بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduate Studies

Aerobic Bacteria Isolated from the Lesions of the Internal Organs Camels at Tambool slaughterhouse

البكتيريا الهوائية المعزولة من آفات الأعضاء الداخلية للإبل بمسلخ تمبول

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بسم الله الرحمن الرحيم

وَكَذلِكَ أَنْزَلْناهُ قُرْآنًا عَرَبِيًّا وَصَرَّفْنا فِيهِ مِنَ الْوَعِيدِ لَعَلَّهُمْ يَتَّقُونَ أَوْ يُحْدِثُ لَهُمْ ذِكْرًا (113) فَتَعالَى اللَّهُ الْمَلِكُ الْحَقُّ وَلا تَعْجَلْ بِالْقُرْآنِ مِنْ قَبْلِ أَنْ يُقْضى إِلَيْكَ وَحْيُهُ وَقُلْ رَبِّ زِدْنِي عِلْمًا (114)

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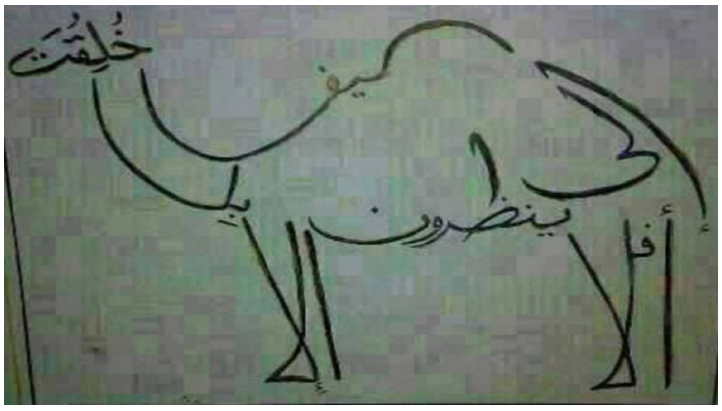

قال الامام الشافعي:

تعلم فليس المرء يولد عالما وليس أخو علم كمن هو جاهل

وان كبير القوم لا علم عنده صغير إذا التفت اليه الجحافل

Dedication

الى .....

امى.. سندي وعضدي وحبى .. زاد مشواري المقدس من سنين

ابى ... ركيزة ..... ودخرى الحوبة ..... مرسانا الأمين

أبنائي ..... عشم باكر ..... قناديل الفرح جواي خزين

إخواني ... وأخواتي ..... ينحتون قوادم الأيام حبا لا يلين

زوجي .. ... رفيق الدرب ..... يشيل يملا الفرح في كل حين

أهلي الطيبين .... وصديقاتي ... بيكم زادنا . ..... مليتو الدنيا يقين

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Table of Contents

List of Tables

Abstract

This cross-sectional study was conducted for six months, from January to June 2013, to estimate the prevalence of internal lesions in slaughtered camels at Tambool slaughterhouse, to isolate and identify the aerobic bacteria colonizing these lesions and to determine the antimicrobial susceptibility profile of these isolates. A total of 280 camels .

Samples were taken investigated from carcasses internal lesions at different organs for bacteriological investigation. Internal lesions were detected in 25.0% (70/280) with 95% CI of ±5.07 carcasses and were detected in different internal organs including lungs, liver and heart. Lungs lesions (51.4%) were the most observed pathology followed by hepatic lesions (45.7%) and the least (2.90%) were lesions of heart muscle. The proportions of internal lesions detection differed between geographical origin, breeds, age groups, and males and females. In the univariate analysis using chi square, origin (x^2 = 49.6, df = 3, p-value = 0.001), sex (x^2 = 29.9, df = 1, p-value = 0.001), breed (x^2 = 35.1, df = 3, p-value = 0.001), and body condition (x^2 = 26.5, df = 2, p-value = 0.001) were significantly associated with the detection internal lesions. However, age (x^2 = 2.56, df = 1, p-value = 0.110) was not significantly associated with internal lesions detection. A number of 179 aerobic bacteria belonging to 9 genera were isolated. Most of the isolates (n = 107; 59.8%) were gram positive bacteria (cocci and bacilli),whereas the rest (n = 72; 40.2%) were gram negative rods. *Staphylococcus* species were the most frequent (32.0%), followed by *E. coli* (26.0%), *Streptococcus* species (18.0%), *Corynebacterium* species (5.0%), *Bacillus* species, *Salmonella* species, *Pseudomonus* species, and *Klebsiella* species; each of them 4.0%, and *Shigella* species (2%). Chloramphenicol was the most effective antibiotic against *Staphylococcus* species, *Corynebacterium* species, and *Bacillus* species, each with inhibition zone of 10 mm, while penicillin g 10 was more against *Streptococcus* species with inhibition zone of 10 mm. Ciprofloxacin 5 mcg and ampicllin/sulpactum 20 mcg were effective against *E. coli, Salmonella* species, *Klebsiella* species, *Shigella* species, and *Pseudomonas* species with inhibition zones of 8 and 10 mm. It can be concluded that internal lesions are prevalent in camels slaughtered at Tambool slaughterhouse and many gram positive bacteria and gram negative bacteria were isolated from the samples collected from these lesions, and hence, an extended study is warranted to evaluate the economic magnitude of internal lesions resulting in partial and/or total condemnation of organs.

ملخص الدراســــــــــــة

تمت هذه الدراسة المستعرضة في مسلخ تمبول لمدة ستة اشهر خلال الفترة من شهر يناير الى يونيو 2013، و تم الكشف عن الإصابات الداخلية في 280 حيوان ، التي تم عزل 70 منها وتمثل 25 % من إجمالي العينات المأخوذة. بلغت نسبة الإصابات في الرئة 51.4 % ، 45.7 % في الكبد و 2.9 % في القلب .

استهدفت هذه الدراسة معرفة الأسباب البكتيرية المسببة للإصابات الداخلية وبعض العوامل الجغرافية المؤثرة ، و تم عمل تجارب قياس قابلية المضادات الحيوية على قتل البكتريا. ثم التحليل الإحصائي أحادي المتغير للنتائج باستخدام مربع كاى ووجدت علاقة بين الإصابات الداخلية والعوامل الجغرافية، العمر، حالة الجسم، التصنيف الجنسي (ذكر/ انثى) .

من خلال الدراسة البكتيرية تم التعرف على 179 بكتريا هوائية تنتمى لـ 9 أنواع تم عزلها . معظم الأنواع المعزولة كانت موجبة الجرام (عصوية وعنقودية) عددها 107 بكتريا تمثل 59.8 % والبكتريا سالبة الجرام عددها 72 بكتريا تمثل 40.2 % . استنادا على الدراسة البكتريولوجية وجد ان البكتريا العنقودية كانت اكثر تواجدا بنسبة 32 % ، تليها الاشريكية القولونية بنسبة 26 % ، البكتريا السبحية بنسبة 18 % ، الكوراينو بكتريا بنسبة 5 % ، وتمثل أنواع الباسلس و أنواع السالمونيلا و أنواع السودومونس و أنواع الكلبسيلا 4 % لكل نوع ، وأخيرا بلغت نسبة أنواع الشايقيلا 2 % .

دراسة المضادات الحيوية اكدت ان الكلورانفينكول هو الأكثر تأثيرا ضد البكتريا العقدية، أنواع الكوراينو بكتريا و أنواع الباسلس بمساحة 10 مليمتر ، والبنسلين 10 جرام اكثر تأثيرا ضد البكتريا السبحية بمساحة 10 مليمتر .سيبروفلوكسسين هو الأكثر فعالية ضد الاشريكية القولونية ، أنواع الكلبسيلا ، أنواع الشايقيلا و أنواع السودومونس بمساحة تتراوح بين 8 الى 10 مليمتر .

محصلة دراسة الإصابات الداخلية في الابل التي ذبحت في مسلخ تمبول هي وجود البكتريا الهوائية سالبة الجرام وموجبة الجرام التي تم عزلها من العينات التي وجدت بها الإصابات تؤكد بان الإصابات الداخلية لها اثار اقتصادية سلبية تؤثر على الإعدام الكلى او الجزئي للأعضاء .

INTRODUCTION

The Sudan is one of the largest camel populated countries in the world with 3.3 million heads (FAO, 2002). These animals are mainly found in the arid and semi-arid zones of the country. The Sudan and Somalia have 70% of the total African camels and 55% of that of the world camel's population .

Camels are classified as pack and riding types according to the function and some are used in milling oil, pulling water from deep wells and carts. they play a vital role in the socioeconomic life in the rural areas of the country and are also slaughtered for human consumption (Babiker and Tibin, 1988).The camels were, and still are, valued as riding, baggage, draught animals, hair hides and as well as the best food providers in the arid areas. Abscesses, fibrosis, hydatidosis and pneumonia were among the most common problems in meat industry and they are hazardous for abattoir workers and meat inspectors as well as consumers.

In the Sudan camels are susceptible to many diseases according to the season of the year, including parasitic conditions, abscesses and pneumonia (Agab and Abass 1998). Several reports were issued by many investigators, focusing on bacterial pathogens that cause abscesses to determine the actual causative agents (Mohamed and Farah., 1994, Afzal and Hussain, 1996, Al-Taraz, 2001). *Staphylococci*, *Pasterullae*, *E.coli* and *Corynebacterum* spp were found to be the most frequent pathogens involved in the abscess (Younan *et al.,* 2006, Zubair *et al.,* 2004).

Objectives

1- To estimate the prevalence of internal lesions in slaughtered camels at Tambool slaughterhouse.

2- Isolation and identification of bacteria from the lesions.

3- To investigate some potential risk factors associated with internal lesions in slaughtered camels at Tambool slaughterhouse

4- To determine the antimicrobial susceptibility profile of the bacteria recovered from isolated from these lesions.

CHAPTER ONE

LITERATURE REVIEW

1.1. Historical Background

Marisa (2006) stated that although camels were found in Africa, Asia and the Arabian Peninsula. The family Camelidae was probably originated in North America during the Eocene Period (about 50 million years ago) before spreading towards South America, where the family evolved as llamas, alpacas, guanacos and vicuăs, they cross the Bering Strait into Asia, the Near East (Arabia) and Africa via North Africa. In the Old World there are two types of camel: the one-humped (*Camelus dromedarius*) or dromedary, and the two-humped (*Camelus bactrians*) or Bactrian.

The one-humped camel was probably first domesticated about 3000 BC in southern Arabia. From there it spread throughout its present range in the deserts and semi-deserts of Africa and the Near East. The two-humped camel was probably domesticated on the borders of Iran and Turkmenistan, again about 3000 BC. From there it spread west as far as the Crimea, north as far as southern Siberia and east as far as Mongolia and northern China. In Turkey, Iran, Turkmenistan, Afghanistan and the northwestern region of the Indian subcontinent it was later displaced by the one-humped Dromedary's which adapted to heat and dehydration Marisa (2006).

1.2. Types of camels in Sudan

According to the function they perform Camels in Sudan are classified as pack heavy and riding types (ref) Mohamed and Farah (1994) :

1- Pack camels: They were classified into two sections:

A/ Arab camels: They are work camels, which were found in Kordofan and Darfur.

B/ Rashidicamels: They are shorter than Arab camels.

2-Riding camels: They were classified into two sections:

A/ Anafi camels: They are faster with light body color, long legs and have small humps.

B/ Bushari camels: Are considered as general purpose mount camels with better confirmation and a well-developed neck

1.3. Physiology of camels

The Dromedary camels do not store water rather than does any other species, yet they do not need to drink water for days. They can handle extreme dehydration as a result of a number of different physiological adaptations. Camels have been known to lose safely body water equivalent to 40% of its body weight, a loss that would be lethal in any other animal.

Plasma volume is maintained at the expense of tissue fluid, so that circulation is not impaired. Marisa (2006) .

The small oval erythrocyte of the camel can continue to circulate in situations of increased blood viscosity.

Camels can take in a very large amount of water at one session to make up for previous fluid loss. In other animals, this would result in severe osmotic problems. Camels can do this because water is absorbed very slowly from their stomach and intestines, allowing time for equilibration. Furthermore, their erythrocytes can swell to 240% of normal size without bursting. (Other species can only go to 150 %). Higgins (1984) .

Their kidneys are capable of concentrating their urine markedly to reduce water loss. The urine can become as thick as syrup and have twice the salt content of sea water.

They can extract water from their fecal pellets so much that these can be used immediately for fuel upon voiding.

A further adaptation solely for heat is involved in the camel's ability to have a large fluctuation in body temperature (from 97.7 to 107.6 degrees F). During the day, its body acts as a heat sink, and during the cool night of the desert, excess body heat is dissipated by conduction variety. Marisa Montes (2006).

1.4. Role of camels in economy

In the Sudan, camels are frequently used as pack animals, riding and for ploughing and for driving oil mills known as Assarat. In addition they are used for transport during migrations, carrying fuel wood, trade goods and, water for household consumption. Their hides are used for making leather goods. They are used in pulling water from deep wells and carts. Their hair is utilized in making carpets and clothes. Recently camels become an important export commodity.

Camels are also used for lactation; she camels were milked three times a day, producing about nine liters per day in the wet season and six litres in the dry season. The duration of lactation is 12 months, but if the camel does not conceive it will give milk for a second year. Camel milk is sold in small quantities. The major importance of camel milk is its availability in dry seasons and during times of drought when milk from other livestock is scarce. At such times, camel milk contributes from 50 to 100 % of the nutrients intake of some of the pastoralist groups.

Camels, especially males and old, unproductive females may be sold for meat. Camel meat is eaten on ritual or festive occasions. Camels are rarely slaughtered for meat at slaughterhouses.

1.5. Epidemiological study in camels

Agab and Abbas (1998) conducted an epidemiological study on camel's diseases in Eastern Sudan where they reported that internal lesions was common disease problem in the area during the rainy season. In their study the lesions were mostly located on flank or ventral abdomen were affected .

However, Falah *et al* (1990) reported that, camels of all ages were susceptible to the disease. They emphasized that, the causative agents of camels lesions were nonspecific since many bacteria were isolated from the condition. They isolated *Staphylococcus, Actinomcyes*, *Actionbacillus* and *Fusebacterium necrophrum.* Sanaa (1996) studied the prevalence of the disease in Gedariff (Eastern Sudan) and isolated *Staphylococcus aeurus, Corynibacterium pyogens, Streptococcus albus,Bacillus, Micrococcus, Proteus, Nocrdia, Erysipelothrix, Actinomyces, and E.coli.*

Lungs and livers of the *Dromedarius* Tuberculosis has been documented since the 19th century (Littlewood 1888; Lingard 1905 and Lease 1908) cited by Weneray 2007. The disease occurred more frequently when camels were kept in proximity to other camels or in close contact with cattle (Mason 1917; Elmossalumi *et al*., 1971; and Donchenko *et al*., 1975).

Recently kinne *et al* (2006) described Tuberculosis case in *Dromedary* in the United Arab Emirates (UAE) with typical lesions in both lungs and livers .

1.6. Pathogenic and Toxigenic Bacteria

Mohamed and Farah (1994) isolated aerobic bacteria from camels in Sudan and reported 32 aerobic pathogenic and toxigenic species. He also isolated Erwiniabicola, Corynebacterium, Klebsiella aerogonosa, Citrobacterkoseri, and Corynebacterum diphtheria from camels in Sudan.

1.7. Reported Bacteria in camels lesion

Lesion of varying size may be seen in internal lesion of lung ,liver and heart .The disease were characterized by painful swellings that suppurate and slough off leaving a row of well circumscribed lesions at the site of infection Sanna (1996).

Higgins (1986) reported that infectious diseases of camel was a common highly contagious but not fatal disease of all camels. Edelestin and Pegram (1994) investigated herds of camels where the disease showed a sporadic nature. They isolated Streptococcus agalactia and *Staphylococcus* aeurus from the investigated lesions.

Bengoumi (2006) reported the isolation of *Staphylococcus aureus,* and *Corynebacteria* from lesions. Moreover, various organisms have been incriminated as causative agents. Cross (1917) isolated *Streptococci,* from camels necrotic lesions. Curasson (1936) isolated a *Streptothix* from affected camels in Sudan and related the isolates to be *Nocardia farcinica*.

Studies on pyogenic *Streptococci* isolated from camels skin were carried out by Younan (2006), types of *Streptococcus* isolated (*Streptococci agalactia), Streptococcus zooepidemicus* and *Streptococcus dysagalactia*.

Mustafa (1994) in Libya, reported that Bacteriological study on camels lesions and *Cornynebacterum pyogenes*. Afzal *et al*., (1996) studied lymphadenitis in camels in Pakistanand reported the isolation of *Corynecbacterium pseudotuberclosis* from the lesions

1.8. Abscesses

Abscesses are characterized by presence of pus. Pus is typically liquid, creamy in color and consistency, but may be thin and almost watery or semisolid. The definite characteristic of pus is the presence of numerous neutrophilic polymorph nuclear granulocytes (Smith, 1966). Abscess is defined as a circumscribed collection of pus, when

well-developed it has a wall or capsule of fibrous tissue separating it from the surrounding normal tissue. The pus is present in major or minor degree.

1.9. Camels Lungs and Livers abscesses

The pulmonary and hepatic abscesses were the development of a single or multiple abscesses. in the lung may cause chronic toxemia, emaciation and supportive bronchopneumonia may follow In his study Hunt, (1997) stated that, pulmonary abscesses could be due to septicaemic emboli that plug , and many bacterial pneumonias.

Liver abscesses is most common disease in Sudan Agab and Abass (1998) stated that, abscesses in Sudan constitute 35% from diseases occurring in camels in Sudan with a prevalence rate of 8.4%. They also stated that wounds and abscesses were the third most common disease problems affecting camels, with a peak incidence during the rainy seasons. Moreover Eltigani (2004) reported the isolation of suppurative microorganisms from condemned lung abscesses, including *Corynebacterim* spp, *Streptococcus* spp, *Pseudomans* spp and *Actinomyces* spp.

In Mauritania the major constraint of camels breeding was found to be the abscesses mainly in young camels. Bacteriological analysis of pus samples resulted in the isolation of *Staphylococcus aureus, Klebsiella pneumone, Psuedomans* spp and *Streptococci* (Kane *et al*., 2003). In Tunisia Seddik *et al*., (2003) also reported the isolation of *Staphylococcus* spp, *Corynetacterium pseudotuberclosis* and *Actinomyces pyogense*.

1.10. pneumonia in Sudan and other part of the world

Some workers studied camel pneumonia in Sudan and other part of the world (Khan, 1970;. McGrane and Higgins, 1985; Mustafa, 1992; Nasr, 2003). Their studies stated the seasonality in the occurrence of camel pneumonia and established the many etiological agents responsible for the condition such as *Staphyolcoccusspp, CorynebacteriumSpp, Streptococcus* spp, *Klebsiella pneumonae,* Diplococcus *pneumoniae,* E. *coli, Bacillus* spp, Pasteurella spp, Haemophilus somnus Micrococcus spp, *Actinomyces* spp and *Mycobacterium* spp.

Flora of the respiratory tract was investigated by many workers; Shigidi, (1973) reported the isolation of *Bacillus species, Staphylococcus, Corynebacterium pyogense*, *Pasterulla* species and *Aspergillus*.

In India, Chauhan, *et al* (1986) studied the bacterial flora of upper respiratory tract of 219 apparently healthy camels. They isolated *Staphylococcus, E. coli, Diphteria, Klebsiella,Corynebacterium*, *Streptococcus* Species, *Anthracoides, Tetracocci* and *Neisseria* spp.

1.11. AerobicBacteria Causing Internal lesions

- *Staphylococcus* species
- *Streptococcus* species
- *Corynebacterium* species
- *Bacillus* species
- *E- Coli*
- *Salmonella* species
- *Shieilla* species
- *Klebsiella* species
- *Pseudomans* species

1.12.1. *Staphylococcus* species

The *Staphylococcus* a Gram- positive cocci, that tend to be arranged in irregular clusters (bunches of grapes) such as S. aureus, S. intermedues, *epidermidis* and S. *sciturs*.

Pathogenesis

Staphylococcus is pyogenic and is associated with abscess formation and suppuration. Pus is composed of bacteria and can be surrounded by intact phagocytic cells and fibrin strands. A fibrous capsule with Staphylococcal wound infection (botryomycosis) the lesion is graulomatous with pockets of pus throughout the tissue (Glean, 2005).

The pathogenic *Staphylococcus* produce toxins, and enzymes, Staphylococcal scalded skin syndrome (SSSS), toxic shock syndrome (TSS), are due to alptoxin. Enzymes produced by *Staphylococcu*s include Staphylokinase, coagulase, hyluriondase and protease(Monica, 2006).

1.12.2. *Streptococci*

Streptococcus is non-motile (vary exception)Gram-positive that occur in pairs or chains. According to Lancefield *Streptococcus* is *S.pyogense*, *S.agalactia*, *dysagalactia* and *penumniae*.

Pathogenesis

The pathogenesis of *Streptococcus* depends on toxins, enzymes and proteins produced. Toxins include erythrogenic toxin and leukocidin, wheras enzymes include Streptolysin**,** Hyaluronidase and Streptokinase**s.** While proteins include protein M. (*Quinn,* 1994).

1.12.3. *Corynebacterium*

The *Corynebacterium* is small pleomrophic Gram-positive rods that occur in rods, coccoid, club or filamentous shapes. Many have metachormatic granules (high phosphate stores). The *Corynbacteria* are non-spore forming .

Pathogenesis

Corynebacteria cause suppurative conditions. The virulence of the organism depends on activity and thecellwall lipids. It produces diffusiblefactors phospolipase C and cholesterol oxidase (Monica, 2006)**.**

1.12.4. Other Gram- positive (Bacillus)

gram-positive,rod,not acid fastaerobic, produce heatresistant spores variablecatalase-positive

1.12.5. *Escherichia coli*

Escherichia coli is a natural inhabitant of the large and small intestine in animals and are geographical spread and may widely distributed out the environment and of animal .

Escherichia coli strains, normally regarded as non-pathogenic, can cause opportunistic infection in sites of the body such as mammary gland and uterus (Quinn, *et al*., 2002). The organisms had also been isolated from different lymph nodes of camel (Mohamed, 1992).This finding indicate that camels are vulnerable to *Escherichia coli* infection in gastrointestinal organs including the liver and lymph nodes.

Ambwani and Jatkar (1969) studied sensitivity of *Escherichia coli* and Salmonella isolated from camel (*Camelus dromedarius*) to various antibiotics, from the results of the in vitro test, it appears, that majority of strains of *E. coli* and Salmonella are sensitive to chlortetracycline, oxytetracycline and chloramphenicol.

1.12.6. *Shigella*

It is gram negative motility bacteria and positive macconkey growth and negative urease

1.12.7. *Klebsiella*

Usually communally equived with chronic extensive fibrous scarring, abscesses formation and necrosis (Cotton, 1992) .It was isolated by Mohamed (1992) from different lymph nodes of camels in the Sudan. Arora and kalra (1973) isolated *Klebsiella species* from broncopneumonia in camels.

The first isolation of Klebsiella organisms in the Sudan was made by Gameel , El Sanousi, Al-Nawawi and Al-Shazly (1991) from sheep suffering from pneumonia.

1.12.8. *Pseudomans*

Pseudomonas species are Gram-negative rod, some species may produce soluble pigments. *Pseudomonas* produces a number of exotoxins and endotoxins such as protease and haemolysin. Villi of *Pseudomonas* facilitate adherence to epithelial cells and some have a capsule that is antiphagocytic (Barrow, 1991).

CHAPTER TWO

MATERIALS AND METHODS

2.1. Study area

This study was carried out in central region of Sudan (Tambool abattoir - Gazera State), and Tampool city is in Butana plains (130 km South East Khartoum) , this location was known to be heavily populated with camels (*Camillus dromedarieus*). Camels in these areas was used for meat production, riding and milk production.

2.0 Sample

2.2.1 Sampling Strategy

Across-sectional study will be conducted for period of six months , from January to June 2013 at Tambool abattoir **(**represent in Butana area) **.** Seventy samples (70) of internal lesion (37 lungs, 31 liver and 2 heart) picked from 280 Carcasses of camels varying in ages, sexes, breeds, body conditions, origins and types of lesions will be exanimated.

2.2.2 Sample Size

The sampling size (n) has been determined as per the standard formula of Thrusfield (2007) taking account a 95 % confidence interval , 5% desired precision and expected prevalence .The sample size was calculated to be 280 animals .B y using the formula :

$$n = \frac{(1.96)^2 \times Pexp \times (1- Pexp)}{d^2}$$

where

n =Requested sample size

Pexp = Expected prevalence rate

d = Desired absolute precision $\pm$ 5 %

2.3. Samples Groups

Study animals were categorized according to :

A- Ages : young (day – 4 months) or adult (over 4 months)

B- Sexes : Male or Female

C- Local breed : Annafi , Bushari ,Rezaigi ,Kabashi and Rashidi

D- Origin :Darfor , Kordofan ,Kassala ,Eldamazin and El Gazera

E- Site of lesion : Lung , Liver and Heart

F- **Body Conditions** : Normal , Obese and Emaciated

G- **Type of internal lesion** : Pneumonia ,Hydatidosis ,Abscesses , Calcification , Congestive in Heart , Fibrin and Change in color (white drops and black drops)

H- **Types Organs** : With lesion or Without Lesion

2.4. Specimen Collection

Specimens were taken aseptically and preserved in sterile bags under cold condition and then transported to Sudan University of Science and Technology , college of Veterinary Medicine Laboratories at bacteriological analysis and Epidemiological Investigations were performed.

Samples were opened under sterile condition using sterile blades, pus was taken by a loop and cultured aerobically human blood agar, Mac Conkeyagar and sub cultured in nutrient agar.

2.5. Sterilization

2.5.1.Sterilization by Hot oven

This was done according to Stainer *et* al, (1986) and was used for sterilization of clean glass containers which were wrapped in paper or put in stainless steel cans, temperature at 160° C for one hour.

2.5.2.Sterilization by flame

This method was used for sterilization of straight wire and tissue forceps. It was done by holding the object over flame as near and vertical as possible until it becomes red hot Cruickshank *et* al, (1975).

2.5.3.Sterilization by autoclaving

Sterilization by autoclaving was used for sterilizing culture media and for materials that could not with stand the dry heat. The temperature was 115-121° C under 10-15 pounds pressure for 15-20 minute. (Barrow and Feltham, 1993**).**

2.6. Preparation of bacteriological media

Culture media used throughout the bacteriological investigations were prepared according to the formulae presented by the manufacturers. Briefly, powder bases of these media: Blood agar, MacConkey agar, and Nutrient agar, were weighted as follows 40 grams, 59 grams 25 grams respectively, then dissolved, and autoclaved at 121°C/ 15 pound per square inch for 15 minutes. Then they were left to cool at 45-50 °C, and poured into their appropria00te containers such as Petri dishes. After being dispensed the prepared media were conserved at 4 °C in refrigerator till being used.

2.7. Bacteriological Protocol

Blood Agar, Mac Conkey Agar and Nutrient Agar were used and streaked by swabs from the specimens and then incubated at 37°C for 24 hours. The primary cultures were examined for bacterial growth, then smeared for gram stain to identify Bacterial shape. Observed colonies were differentiated according to their hemolysis patterns, size, color, surface and shape different types of colonies were sub cultured in special media(manitol agar , egg yolk agar ,DCA ,EMB, KIA , Simon Satarate) for purification and were incubated at 37°C for 24 hours.

2.8. Identification of the isolated bacteria

To identify Gram-positive and Gram- negative bacteria in these lesions were used (special media, carbohydrates reduction and biochemical testing).

2.8.1. Procedure to identify bacteria

This procedure was performed as per the manufacturer's directions. Briefly, the pure culture was inoculated in sterile Pasteur pipette within saline suspension , this process also rehydrate the desiccated medium in each tube ,which was filled by bacterial suspension .

2.8.2. The biochemical reactions

After incubation of bacterial suspension in a humidity chamber for 24 hours at 37°C ,then a drop of bacteria suspension for Oxidase tests, Catalase tests and motility tests were carried out separately using the conventional methods that were described and reading the

reaction to described bacteria. Also suitable biochemical testing was used according to isolated bacteria to identify their species. The test includes Indole test , Vogas Prokauer , Nitrate reduction and Urease test.

Carbohydrate reduction to identify bacterial species (Lactose ,Sucrose ,Trehalose ,Xylose ,Raffinose ,Maltose ,Mannitol , Sorbitol ,Simmons's citrate and O/F) and H_2S production was also exanimated .All reactions were recorded in Result Sheets.

2.8.3. Identification of the bacteria

The generated results (plus the oxidase, catalase , motility tests ,carbohydrates reduction and biochemical reaction that were performed separately) were compared with the standard tables provided in Cowan and Steel Manual for identification of Medical Bacteria (1974).

2.9. Antimicrobial Susceptibility testing

In nutrient agar bacterial suspension which isolated and identified was cultured by swab , then we put the disc of test which filtered by antimicrobial test (Penicillin 10 , Amoxicillin 10 ,Cloroamfenicol) to gram positive bacteria and (Tetracycline 30mcg , Ciprofloxacin 5mcg ,Ampicillin / sulbactam 20 mcg) to gram negative bacteria .

After incubation in Humidity chamber for 24 hours at 37 °C ,the clear zone surrounding the antimicrobial disc was appear . The reactions diameter were measured in centimeters . All reaction were recorded in Result Sheets .

CHAPTER THREE

RESULTS

3.1. The overall prevalence internal lesions

Generally, internal lesions were detected in camels slaughtered at Tambool slaughterhouse with variations between different age groups, breeds, sexes, and origin of animal as presented in Table 1. The overall prevalence was 25.0% (70/280) with 95% CI of ±5.07.

3.2. Prevalence of risk factors in internal lesions

Regarding the origin of investigated camels, the highest prevalence of internal lesions was in camels from Darfur (70.3%; 26/37, with 95% CI between 55.6 and 85.0) while the lowest was in camels from Kassala (12.2%; 278/420, with 95% CI between 5.12 and 19.3). The prevalence in camels from Darfur was significantly higher than in camels from other geographical areas (Table 1).

There were differences in the prevalences estimated among different breeds; Rezaigy camels (70.3%; 26/37, with 95% CI between 55.6 and 85.0)were showing a significantly higher prevalence than the prevalence in Anaafi, Kabashi, and Rashiadi camels. while in contrast Rashiadi camels were showing the lowest prevalence (12.2%; 278/420, with 95% CI between 5.12 and 19.3), as shown in Table 1.

There were no statistically significant differences in the prevalence of internal lesions in camels of different age groups. Camels that were ≤ 4years old were showing a lower prevalence of 20.3% (25/123), (95% CI 13.2 - 27.4), and camels that were >4 years old were showing a higher prevalence of 28.7% (45/157), (95% CI 21.6 - 35.8), as depicted by Table 1.

Females were showing a higher prevalence (35.1%; 65/185, 95% CI 28.2 - 42.0), whereas males were showing a lower prevalence (5.30%; 5/95, 95% CI 0.79 - 9.81) – (Table 1).

Statistical significant differences in the prevalence of internal lesions in camels with different body conditions were observed. Camels with poor body condition were showing the highest prevalence of 51.9% (27/52), (95% CI 38.3 - 65.5), however, camels with good

body condition were showing the lowest prevalence of 13.0% (9/69), (95% CI 5.06 - 20.9 – (Table 1).

Table 1: Observed prevalences of internal lesions of camels by origin, sex, age breed, and body conditionin Tambool slaughterhouse

Factor	**No. inspected**	**No. with lesions**	**%**	**95% CI**
Origin				
Algazira	123	24	19.5	12.5-26.5[a]
Kordofan	38	10	26.3	12.3-40.3[a]
Darfour	37	26	70.3	55.6-85.0[b]
Kassala	82	10	12.2	5.12-19.3[a]
Sex				
male	95	5	5.30	0.79-9.81[a]
female	185	65	35.1	28.2-42.0[b]
Age				
≤ 4	123	25	20.3	13.2-27.4[a]
> 4	157	45	28.7	21.6-35.8[a]
Breed				
Anaafi	123	24	19.5	12.5-26.5[a]
Rezaigy	37	26	70.3	55.6-85.0[b]
Kabashi	38	10	26.3	12.3-40.3[a]
Rashiadi	82	10	12.2	5.12-19.3[a]
Body condition				
good	69	9	13.0	5.06-20.9[a]
moderate	159	34	21.4	15.0-27.8[a]
poor	52	27	51.9	38.3-65.5[b]
Total	280	70	25.0	19.9-30.1

3.3. Univariate association with internal lesions

The proportions of internal lesions detection differed between geographical origin, breeds, age groups, and males and females. In the univariate analysis using chi square, origin (x^2 = 49.6, df = 3, p-value = 0.001), sex (x^2 = 29.9, df = 1, p-value = 0.001), breed (x^2 = 35.1, df = 3, p-value = 0.001), and body condition (x^2 = 26.5, df = 2, p-value = 0.001) were significantly associated with the detection internal lesions. However, age (x^2 = 2.56, df = 1, p-value = 0.110) was not significantly associated with internal lesions detection (Table 2).

Table 2: Univariate associations of risk factors with internal lesions in camels in in Tambool slaughterhouse

Factor	No. inspected	No. with lesions	%	x^2	df	p value
Origin				49.6	3	0.001
Algazira	123	24	19.5			
Kordofan	38	10	26.3			
Darfour	37	26	70.3			
Kassala	82	10	12.2			
Sex				29.9	1	0.001
male	95	5	5.30			
female	185	65	35.1			
Age				2.56	1	0.110
≤ 4	123	25	20.3			
> 4	157	45	28.7			
Breed				35.1	3	0.001
Anaafi	123	24	19.5			
Rezaigy	37	26	70.3			
Kabashi	38	10	26.3			
Rashiadi	82	10	12.2			
Body condition				26.5	2	0.001
good	69	9	13.0			
moderate	159	34	21.4			
poor	52	27	51.9			

3.4. Univariate association with internal lesions

The logistic regression analysis revealed that revealed that geographical origin (Darfour) sex (she-camels), breed (Rezaigy), and body condition (poor) were associated with odds of observing internal lesions in camels' carcasses (Table 3).

Table 3: Multivariate associations of risk factors with internal lesions in camels in in Tambool slaughterhouse (January to June 2013)

Risk factor	No. inspected	No. with lesions	**Exp(B)**	***p-value***	**95% CI forExp(B)**
					Lower - Upper
Origin					
Kassala	82	10	ref		
Algazira	123	24	1.74	0.171	0.786 - 3.876
Kordofan	38	10	2.57	0.057	0.966 - 6.846
Darfour	37	26	17.0	0.001	6.473 - 44.74
Sex					
male	95	5	ref		
female	185	65	9.75	0.001	3.773 - 25.20
Breed					
Rashiadi	82	10	ref		
Anaafi	123	24	1.74	0.171	0.786 - 3.876
Rezaigy	37	26	17.0	0.001	6.473 - 44.74
Kabashi	38	10	2.57	0.057	0.966 - 6.846
Body condition					
good	69	9	ref		
moderate	159	34	1.81	0.143	0.818 - 4.022
poor	52	27	7.20	0.001	2.966 - 17. 48

3.4. Organs with lesions

Lesions were detected in different internal organs including lungs, liver and heart. Lungs inflammation (pneumonia) (51.4%) was the most observed pathology followed by hepatic lesions (45.7%) and the least (2.90%) was inflammation of the heart muscle (myocarditis). However, no other internal organs showed any kind of pathologies during the period of the study.

Table 4: Internal lesions in lungs, livers, hearts and other organs of camels in in Tambool slaughterhouse

Organ	No. of lesions	%
Lung	36	51.4
Liver	32	45.7
Heart	2	2.90
Other organs	0	0.00
Total	70	100

3.5. Bacteria isolated from internal lesions

In this study, 179 aerobic bacteria belonging to 9 genera were detected (Table 1). Most of the isolates (n = 107; 59.8%) were gram positive bacteria (cocci and bacilli), whereas the rest (n = 72; 40.2%) were gram negative rods.

Staphylococcus species were the most frequent (32.0%), followed by *E. coli* (26.0%), *Streptococcus* species (18.0%), *Corynebacterium* species (5.0%), *Bacillus* species, *Salmonella* species, *Pseudomonus* species, and *Klebsiella* species; each of them 4.0%, and *Shigella* species (2%) from the total isolate.

3.6. Gram positive bacteria

3.6.1. *Staphylococcus* species

Fifty eight *Staphylococcus* species have been isolated and identified as *Staphylococcus aureus* (n = 28, 26.2%), *Staphylococcus intermedius* (n = 8, 7.5%), *Staphylococcus epidermidis* (n = 18, 16.8%), and *Staphylococcus citreus* (n = 4, 3.75%).

3.6.2. *Streptococcus* species

Three *Streptococci* species; *Streptococcus pyogenes* (n = 15, 14.0%), *Streptococcus agalactiae* (n = 13, 12.1%), and *Streptococcus pneumonia* (n = 5, 4.67%) were observed in the present study.

3.6.3. *Corynebacterium* species

This organism represented 8.4% (n = 9) of the total gram positive isolates. *Corynebacterium pseudotuberculosis* (n = 4), *Corynebacterium renale type 1* (n = 4), *and Corynebacterium diphtheria*(n = 1).

3.6.4. *Bacillus* species

Bacillus species were found at a frequency of 6.5% of the whole isolates. *Bacillus mycoides* (n = 3) *and Bacillus subtilis* (n = 4) were isolated and identified.

Table 5: Number of gram positive bacteria isolated from internal lesions of lungs, livers, hearts and other organs of camels in in Tambool slaughterhouse

Gram positive bacteria	No.	%
Staphylococcus aureus	28	26.2
Staphylococcus intermedius	8	7.50
Staphylococcus epidermidis	18	16.8
Staphylococcus citreus	4	3.75
Streptococcus pyogenes	15	14.0
Streptococcus agalactiae	13	12.1
Streptococcus pneumoniae	5	4.67
Corynebacterium	4	3.75
pseudotuberculosis	4	3.75
Corynebacterium renale type 1	1	0.93
Corynebacterium diphtheria	3	2.80
Bacillus mycoides	4	3.75
Bacillus subtilis		
Total	107	100

3.7. Gram negative bacteria

3.7.1. *Escherichia coli*

Escherichia coli isolated and identified bacteria ,most isolate among the gram negative species (64.9%) – (table 6).

3.7.2. *Salmonella* species

Salmonella species represented 9.7% from all gram negative bacteria. *Salmonella paratyphi* A and *Salmonella pullorum* were isolated 4 and 3 times, respectively%) – (table 6).

3.7.3. *Klebsiella* species

Only one species has been isolated belonging to the genus *Klebsiella* representing 11.1% of the whole gram negative isolates. *Klebsiella pneumoniae* was isolated and identified 8 times.

3.7.4. *Shigella* species

One species has been isolated and that was *Shigellasonnei*3 times and that comprised 4.17% from the total number of gram negative bacteria.

3.7.5. *Pseudomonus* species

Only one species has been isolated belonging to the genus *Pseudomonus* representing 11.1% of the whole gram negative isolates. *Pseudomonas aeruginosa* was isolated and identified 8 times.

Table 6: Number of gram negative bacteria isolated from internal lesions oflungs, livers, hearts and other organs of camels in in Tambool slaughterhouse

Bacteria	No.	%
Escherichia coli	46	64.9
*Salmonella paratyphi*A	4	5.56
Salmonella pullorum	3	4.17
Klebsiellapneumoniae	8	11.1
Shigellasonnei	3	4.17
Pseudomonas aeruginosa	8	11.1
Total	72	100

3.8. Drug susceptibility testing

As displayed in (Table 7), chloramphenicol was the most effective antibiotic against *Staphylococcus* species, *Corynebacterium* species,and *Bacillus* species, each with inhibition zone of 10 mm. while Penicillin g 10 was more against *Streptococcus* species with inhibition zone of 10 mm.

Table 7: Bacterial Growth Inhibition Zones (mm) showing Susceptibility and Resistance of the Gram +ve Bacteria isolated from internal lesions of lungs, livers, hearts and other organs of camels in in Tambool slaughterhouse

Gram positive bacteria	Penicillin g 10	Amoxicillin 10	Chloramphenicol
Staphylococcus spp.	5	7	10
Streptococcus spp.	10	8	8
*Corynebacterium*spp.	2	7	8
Bacillus spp.	1	2	10

Ciprofloxacin 5 mcg and Ampicllin/Sulpactum 20 mcg were effective against *E. coli*, *Salmonella* species, *Klebsiella* species, *Shigella* species, and *Pseudomonas* species with inhibition zones of 8 and 10 mm (table 8).

Table 8: Bacterial Growth Inhibition Zones (mm) showing Susceptibility and Resistance of the Gram –ve Bacteria isolated from internal lesions of lungs, livers, hearts and other organs of camels in in Tambool slaughterhouse

Bacteria	Tetracycline 30 mcg	Ciprofloxacin 5 mcg	Ampicllin/Sulpactum 20 mcg
Escherichia coli	7	8	8
Salmonella spp.	2	10	8
*Klebsiella*spp.	4	5	8
*Shigella*spp.	2	8	8
Pseudomonas spp.	1	3	8

CHAPTER FOUR

DISCUSSION

Many apparently healthy slaughtered camels were found to have one or more internal lesions in one or more organ (Bekele, 2008; Awol *et al*., 2011). In this study, 25.6% of the examined the carcasses of the slaughtered camels had internal lesions in the lungs, livers, and hearts and this was lower than the reports of Awol *et al*. (2011) and Teklu (2008) from Ethiopia which were 77.5% and 98.0% and the report of Abubaker *et al*. (2011) from Nigeria which was 64.0%. These observed difference in occurrence of internal lesions could be due to variation in sample size or due to variation among geographical areas from where the camels are originated.

The highest prevalence of internal lesions was in carcasses of camels from Darfur while the lowest was in carcasses of camels from Kassala. The prevalence in carcasses of camels from Darfur was significantly higher than in carcasses of camels from other geographical areas. The same was observed for Rezaigy camels when compared with camels from other breeds. This might be due to the stress of the long-distance travel.

The difference between the prevalences reported from males and females were significantly dissimilar. This was different from the findings of Tenaw *et al*. (2015) who found no significant difference in the prevalence of lungs lesions between sexes. Females were showing a higher prevalence than males, this might be due to the high number of females investigated in comparison to males.

Significant differences in the prevalence of internal lesions in camels with different body conditions were observed. Camels with poor body condition were showing the highest prevalence, however, camels with good body condition were showing the lowest prevalence. Tenaw *et al*. (2015) made the same observation and reported that lung of camels having poor body condition score was found to be highly affected with pneumonia when compared to camels with medium and good body condition score.

Origin, sex, breed, and body condition were associated with the detection internal lesions univariate analysis using chi square. However, age was not significantly associated with internal lesions detection. Prevalence of lesions due to hydatid cyst in the lungs of slaughtered camels was related to body condition score ($p \geq 0.000$) while it was not influenced by sex. Furthermore, body condition score and sex were not associated with lesions due to

hydatid cyst in the livers (Tenaw *et al*., 2015). Prevalence of emphysema and pneumonia in the lungs of slaughtered camels was not related to body condition score and sex (Tenaw *et al*., 2015).

Cultural variations as well as social activities, animal production and improper disposal of dead animals (Yifat *et al*., 2011; Tenaw *et al*., 2015).

Lesions were detected in different internal organs including lungs, livers and hearts. The prevalence of lesions in the lungs herein was higher than the prevalences reported by Aljameel *et al*. (2013) in slaughtered camels in Nyala, the Sudan, and by Al-Tarazi, (2001) in Jordan which were 13.3% and 10.2%, respectively, while it was lower than the prevalence reported by Tenaw *et al*. (2015) in Ethiopia which was 59.7%. The lungs receive the objects that enter the body by inhalation through the respiratory tract and this makes them prone to damage and lesions formation (Emphysema and pneumonia could be due to exposure of animal to bacterial or viral origin infections, stress factors including exposure to dust and starvation. Moreover, penetration of lung by foreign body, adverse weather condition or accidental inhalation of liquid may cause pneumonia (Amene *et al*., 2012; Tenaw *et al*. 2015). The percentage of hepatic lesions in the present study coincided with the findings of Nuseba *et al*.. (2014) who found a prevalence of 50.0%. However, other researchers like Ahmedullah *et al.* (2007), Cadmus and Adesokan (2009), Mellau *et al,* (2010), and Tenaw *et al*. (2015) found hepatic lesions in 3.8% to 29.0% of the livers of the slaughtered camels in Nigeria and Bangladesh. Hepatocytes destruction induced by worms like liver flukes and removal of toxic materials that have been absorbed from the gut enhance liver lesions and colonization of the these lesions by opportunistic bacteria (Scanlan and Edwards, 1990). Condemnation of hearts due to myocarditis was observed in percentage in this study typifying the findings of Tenaw *et al*. (2015) who reported that 1.55% (n=6) of the hearts of slaughtered camels were found with lesions. However, no other internal organs showed any kind of pathologies during the period of the study.

A number of aerobic bacteria, gram positive cocci and bacilli and gram negative rods, belonging to 9 genera were detected in this study. Nuseba *et al*. (2014) was able to grow 81 isolates of different microorganisms; fifty six (76%) were gram-positive bacteria, 20 (24%) were gram negative bacteria, and 5 (7 %) were fungi.

Staphylococcus species were the most frequent, followed by *E. coli*, *Streptococcus* species, *Corynebacterium* species, *Bacillus* species, *Salmonella* species, *Pseudomonus* species, and *Klebsiella* species; each of them, *Shigella* species from the total isolate. Among the gram positive bacteria isolated from the hepatic lesions by Nuseba *et al*. (2014), 31.3% (n=25) were *Staphylococcus* spp., 12.3% (n=10) *Streptococcus* spp., 12.3% (n=10) *Micrococcus* spp, 6.1% (n=5) *Corynebacterium* spp., 3.7% (n=3) *Bacillus cereus*, 1.2% (n=1) *Clostridium novyi*, 1.2% (n=1) *Listeria monocytogenes* and 1.2% (n=1) were *Lactobacillus plantarum*. Gram-negative were 8.6% (n=7) *Pseudomonas aerogenosa*, 7.4% (n=6) *Escherichia coli*, 4.9% (n=4) *Acinetobacter* and 3.7% (n=3) *Klebsiella pneumonia.* Moreover, 4.9% (n=4) yeast and one fungus (1.2%), *Actinomyces viscosus* were recovered. Aljameel *et al*. (2013) isolated the following bacteria from the lesions of the lungs: *Staphylococcus aureus*, *Streptococcus* spp., *C. pseudotuberculosis*, *A. pyogenes* were isolated from the lesions of the lungs while Al-Tarazi (2001), Azmi (2008), Abubakar *et al*. (2010) and Kinne *et al*. (2011) detected *Staphylococcus* spp., *Streptococcus* spp. and *Corynebacterium* spp. The isolation of *C. pseudotuberculosis* serotype I in this study, coincided with the findings of Tejedor *et al*. (2008) and Aljameel et al. (2013). Other bacterial isolates in this study, such as *Pseud. aeruginosa*, *M. luteus*, *E. durans*, *B. cereus*, *Prot. vulgaris*, *Enter. aerogenes*, *Past. multocida* and *K. pneumoniae* subsp.*pneumoniae* were previously reported as having association with pneumonia in the dromedary camel (Barbour *et al*., 1985; Bekele, 1999 and Younan *et al*., 2005). Afzal, *et al*, (1996) and Abraheem (2009) reported *Staphylococcus, Corynebacterum, E .coli*, *Stretococcusspp* and *Pasterulla*, in camel lungs. isolation of *Bacillus*spp, *Micrococucus* spp. and *E. coli* from abscessesgo with the work of Eltigani *et al*, (2004), Mohamed and Farah (1994). Abraheem (2009) isolated different organisms from abscesses from Tampool and Gedarif slaughterhouses constituted 45.0% and 40.1%, respectively, of total organisms isolated, whereas *Streptococcus* species constituted 2.5%, from Tampool and 3.7%. From Gedarif. These results indicate that *Staphylococcus* species was the predominant organism.

The growth inhibition efficiency of Penicillin g 10, Amoxicillin 10, and Chloramphenicol was tested against Gram positive bacteria and of Tetracycline 30 mcg, Ciprofloxacin 5 mcg, and Ampicllin/Sulpactum 20 mcg against Gram negative bacteria.

Chloramphenicol was the most effective antibiotic inhibiting the growth of Gram positive bacteria, Amoxicillin 10 was fairly effective and Penicillin g 10 did not inhibit the growth of *Bacillus* species. Ampicllin/Sulpactum 20 mcg was the most effective antibiotic inhibiting the growth of Gram negative bacteria, Ciprofloxacin 5 mcg was fairly effective and Tetracycline 30 mcg did not inhibit the growth of *Pseudomonas* species. This was similar from the findings of Tiwari et al. (2015) who found that Chloramphenicol was among the highly sensitive drugs and conversely Amoxycillin and Ampicillin/Sulbactum were resisted in most cases. Shuaib et al. (2016) found out that Ciprofloxacin (5 mcg), Amikamicin (30 mcg), Cephalexin (30mcg), and Impenen (10 mcg) efficiently inhibited the growth of most isolated bacteria in their study while Cefotaxime, Ampicillin/Sulbactam (30 mcg), Bactricin (10 mcg), Ceftizoxime (30 mcg) and Amoxacillin (30 mcg) were the less effective or totally ineffective antibiotics in inhibiting bacterial growth. Cholaramphenicol (30 mcg) and Penicillin-G (10 unit) inhibited bacterial with varying degrees. Shuaib et al. (2016) mentioned that the dynamic of drug-resistant bacteria in animals in the Sudan is most likely related to the storing conditions of veterinary drugs, liberated uncontrolled trading, and arbitrary use of these drugs by animal owners.

CONCLUTIONS

It can be concluded that internal lesions are prevalent in camels slaughtered at Tambool slaughterhouse. In the univariate analysis using chi square, origin, sex, breed, and body condition were significantly associated with the detection internal lesions. However, age was not significantly associated with internal lesions detection. Many gram positive bacteria and gram negative bacteria were isolated from the samples collected from these lesions including *Staphylococcus* species, *E. coli*, *Streptococcus* species, *Corynebacterium* species, *Bacillus* species, *Salmonella* species, *Pseudomonus* species, *Klebsiella* species, and *Shigella* species. Chloramphenicol and Penicillin g 10 were effective against most gram positive bacteria and ciprofloxacin 5 mcg and ampicllin/sulpactum 20 mcg were effective against gram negative bacteria.

RECOMMENDATIONS

1- An extended study to investigate to prevalence of internal lesions in carcasses of camels and other animals
2- The economic magnitude of internal lesions resulting in partial and/or total condemnation of organs should be evaluated
3- Molecular epidemiology of the isolates to determine their origin is highly recommended.

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APPENDIXES

Table No. (1) : First stage of Gram-positive bacteria

Test	Staphylococcus	Streptococcus	Corynebacterium
Shape	Sphere (coccus)	Sphere (coccus)	Sphere (coccus)
Acide fast	negative	negative	negative
Spore	negative	negative	negative
Motility	negative	Differnet reaction	positive
Groth in air	positive	positive	positive
Calalase reaction	positive	negative	positive
Oxidase reaction	negative	negative	negative
Galacose (acide)	positive	positive	positive
Carbohydrates (F /O/ -)	F	F	F/-

Table No. (2) : Identification of Staphylococcus

Biochemical test	**Staphylococcus Aureus**	**Staphylococcus Intermedus**	**Staphylococcus Epidermidis**	**Staphylococcus Sciturs**
Oxidas	negative	negative	negative	positive
Coagulas	positive	positive	negative	negative
Sucrose	positive	positive	positive	positive
V.P*	positive	negative	positive	negative
Lactose	positive	positive	Defrnet	negative
Maltose*	positive	positive	positive	positive
Mannitol	positive	positive	negative	positive
Fructose	positive	positive	positive	positive
Trehalose*	positive	positive	negative	positive
Xylos	negative	negative	negative	negative
Nitrat	positive	positive	positive	positive
Mannose	positive	positive	positive	Inferred reaction

Table No. (3) :Identification of Streptococcus

Biochemical test	**Streptococcus Pyogene (haemolyticus)**	**Streptococcus Agalactiae**	**Streptococcus Pnemniae**
Haemolysis (on blood agar)	ß	ß/–	α
Vogas-prokauer*	negative	positive	negative
Motility	negative	negative	negative
Ribose *	negative	positive	negative
Arabinose	negative	negative	negative
Monnitol	Different reaction	negative	negative
Sorbitol	negative	negative	negative
Sucrose	positive	positive	positive
Lactose	positive	inferred reaction	positive
Trehalose	positive	positive	positive
Raffinose	negative	negative	inferred reaction

Table No. (4) :Identification of Corynebacterium

Biochemical test	Corynebacterium Pseudotuberculoses	Corynebacterium Renale type 1	Corynebacterium Diphtheriae
Motility	negative	negative	negative
Catalas	positive	positive	positive
Metachromatic -granules	Different reaction	positive	positive
Haemolysis	Different reaction	negative	negative
Growth improved by blood	positive	positive	positive
Carbohydrate breakdown (F /O/ -)	F	F	F
Carbohydrates			
Glucose	positive	positive	positive
Lactose	negative	negative	negative
Maltose	positive	d	positive
Mannitol	negative	negative	negative
Sucrose	negative / strain positive	negative	negative
Trehalose	negative	d	negative
Xylos	negative	negative	positive
V.P	negative	negative	negative
Nitrate reduction	positive	negative	negative
Ureas	negative	positive	positive

Table No. (6) : Gram Positive Bacerial Species & Site of lesion

Staphylococcus Species & Site of lesion

Staphylococcus Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
Staphylococcus Aureus	12	15	1	48%	28
Staphylococcus Intermedus	1	7	0	14%	8
Staphylococcus Epidermidis	8	10	0	31%	18
Staphylococcus Sciturs	4	0	0	7%	4
Total	**25**	**32**	**1**		**58**

Table No. (7) : Streptococcus Species & Site of lesion

Streptococcus Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
St.Pyogene (haemolyticus)	8	7	0	45%	15
St. Agalactiae	5	8	0	39%	13
St.Pnemniae	4	1	0	15%	5
Total	**17**	**16**	**0**		**33**

Table No. (8) : Corynebacterium Species & Site of lesion

Corynebacterium Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
C.Pseudotuberculoses	0	4	0	44%	4
C. Renale type 1	2	2	0	44%	4
C. Diphtheriae	1	0	0	11%	1
Total	**3**	**6**	**0**		**9**

Table No. (9) : Bacillus Species & Site of lesion

Bacillus Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
Bacillus Mycoides	3	0	0	43%	3
Bacillus Subtilis	2	2	0	57%	4
Total	**5**	**2**	**0**		**7**

Table No. (5) : Identification of other Gram positive bacteria (Bacillus)

	Bacillus Mycoides	**Bacillus Subtilis**
Gram reaction	positive	positive
Motility	negative	positive
Carbohydrates , acide from:		
Glucose	positive	positive
Mannose	negative	positive
Raffinose	negative	positive
Xylos	negative	positive
Ureas	differnet	negative
Indol	negative	negative
V.P	positive	d
Oxidoas	d	negative

Table No. (10) : First stage of Gram- Negative Bactiria

	Salmonella		Klebsiella	Shigella	Pseudomonus
	Paratyphi-A	Pullorum	Pneumoniae	Sonnei	Aerginosa (pyocyanea)
Motility	positive	negative	negative	negative	positive
Oxidase					positive
Yellow pigment	negative	negative	negative	negative	negative
Brown pigment					positive
Red pigment	negative	negative	negative	negative	
Oxiditive in o - f					positive
Macconkey growth	positive	positive	positive	positive	positive
Nitrate reduction					positive
Simmon's citrate	positive	positive	positive	negative	d
Urease	negative	negative	positive	negative	
H2S for TSI	negative	**d**	negative	negative	positive
Carbohydrates (pepton):					
Gase from glucose	positive	**d**	positive	negative	negative
Carbohydrates from acide:					
Maltose	positive	negative	positive	**d**	positive
Mannitol	positive	positive	positive	**d**	negative
Lactose	negative	negative	positive	negative	negative
Raffinose	negative	negative	positive	**d**	negative
Sorbitol	positive	negative	positive	**d**	negative
Sucrose	negative	negative	positive	negative	negative
Trehalose	positive	positive	positive	positive	positive
Xylos	negative	**d**	positive	negative	positive
V.P under (37 c)	negative	negative	negative	negative	
Indol	negative	negative	negative	**d**	

Table No. (11) : Identification of E-Coli

Tests	**Results**
Motility	positive
Oxidase	negative
Macconkey growth	positive
Indol	positive
Simmon's citrate	negative
Catalase	positive
Ureas	negative
Carbohydrates acide (pepton):	
OF	F
H2S	negative
KIA	yellow yellow
Lactose	positive
Maltose	positive
Mannitol	positive
Raffinose	d ±
Sucrose	positive
Trehalose	positive
Xylos	positive

Gram Negative Bacterial Species & Site of lesion

Table No. (12) : E-Coli Species & Site of lesion

E-Coli Species	**Site of Lesion**	**%**			**Total**
	Lung	**Liver**	**Heart**		
E-Coli	21	23	2		46
%	46%	50%	4%		
Total	**21**	**23**	**2**		**46**

Table No. (13) : Salmonella Species & Site of lesion

Salmonella Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
SalmonellaParatyphi-A	1	3	0	57%	4
SalmonellaPullorum	2	1	0	43%	3
Total	**3**	**4**	**0**		**7**

Table No. (14) : Klebsiella Species & Site of lesion

Klebsiella Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
KlebsiellaPneumoniae	6	2	0		8
%	75%	25%	0%		
Total	**6**	**2**	**0**		**8**

Table No. (15) :Shigella Species & Site of lesion

Shigella Species	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
ShigellaSonnei	6	2	0		8
%	75%	25%	0%		
Total	**6**	**2**	**0**		**8**

Table No. (16) : Bacteria & Site of lesion

Bacteria	**Site of Lesion**			**%**	**Total**
	Lung	**Liver**	**Heart**		
Gram Positive	50	56	1	60%	107
Gram Negaitive	37	33	2	40%	72
Total	**87**	**89**	**3**		**179**

Table No. (17) : Summary - Gram Positive and Gram Negative Isolate & %

Item	Gram Positive Isolate												Gram Negative Isolate					
	Staphylococcus				Streptococcus			Corynebacterium			Bacillus		E. coli	Salmonella		Klebsiella	Shigella	Pseudomonus
Species Isolate	28	8	18	4	15	13	5	4	4	1	3	4	46	4	3	8	3	8
Total of Organism	58				33			9			7		46	7		8	3	8
Ratio of Organism related to total	32%				18%			5%			4%		26%	4%		4%	2%	4%
Bacterial organism	107												72					
Ratio of Bacterial organism	60%												40%					
Total of Bacterial organism	179																	
Ratio of Species Isolate	16	4	10	2	8	7	3	2	2	1	2	2	26	2	2	4	2	4

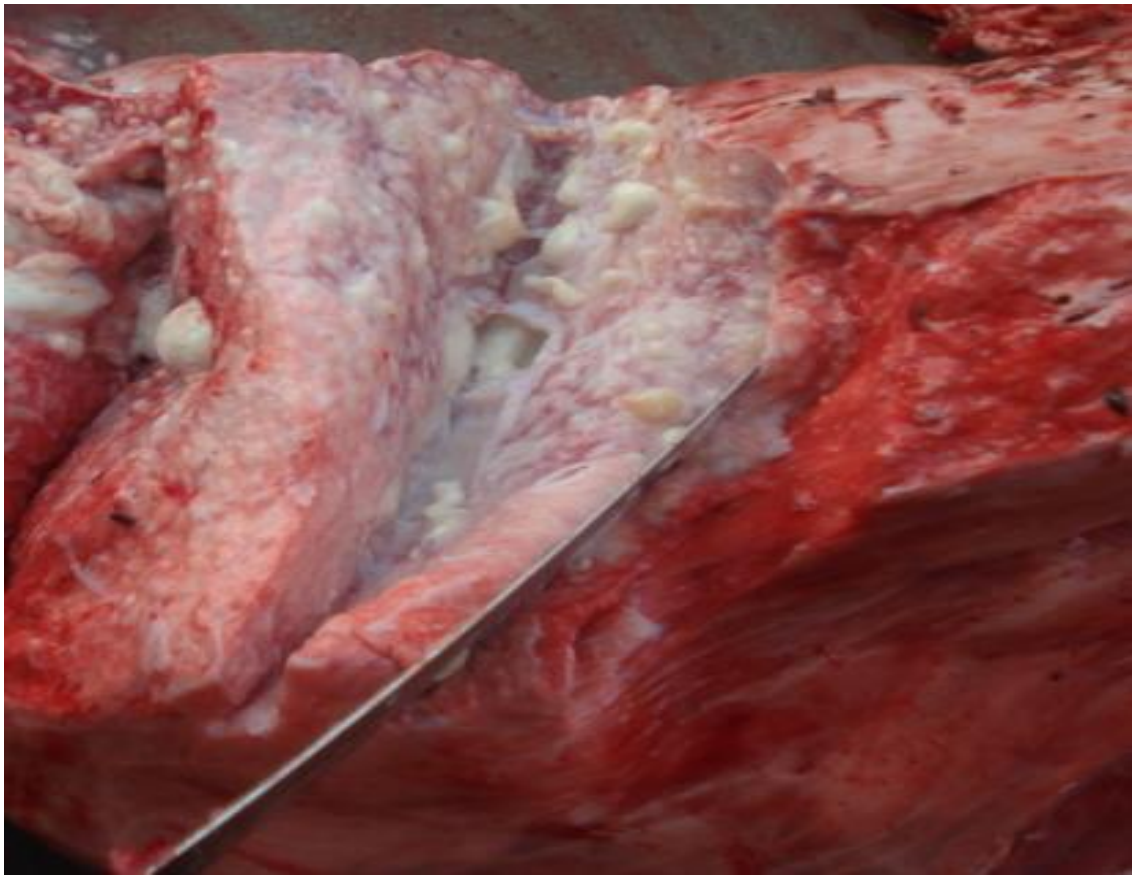

Figure No (1) : Lung abscess in camel

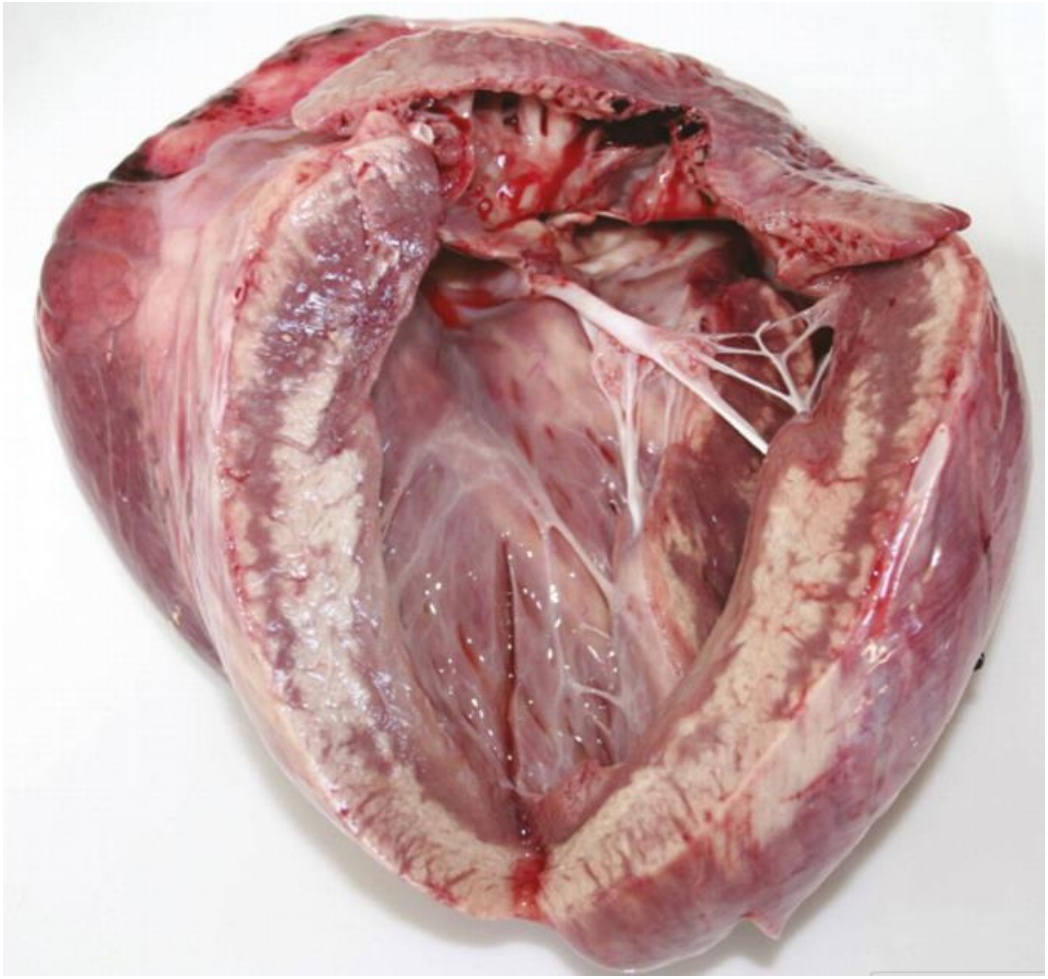

Figure No (2) : Heart white color drops in camel

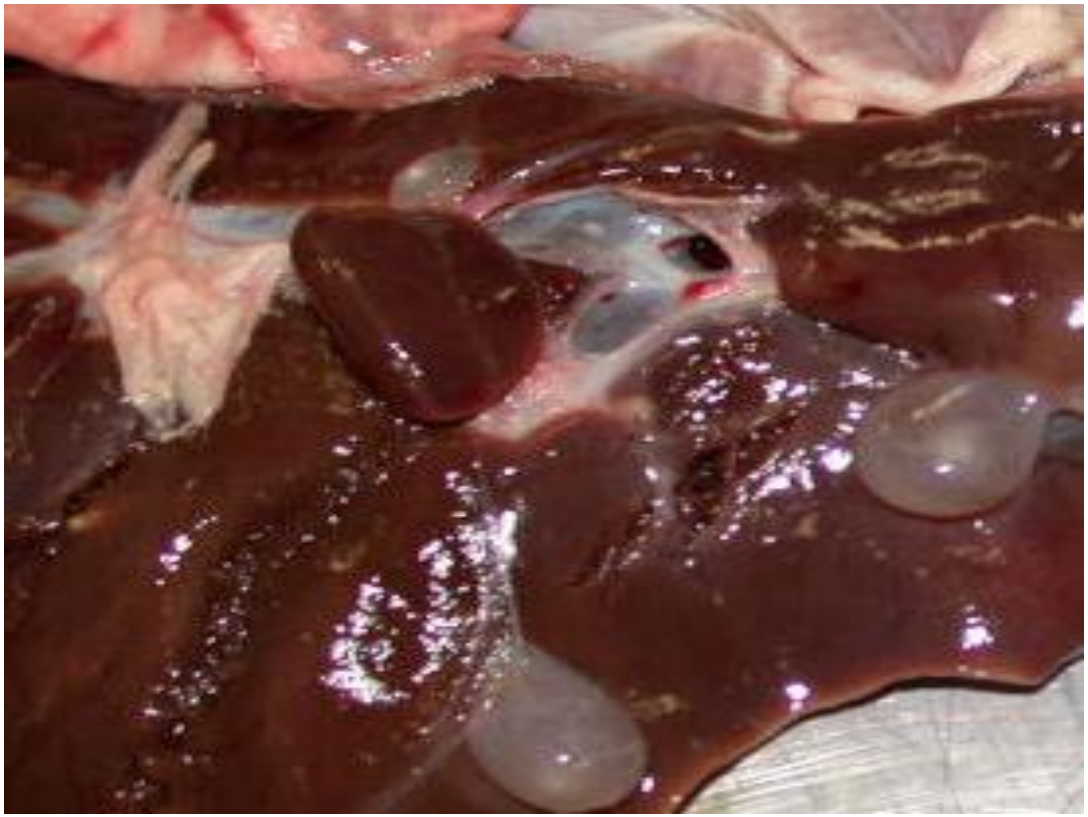

Figure No (3) : Liver hydatidosis in camel

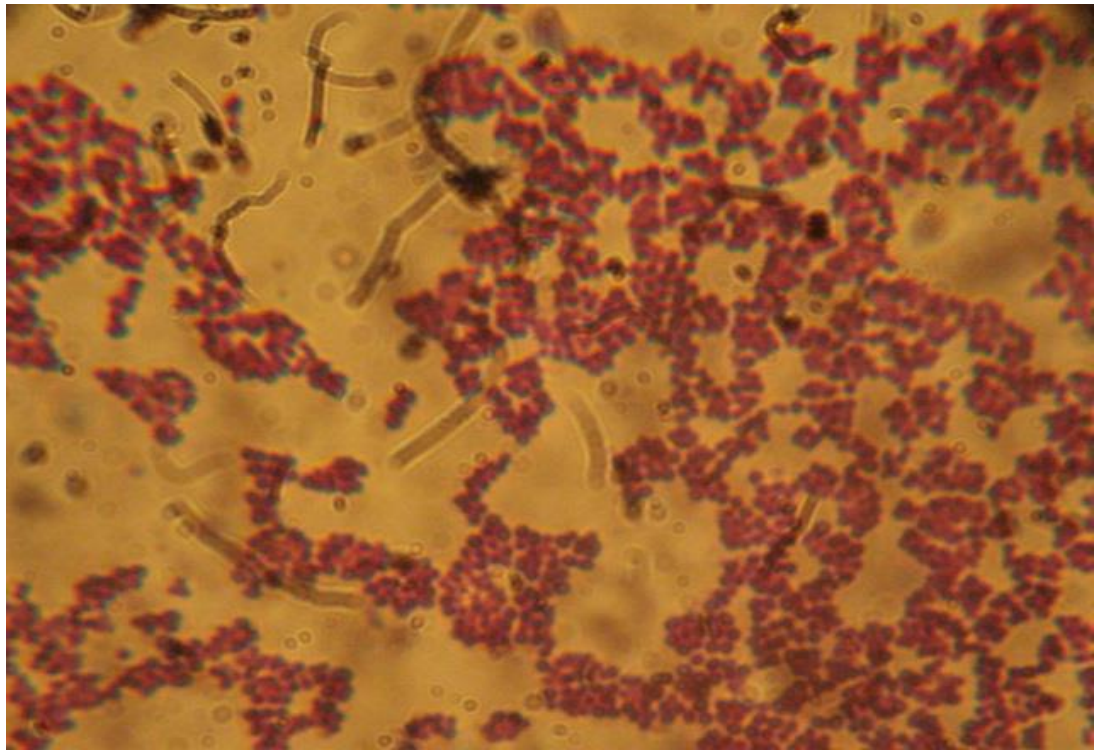

Figure No (4) : *Staphylococcus aeurus* in...of camel

X= 100 Gram stain

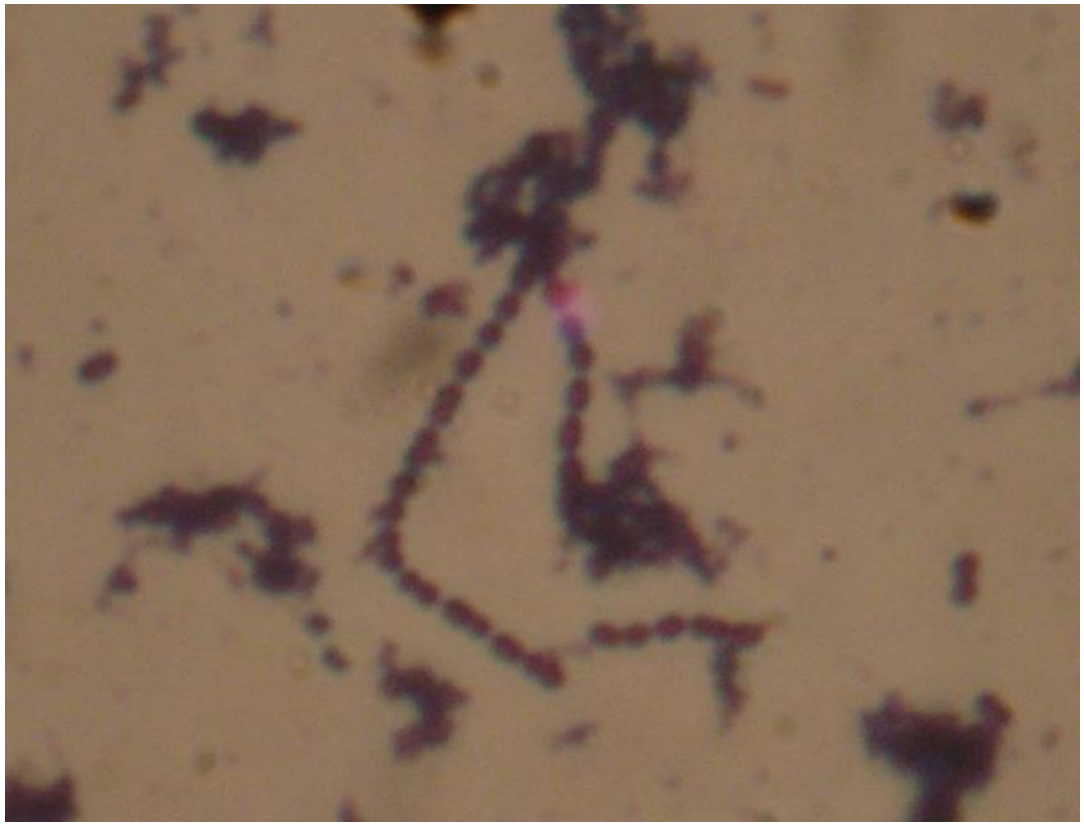

Figure No (5) : *Streptococcus pyogenes* in...of camel

X= 100 Gram stain