Prevalence of *Staphylococcus aureus* subsp. *anaerobius* in Sheep and Goats abscesses in Nyala, South Darfur State, Sudan

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ABSTRACT

This study was conducted in Nyala, South Darfur State; samples were collected between August and November 2015 aiming at investigating the prevalence of Morel's disease caused by *Staphylococcus aureus* subsp. *anaerobius* in sheep and goats at meat inspection in Nyala North abattoir. Out of 1050 slaughtered animals (441 sheep and 609 goats) 24 sheep (5.4%) and 25 goats (4.1%) had superficial lymph nodes abscesses, *S. aureus* subsp. *anaerobius* was isolated from 18 (72%), 14 (58.3%) of sheep and goats, respectively, giving prevalence rates of 4.1% in sheep and 2.3% in goats. Fisher's test showed that there was no significant association between the prevalence of Morel's disease between sheep and goats ($p<0.05$). The parotid (36%) and prescapular (20%) lymph nodes were more frequently affected by Morel's disease in sheep and the prescapular (37.5%) and precrural (20.8%) in goats. The position of abscess was located close to the lymph node in goats and close to and/or within the lymph nodes in sheep. In one sheep, 3 abscesses were observed at the same time, and in one goat 2 abscesses were observed. The size of one abscess in sheep reached 12.5×14.5 cm. The resulting of this study revealed the high prevalence of Morel's disease in sheep and goats and the great economic losses due to triming carcass and skin.

KEY WORDS: Morel's disease, sheep, goat, *Staphylococcus aureus* subsp. *anaerobius*, Sudan.

INTRODUCION

Morel's disease (MD) is a bacterial disease caused by *Staphylococcus aureus* subsp *anaerobius*. It causes abscessation in superficial lymph nodes with high morbidity rate (Musa 2009 and Alharbi 2011a) in small ruminant mainly in early ages and give food supplements (Radwan and Babiker *et al*., 2014; Møller *et al*. 2000), aged between 4-10 months and less in 1-5 years, abscess reached to 30-70cm (Alhendi *et al.* 1993, Szalus-Jordanow et al 2010). The etiologic agent is *S. aureus subsp. anaerobius*. MD is prevailing in some African and Asian countries

plus some reports of outbreaks in some European countries

In the Sudan, it's known as Aldamamil. Results of high prevalence rate of Morel's disease conducted by investigators of Sudanese sheep abscesses illustrate poor vaccination against disease and observed the prevalence rate highest among Hamari and Kabbashi breed than other breeds and the incidence of disease was higher among feed lots animals when compared with natural cases (Rodwan and Babiker et al 2014). However, there have been vigorous efforts to produce the vaccine Musa (2012). Many researchers worked in epidemiology of this disease in difference part of countries (Ben Said et al. 2002 and Kaba et al. 2007), so as to solve export sheep and goats problem to make control of the disease that causes problematic and negatively economic impact throughout the world. Speed of the disease from infected to susceptible animals is mainly through skin injuries and abrasion during rough gathering. This study aimed at carrying out of prevalence study of *Staphylococcus aureus* subsp. *anaerobius* in sheep and goat abscesses.

MATERIALS AND METHODS

Study area:

The study was conducted in Nyala town, South Darfur State. It is situated on the South West part of the Sudan; it is about **1446 km** from Khartoum. The main activities of population are agriculture and animal breeding. There are about 3.7 million head of sheep and goats about 4.2 million head according to the Ministry of Animal Resources, South Darfur State report (2016), It has the biggest markets. Most of animal wealth in western Sudan is concentrated in South Darfur State and has become of great importance both locally and for exportation. Nomads migrate to the North during to the rainy season (August to October) and to the South during the dry season and remain there until rainfall ensuring in May to June in search of pasture and water. The climate is savannah type, which plant cover natural pasture comprised grasses, bushes shrubs and trees. In district the people breed goats often raised with sheep and mainly rearing together in open range system and rarely separated (Figure 1) where they are expected to be subjected to various injures and so considered as predisposing factors for occurrence the disease.



Figure (1): Sheep and goats grazing togather in natural area



Figure (2): Numerus abscesses in different parts of superficial lymph node of sheep and goats

Sampling

A total number of 1050 sheep and goats were slaughtered at Nyala North abattoir in South Darfur State between August to November, 2015 for domestic consumption. Samples were collected from enlarged superficial lymph nodes of those were that routinely palpated at meat inspection. The whole intact enlarged lymph nodes were incised and placed in sterile plastic bags in an ice box and sent to the bacteriology laboratory at the Institute of Molecular Biology, University of Nyala for bacterial culture.

Data analysis:

Data were analysed using PRISM® version 6.07 (Graph Pad Software Inc., San Diego, California, USA). Fisher's exact test was used to assess the significant difference between the prevalence of *Staphylococcus aureus* subsp. *anaerobius* in sheep compared with goats.

Descriptive statistics:

Sample collection for identification of *Staphylococcus aureus* subsp. *anaerobius* associated with sheep and goats abscesses. A total 49 abscesses were collected, of which 18, 14 strains respectively were obtained

Procedures for identification of isolates:

The organisms were examined for morphological, cultural and biochemical tests. The pure isolates were identified according to the scheme for identification of *Staphylococci* species modified by El-Sanousi et al. (2016).

RESULTS

Bacteriological isolation:

Out of 1050 sheep and goats slaughtered, 49 abscesses were collected from sheep and goat (25, 24 respectively).

Statistical analysis: By using Fisher's test there is no statistically ($P<0.05$) significant differences. Rate of infection in sheep and goats showed no significant difference ($P<0.05$) in detection of prevalence of sheep infection when compared with the goats.

Table 1: Significance of sheep infection result in comparison with goats infection

Data analysed	+ve	-ve	Total	Significance
Sheep infection	18	7	25	
Goat infection	14	10	24	P = 0.3772
Total	32	17	49	Not significant

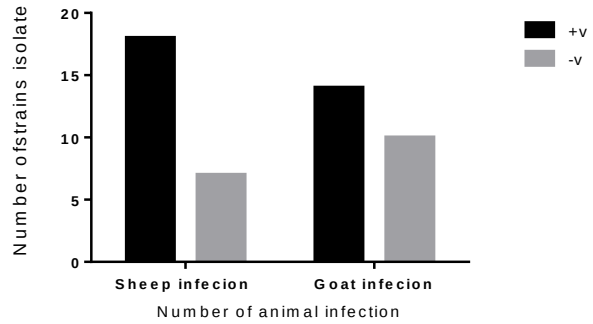


Chart (1): Association difference between the infection of sheep and goats

Table 2: Isolation of *Staph aureus* subsp. *anaerobius* from slaughtered sheep and goats in Nyala north abattoir South Darfur State.

species	No of Slaughtered Animals	No of samples Collection	No of Isolations	Prevalence rate
sheep	441	25	18	4.1
Goat	609	24	14	2.3
Total	1050	49	32	6.4

Data in the table (2) and Chart (1) represent the prevalence and distributions of abscesses among slaughtered sheep and goats

In Figure (5) showed variable shape of abscesses which contains of pus varied from greenish yellow creamy and thick consistency, whereas Figure (6) observe 2-3 abscesses in the same carcass and the big size was reached to 12.5×14.5cm.

Table 3: Frequency and percentage of lymph node abscesses among slaughtered sheep and goats.

Lymph node	No .of abscesses (%)	
	Sheep	Goats
Parotid	9(36%)	3(12.5%)
Prescapular	5(20%)	9(37.5%)
Precrural	4(16%)	5(20.8%)
Popliteal	2(8%)	2(8.2%)
Supramammary	1(4%)	0(0%)
Mandibular	3(12%)	2(8.2)
Retropharyngeal	1(4%)	2(8.2)
Scrotum	0(0%)	1(4.1%)
Total	25(100)	24(100%)

The formation of abscesses in difference part of the body located in superficial lymph nodes, close to lymph nodes in goats, while in sheep it was found in three forms: abscess developed close to, within lymph nodes and in both form (close to and adjacent) (Figure 4)

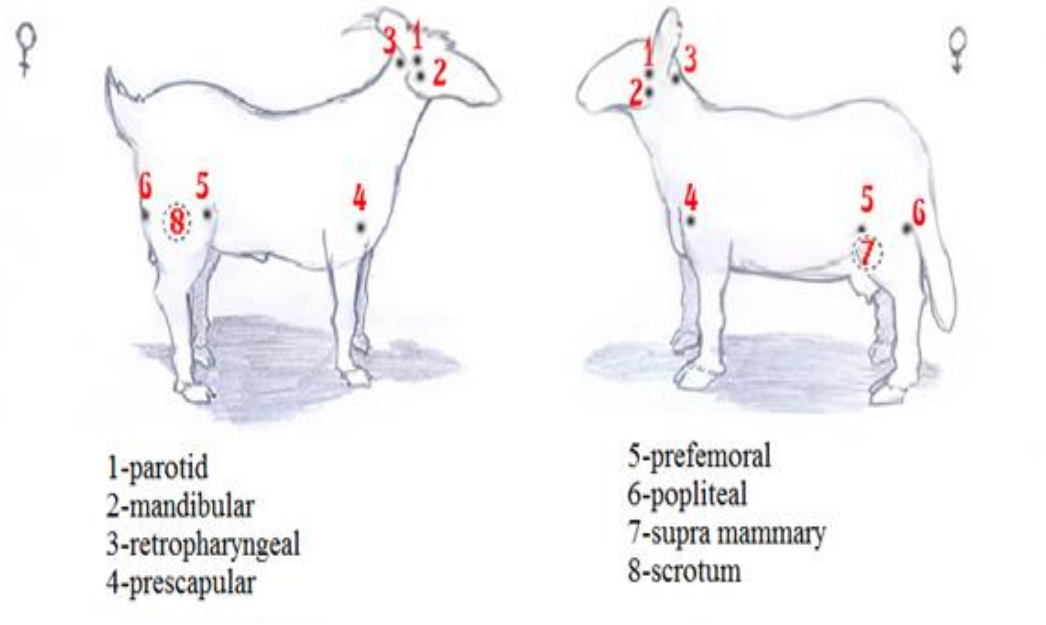
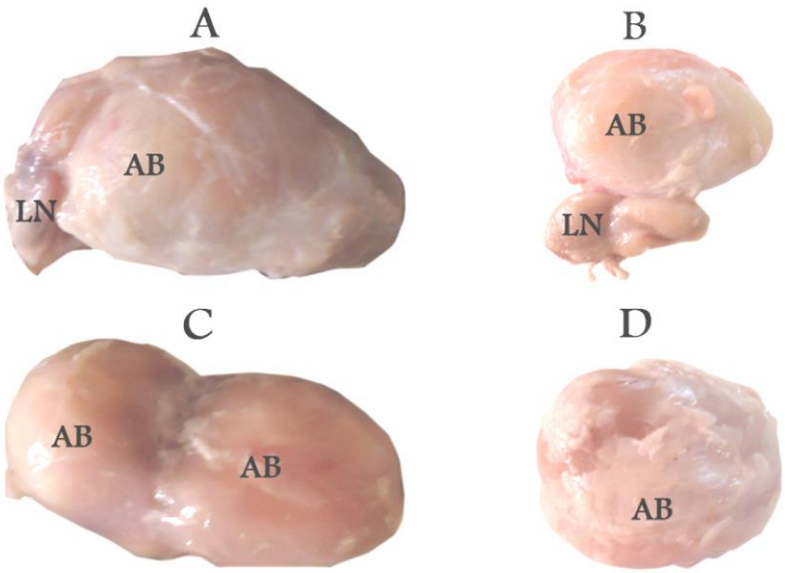


Figure (3): Distribution of major affected superficial lymph nodes abscesses in body of sheep and goats.



Figure(4): The position of abscess in lymph nodes; A,C and D represented the position of abscess in sheep, B- represented the position of abscess in goats

- **AB: abscess**
- **LN: lymph nod**



Figure (4): Shape of abscesses collected from sheep and goats



Figure (6): The size of abscess in sheep was found to be12.5×14.5 cm

DISCUSSION

In study area, affected sheep and goat with abscesses passed after treaming abscesses during meat inspection in abattoir for human consumption. Previous studies have confirmed the goats are resistant to the disease, but it has spread widely (Szalus-Jordanow *et al* 2010).

In the present study showed the number of collected abscesses from superficial lymph nodes in different parts of the body in carcasses of sheep and goats were 25, 24 abscess respectively. These findings suggested that the sheep and goats in state are mainly rearing together in open range system where they are expected to be subjected to various injures and so considered as predisposing factors for occurrence the abscesses. The bacteriological culture result showed that the percentage of *Staph aureus* subsp. *anaerobius* in slaughtered sheep was 18 (72%), while in goats was 14(58.3%). The results of prevalence rate of the disease in sheep (4.1%) while in goats (2.3%).

The current study revealed that the high percentage of *Staphylococcus aureus* subsp. *anaerobius* in sheep and goat was 72%, 58%; respectively; this percentage indicated that the incidence of Morel's disease is higher in slaughtered sheep when compared with goats. Many studies have reported the occurrence of abscesses in sheep in Sudan and who stated that *Staph aureus* subsp. *anaerobius* is the common pathogen in sheep among bacterial isolation. The results obtained in sheep by Hamad *et al*. (1992) was 73.9%, Babiker (1996) 75%, Musa (2009) 63.3% and Radwan and Babiker) et al (2014) 65.95%, Nagah (2007) 53.3%, Karamala (1997) 26% and Bihary (2002) 24%. Lower rate reported by Elgadal (1997) and Alharbi(2011) who reported that the *Corynbacterium pseudotuberculosis* was dominating 51.85%, 25.77% followed by *Staph. aureus* subsp. *anaerobius* 27.07%, 27.84 respectevly.

The prevalence rate of infection in sheep was found higher than that in goats (4.1%, 2.3% respectively). This contrast may be due to comparatively increase susceptibility of sheep to various adverse environmental conditions and disease in general. Higher

prevalence rates recorded in sheep by Hamad (1987), Hamad (1989), Karamalla (1993), Alharbi (2011) and Radwan and Babiker et al (2014) 73%, 12.6%, 10% , 5-44.1% and 16.7% respectively. Radwan (1996) found that the prevalence rate in natural rang area was 5.8%. Also Hassan (1996) recorded the prevalence rate of 8%. While the higher prevalence rate recorded in goat by Valenti and Bieler (1984), 46.7%, De la Fuente *et al*., (1997) 71%, Szalus-Jordanow, et al (2010) 93.6%, Al-Harbi, K. B. (2011) 2.2 - 6.5 % %). Overall prevalence of Morel's disease in sheep 4.1% was recorded in the current study, which is different with 1.21% reported by Elgadal F(1997) how investigated the aetiology of sheep abscess in postural area in the same district. This variability in our study could be

attributed to difference in breeds and management of the herd, which the majority of the slaughtered animals submitted to the fattening process, in addition to mostly slaughtered animals at early ages due to consumer preferences so that the important factors to occurrence the disease. Thus incidence of abscesses high rate more probably in our study. In addition, higher prevalence rate of goat in Saudi Arabia 6.5-22% was recorded by Alharbi (2011) while Szalus -Jordanow (2010) recorded the highest prevalence rate 93.6%

Earlier studies of Morel's disease (Morel, 1911; and Shirlaw and Ashford, 1962) described the size and shape of abscess as a pigeon and as orange, Bajmocy *et al*. (1984) described hen egg, Alhendi (1993), El-sanousi (1989) and Moller *et al.* (2000) described the abscess as big as football. The same observations were found in this study.

In this study the contents of abscesses were creamy and greenish yellow in color and thick in consistency. Similar results were obtained among many studies (Santa Rosa, *et al.,* 1989; El-Sanousi, 1989; Hamad *et al*. 1992; Alhendi *et al.,* 1993 and Moller *et al.*, 2000). Concerning the formation of abscess in lymph node associated with, within, close and within (in lymph node and adjacent) lymph node in sheep. These observations disagree with earlier reporters (Aynaud, 1922, Bajmocy *et al*., 1984; Shirlaw and Ashford, 1962) they reported abscesses developed close to, but not within lymph nodes. Also Bajmocy *et al.* (1984) and Fuente and Suarez (1985) found abscesses inside the superficial lymph nodes and not around them.

Abscesses were located close with lymph nodes in goats. Our observations agree with Valenti and Bieler (1984), Moller *et al.* (2000), Koba *et al.* (2007), and Szalus - Jordanowet al. (2010).

Morel's investigations reported by Ayaund (1927), Joubert (1958), El-Sanousi (1989) and Szalus-Jordanow *et al.* (2010) found that the most commonly sites affected lymph nodes among slaughtered sheep were parotid lymph nodes and prescapular region in goats may be associated with behavior of sheep and goats that tend to scratch their jaw and shoulder in hard objects such as wall, fences and metallic feeding.

Our study is considered the first report of prevalence of *Staphylococcus aureus* subsp *anaerobius* in goats in Sudan.

CONCLUSION

This study provide the facts for prevalence of *Staphylococcus aureus* subsp. *anaerobius* in sheep and goats in Nyala, South Darfur State, Sudan, which will help to make information on the prevalence of the disease to be available and so put forward an appropriate control strategies for this economically important disease and their control method. The very high prevalence of Morel's disease during inspection of carcasses revealed the great economic losses due to

reduction of wool and meat because terming skin and carcass. The resulting of this study warrants the need for strategic approach directed to the competent authorities for the disease risk, and control measures to achieve high animal health standards.

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