976).

3. Antibiotic sensitivity test of S. aureus (Feingold and Martein1982).
The isolates were subjected to the sensitivity test against 10 standard antibiotic discs (Oxoid) using agar diffusion technique.

3. RESULTS

4.1. Bacteriological examination:
Staph. aureus was isolated in pure cultures from 30 pus samples (15%), include 26 (15.75%) sheep and 4 (11.4%) goat as shown in table (1). The most affected lymph nodes in sheep and goatswere parotid (n=12, 46.3%, and n=2, 50%) and mandibular (n=9, 34.6%, and n=1, 25%)followed by prescapular(n=3, 11.5%, and n=1, 25%, respectively), while infection was recorded in prefemoral lymph node otwo (7.6%)sheep only.

4.1.1. Colonial appearance:
S. aureus colony on mannitol salt agar was yellow color surrounded by yellow halo against yellow colored medium. On Baired-Parker agar showed black small colonies 1.0 mm in diameter after 24hrs incubation and enlarged to 2.5mm after 48h incubation surrounded by opalescent ring and a clear zone were appeared. Moreover, colonies were surrounded by zone of ß-hemolysis on blood agar medium.

4.1.2. Microscopical examination:
Staph. aureus is Gram positive cocci arranged inclusters like bunch of grapes under light microscope.

4.1.3. Biochemical examination:
The result of biochemical tests for *S. aureus* isolates identification was positive for catalase, coagulase, Voges-Proskaur (VP), lipase and phosphor lipase test,while it was negative with oxidase and indol tests.

2. Antibiogram pattern of *S. aureus* isolates:
The majority of isolates were highly sensitive to gentamicin 28 (93.3%), ciprofloxacin 27 (90%) and rifampicin 18 (60%) while, such strains showed high resistance to penicillin G 28 (93.3%), vancomycin 28(93.3%) and spectinomycin 27(90%). On the other hand, moderate sensitivity was recorded to 5 isolates; to ciprofloxacin, clindamycin and rifampicin with percentage3 (10%), 1 (3.3%) and 1 (3.3 %), respectively as shown in table (2).

Table 1 prevalence of *S. aureus* in sheep and goats

Animal spp.	Number Of abscessed cases	*S. aureus* positive cases	Percentage
Sheep	165	26	15.75%
Goats	35	4	11.4%
Total	200	30	15.0%

Table 2 Results of antibiotic sensitivity test of *S. aureus* isolates.

Antibiotic discs and its concentration	*S. aureus isolates*		
	Susceptible isolates Noand (%)	Intermediate isolates No and (%)	Resistance isolates No. and (%)
Amoxicillin/Clavulanic Acid (20/10 µg)	4 (13.3%)	0	26 (86.6%)
Ciprofloxacin(5µg)	27 (90%)	3 (10%)	0
Clindamycin (2 µg)	4 (13.3%)	1 (3.3%)	25 (83.35%)
Doxycycline (30 µg)	6 (20%)	0	24 (80%)
Gentamicin (10 µg)	28 (93.3%)	0	2 (6.7%)
Penicillin G (10 U)	2 (6.7%)	0	28 (93.3%)
Oxacillin (1 µg)	12 (40%)	0	18 (60%)
Vancomycin (30 µg)	2 (6.7%)	0	28(93.3%)
Rifampicin (5 µg)	18 (60%)	1 (3.3%)	21 (70%)
Spectinomycin (100 µg)	3 (10%)	0	27(90%)

4. DISCUSSION

Sheep and goats constitute one of the major sectors of the animal wealth in Egypt. This livestock part face the risk of bacterial diseases caused by various pyogenic organisms which often cause abscess formation in superficial lymph nodes (Hatem et al., 2013).
Staph. aureus is a very important causing abscessation in superficial lymph node of sheep and goat (Murray et al., 2003). In this study, the parotid lymph nodes were the most affected followed by mandibular lymph nodesat percentage 46.3%, 34.6% in sheep and 50% , 25% in goats which is parallel with previous report (AL-Tuffyli and Shekhan, 2012). This is also in agreement with the reported data that the head was most commonly affected, especially during shearing and tagging operations (Dorella et al.,2006).
Conventional biochemical testing of *Staph. aureus* isolates showed that all isolates were positive for coagulase, haemolysin, pigment production, phosphatase, lipase, mannitol and glucose fermenting (Ata, 1990).
The prevalence of *Staph. aureus* in this studybeing 15% agree with previous reports (Zidan et al.,2013) and close to a previous report by Alharbi and Mahmoud (2012), who also reported a prevalence of(12.37%). However, the results of the current workwas lower than other previous report of *Staph. aureus* prevalence of (30.4%) (AL-Tuffyli and Shekhan 2012) and (20.8%) (Hatem et al., 2013). These variations in prevalence between the current study region and other locality in Egypt may be attributed to the management system and the surrounding temperature which affects spread of the bacteria.
Antibiotic susceptibility test of *Staph. aureus* isolates in the current study showed high rate of resistance to vancomycin in agreement with Zhu et al. (2008).In the contrary to these results, it was reported that *Staph. aureus* susceptibility to vancomycin was (100%) (Hatem et al., 2013).This variation may be attributed to the extensive previous exposure of the bacteria to such antibiotics and emerging of resistance genes in some locality andabsence of pervious exposure in other locality in Egypt. Antibiotic susceptibility of *Staph. aureus*revealed high susceptibility to gentamicin (93.3%), ciprofloxacin (90%) and rifampicin (60%) that nearly in agreement with the reported (80%) sensitivity of *Staph. aureus*isolates to gentamicin (Aivni et al., 2017) and(100 %) sensitivity of *Staph. aureus*isolates to ciprofloxacin and (85.7%) to rifampicin(Hatem et al., 2013).

In the current study, the resistance of *Staph. aureus*isolates to amoxicillin/clavulanic acid was 86% which is in contrast to a previous study result showed no resistance of *Staph. aureus*isolates to amoxicillin/ clavulanic acid (Guler et al., 2005). This contradiction may be related to the antibiotic regime that has been implemented in different locality.
Staph. aureus strains are known to be mostly resistant to antibiotics drugs due to their capacity to produce an exo polysaccharide barrier as well as their protection due to hiding within the encapsulated lesion (Gundogan et al., 2006).
To sum up, the difference of *S. aureus* susceptibility to antibiotics may be attributed to the differences in antibiotics regimes used in treatment of bacterial infection or even the use of antibiotics as growth promoters in livestock intensive production or even in broiler that led to the emergence of antibiotic resistance genes in the environment that by somehow find their way to be transformed to pathogenic bacteria including *S. aureus*.
In this work the high resistance pattern of *S. aureus* againstpenicillin and oxacillin, may be due to production of β- lactamase by *S. aureus* that cause destruction of β-lactam antibiotics called methicillin-resistant *S. aureus* (MRSA). (Wichelhaus et al. 1997).Accordingly, the drugs of choice for treatment of *S. aureus* infection are ciprofloxacin, gentamicin and rifampicin.

5. CONCULOSION

In conclusion, effective control program to organize application of policies required for prophylaxis of abscess formation in animals. A right control measure is required to prevent spread of abscessation between small ruminant as grazing among sharp objects and vigorous shearing to guard against producing entrance of the bacteria to the body, avoidance of antibiotic overuse to avoid drug resistance emergence and the use of drugs of choice for efficient treatment as ciprofloxacin, gentamicin and rifampicin to treat *Staph. aureus* infection.

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