BACTERIAL AND PATHOLOGICAL STUDIES ON CONDEMNED LIVERS OF ONE HUMPED CAMELS (*Camelus dromedarius*) SLAUGHTERED IN TAMBOOL SLAUGHTERHOSE, SUDAN

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المستخلص

اجريت هذه الدراسة بمسلخ محليه تمبول بولاية الجزيرة–السودان. حيث جمعت مئتين وواحد وثمانون عينة من مختلف انواع الابل الذبيح خلال الفتره من (2010 حتى 2011).اخذت (120)عينة دم لفصل البلازما وذلك لدراسة انزيمات الكبد. اماعينات الكبد (95) فقدقسمت كل كبد الى جزئين هحدهما طازج للدراسة البكتيرية والآخر اخذت عينات منه حفظت في(10%) فورمالين لدراسةالتغيرات النسيجية.

اظهرت الدراسة البكتيرية (76%) 56عزلة إيجابية الجرام و (24%)20 كانت سلبية الجرام ,فطريات1.2%

خمسة وعشرون (28٪)عزلة من البكتيريا إيجابية الجرام المعزولة كانت بكتيريا عنقودية، و10(11٪) بكتريا سبحية ، و3 (3٪) البكتريا العصوية الشمعية و1 (1٪) البكتريا المطثية و1 (1٪) الليستيريا المستوحدة و10 (11٪) المايكروكوكاس.و5 (5٪) الكورابنوباكتريم و1 (1٪) لاكتوباسيليس بلانتيريم.

ثلاثة(3٪) عزلات من البكتيريا سلبية الجرام المعزولة كانت الكلبسيلة الرئوية و7 (8%)الزائفة الزنجارية و4 (4%) البكتريا الراكدة و5 (5%) انتيروباكتريسي و6(6%) الإشريكية القولونية.

اربعة (4%)عزلات من الفطريات المعزولة كانت فطر الخميرتو1(1%)الشعية اللزجة.

Abstract

This study was carried out at Tambul slaughterhouse- Gezira State in the central Region of the Sudan to examine livers of camels slaughtered for human consumption, with special emphasis on the bacteriological and pathological changes.

Ninety five liver specimens were collected randomly from slaughtered camels during the period (2010-2011) in duplicates. Each one of the duplicate specimens was placed in a sterile plastic container and studied bacteriologicaly by conventional bacteriological methods and rapid API strips were used for the identification of the isolates; and the other one was placed in 10% formalin for histpathological investigations. Among the gram positive isolated bacteria 25 (31.3%) were *Staphylococcus* spp., 10 (12.3%) *Streptococcus*.spp., 10 (12.3%) *Micrococcus* .spp.,

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5 (6.1%) *Corynebacterium* spp., 3 (3.7%) *Bacillus cereus.*, 1(1.2%) *Clostridium novyi.*, 1 (1.2%) *Listeria monocytogenes* and 1(1.2%) *Lactobacillus plantarum* .Gram-negative bacteria were 7 (8.6%) *Pseudomonas aerogenosa*, 6 (7.4%) *Escherichia coli*, 4 (4.9%) *Acinetobacter* and 3 (3.7%) *Klebsiella pneumoniae*, 4 (4.9%) *yeast* were recovered and one fungus (1.2%), *Actinomyces viscosus*.

The results revealed that considerable numbers of pathogenic bacteria were observed with the end results of hepatic tissue degeneration and necrosis. Great attention should be taken in the slaughterhouse for appropriate evaluation of these pathogenic sources and only healthy livers should be passed for human consumption as generally it thecustom that camel livers are consumed uncooked (raw).

***Keywords*:** Liver, Abscesses, Camels, Bacteriology, Pathology.

Introduction

The Sudan is one of the largest camel populated countries in the world. The world population is about (24,246,291) of one-humped camels (*Camelus dromederius*) 80% of them being in Africa and the largest population is found in Somalia (7 million) followed by Sudan (4, 25 million) (FAO, 2009).

Bacterial liver infections may ascend the biliary passage either through static secretions following obstruction or by continuous spread of an infectious inflammatory process from the duodenum and up the ductal tissues. Different types of pathogenic bacteria can be found in carcasses and internal organs of slaughtered animals in slaughterhouses including *Salmonella* species and *Staphyllococcus* species (El-Bassiouny and Samaha, 1991). So, meat could be considered as an important vehicle in transmission of food-borne diseases from animals to man leading to some outbreaks of food poisonings due to consumption of meat contaminated with these organisms (El-Aboudi *et al*., 1987; Mousa and Yassein, 1987).

Liver abscesses may occur as a result of entrance of pyogenic cocci or other well organized pus-producing microorganisms to the liver through different routes. These microorganisms play a major role in the generalized and fatal cases. These hepatic abscesses may lead to chronic wasting conditions with subsequent erosions and perforation of the wall of the posterior vena cava terminating into entrance of bacteria-rich abscess contents into the circulation (Rubarth, 1960).

When mucosal damage occurs bacteria can enter the blood stream and stimulate an inflammatory reaction of neutrophils, and the end result is a liver abscess. It may be resolved with time and disappear leaving only a scar. However, large abscesses or persistent insults are likely to remain present for certain times (Nagaraja *et al* .,1996).

The objective of this study was to examine the livers of slaughtered camels at Tambool Slaughterhouse for human consumption, with special emphasis on the bacteriology, and pathological changes.

Materials and Methods

This study was conducted at Tambool slaughterhouse in the Butana plains, (130 km) South East of Khartoum, Gezira State, Sudan. This area is known to be heavily populated with camels (*Camelus dromedarius*). Which come from different regions of the Sudan.

Ninety five liver samples were collected from slaughtered camels and subjected to bacteriological and patholological studies. Careful postmortem examination was carried out, the liver capsules were grossly examined and several incisions were made throughout the hepatic tissue.

Specimens were collected from livers showed either parasitological infestations or pathological lesions in duplicates which The first specimen is placed in a sterile bag and placed in a thermos flask containing ice and the other one is placed in 10% formalin for pathological investigations. The collected samples were transport to the Veterinary Research Institute for bacteriological and pathological examinations. The surface of the affected liver was touched by hot spatula then an incision was made by sterile scissor. Sterile cotton swabs were dipped into the incised area and inoculated onto the blood agar medium and incubated at 37 °C for 24 hours. Representatives of the bacterial colonies were sub cultured onto blood agar and nutrient agar incubated aerobically at 37°C for 24 hours for purification. Primary tests including motility, glucose, OF, Oxidase, Catalase and secondary biochemical tests were carried out for the identification of the isolates by conventional methods according to Barrow and Feltham (1993).

API 20/ kits (BioMerieux) were used for rapid identification of 9 isolates of *Enterobactericae* and performed according to the manufacturer's instructions. Briefly, a plastic strip holding twenty mini-test tubes was inoculated with a saline suspension of young and pure culture adjusted to 0, 05 McFland tube .The tests CIT, VP and GEL were completely filled with suspension and the tests ADH, LDC, ODC, H_2S, URE were overloaded with mineral oil .The strip was placed in an incubation box containing asmall amount of water and incubated at 37°C for 18 hours. After incubation, the reagents TDA, Indole, VP and Nit1+Nit2 reagents were added to the tests TDA, IND, VP and Nitrate respectively. The results were recorded on the result sheet and interpreted with the interpretation chart and the API profile index manual.

Results

Of the ninety five cultured samples 81 isolates of different microorganisms were obtained. Fifty six (76%) were gram-positive bacteria, 20 (24%) gram negative bacteria, and 5 (7 %) Fungi. Among the gram positive isolated bacteria 25 (31.3%) were *Staphylococcus* spp. 10 (12.3%) *Streptococcus*.spp. 10 (12.3%) *Micrococcus* .spp, 5 (6.1%) *Corynebacterium* spp 3 (3.7%) *Bacillus cereus*, 1(1.2%) *Clostridium novyi*, 1 (1.2%) *Listeria monocytogenes* and 1(1.2%) were *Lactobacillus plantarum* .Gram-negative bacteria were 7 (8.6%) *Pseudomonas aerogenosa*, 6 (7.4%) *Escherichia coli*, 4 (4.9%) *Acinetobacter* and 3 (3.7%) *Klebsiella pneumoniae*, Moreover4 (4.9%) *yeast* and one fungus (1.2%), *Actinomyces viscosus* were recovered (Table.1).

Clostridium novyi was isolated from a brown black sample, *Bacillus cereus* from a cavernous haemangioma while *E coli* was isolated from telangiectasis.

Cultural characteristics of some isolates

On MacConkey agar *Klebsiella pneumoniae* appeared as mucoid and lactose positive. On eosin-methylene blue agar *E.coli* appeared as dark blue colonies with green metallic sheen. Colonies of *Pseudomonas aeruginosa* on blood agar were surrounded by a wide zone of beta-hemolysis on nutrient agar and greenish pigmentation of the medium was observed. On mannitol salt agar coagulase-positive *Staphylococci* produced yellow colonies with changing of the medium to the yellow coloration and the coagulase-negative *Staphylococcal* isolates produced small pinkish colonies without changing the color of the medium.

Table.1: Frequency of bacteria isolated from liver specimens of camels.

Organism	**No. of isolates**
Micrococcus.spp	10 (12.3%)
Streptococcus.spp.	10 (12.3%)
Pseudomonas aerogenosa	7 (8.6%)
Escherichia coli	6 (7.4%)
Corynebacterium.spp	5 (6.2%)
Staph. arletae	5 (6.2%)
Acinetobacter	4 (4.9%)
Staph. auricularis	4 (4.9%)
Yeast	4 (4.9%)
Klebsiella pneumoniae	3 (3.7%)
Bacillus cereus	3 (3.7%)
Staph. gallinarum	3 (3.7%)
Staph. hyicus	3 (3.7%)
Staphylococcus aureus	3 (3.7%)
Staph. intermedius	2 (2.5%)
Staph.. sacchrolyticus	2 (2.5%)
Clostridium novyi	1 (1.2%)
Listeria monocytogenes	1 (1.2%)
Lactobacillus plantarum	1 (1.2%)
Actinomyces viscosus	1 (1.2%)
Staph. haemolyticus	1 (1.2%)
Staph. epidermidis	1 (1.2%)
Staph. cohni	1 (1.2%)
Total	81

Pathological findings

Grossly we found white foci and red spots on the surface of the liver . Most of these foci were abscesses with a diameter varying from 0.5 to 1. cm. Some of these abscesses showed greenish and white to yellow exudates. Microscopically: leukocytes were seen at the center surrounded by a thin fibrous capsule. Pathogenic organisms isolated from these lesions were *Staphylococcus.spp, Streptococcus.spp, Corynebacterium, Pseudomomans, E.coli* and *Actionomyces*. These organisms were associated with suppurative inflammation that progressed to abscess formation at the

invasion sites. Focal purulent infiltration and softening of tissues were observed, the focus was demarcated by inflammatory cells from the surrounding tissues which lead to formation and proliferation of connective tissue capsule .The inflammatory cells included lymphocytes, plasma cells, macrophages and neutrophils . In addition, the surrounding part of the liver developed lesions and the adjacent hepatic tissues displayed degeneration and necrosis of hepatocytes with swelling characterized by a clear zone around the nucleus. The cytoplasm was displayed towards the periphery of the cell and hydropic degeneration was seen . Massive proliferation of fibrous tissue forming a capsule was evident. (Fig. 1). In some sections bacterial emboli comprising gram positive cocci and bacilli were seen at the blood vessels and dilated sinusoids (Fig.2).

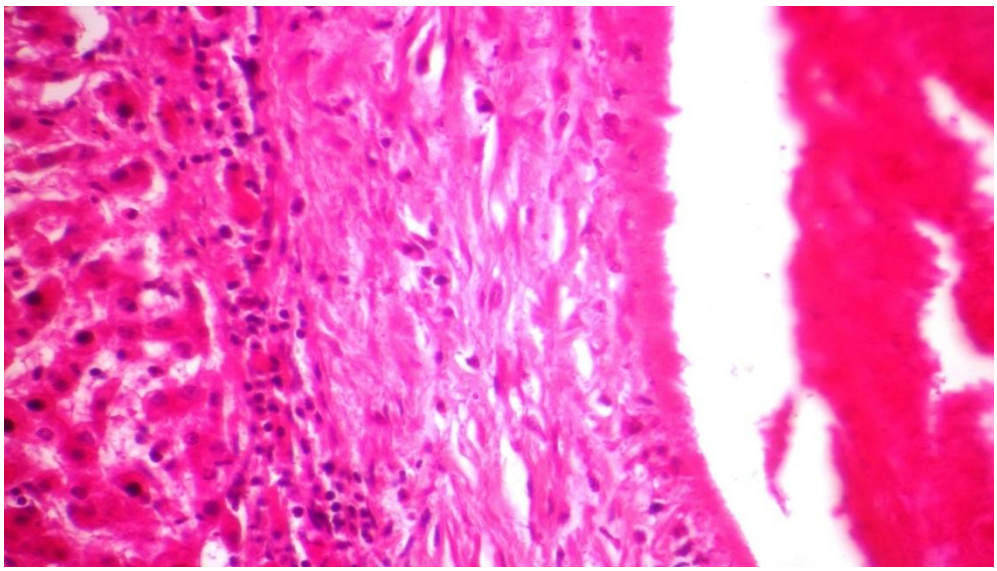

Figure.1: A camel liver showing abscess; note from right to left necrotic center, pyogenic membrane and proliferative connective tissue capsule. (H&E. 40 X).

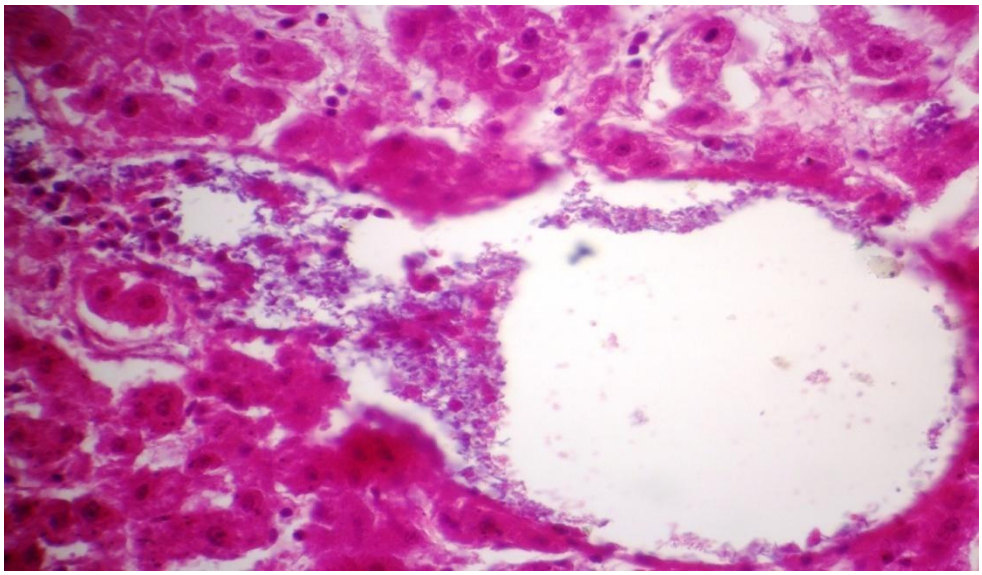

Figure.2: A camel liver with bacterial embolism note gram +ve cocci and bacilli in central vein and sinusoid (H&E.X40).

Discussion

Affections of livers in meat-producing animals constitute a major factor that reduces the national income either directly through condemnation of the affected livers, or indirectly by their effect on the animal growth and meat production (Eid *et al.*, 1998).

As far as we Know this is the first study to discuss the bacteriological infections of liver abscesses in camels in the Sudan. It revealed that liver abscesses occurr frequently in these animals. It also showed that a high percentage of the isolated bacteria were *Staphylococcus spp.,* (31.3%). *Micrococcus spp.,* (12.3 %). *Streptococcus.spp.,* (12.3 %) *and Escherichia coli.* (7.4 %). The pathological results were in agreement with those obtained by (Abakar, 2011; Hamad, 2008 and Teixeira *et al*, 2001). Hegazy (1990)however, reported a high percentage of *E. coli* in the affected livers (80%) and he referred that to the improper sanitary conditions in the slaughter house.

Several cases of infected livers showed multibacterial infections which indicated that more than one route of infection was involved. This was also observed by El Dakhly *et al.*(2007).

The main risk factors that have been documented to be associated with the high prevalence of liver abscesses in ruminants are parasite-induced damages that create suitable environment for some opportunistic bacteria to populate and form abscesses (Scanlan and Edwards, 1990).

Livers affected with abscesses are condemned and are not used for human consumption .Infected camels have decreased slaughter weight, carcass weight, fat thickness and dressing percentage.

The prevalence of abscesses in camel's livers in the present study, was generally higher (50%) than the findings reported by previous workers in other animals. Cadmus and Adesokan(2009) reported that 29% of the condemnation of liver in Nigeria are due to abscesses. Mellau *et al*, (2010) reported an infection of 11% of condemned livers. However, Ahmedullah *et al.* (2007) reported 3.8 liver condemnation rate in Bangladesh.

The etiological factors which lead to the formation of abscess seriously affect the keeping quality of infected livers which comprise an important source of food in the Sudan. So, infected livers important hazards to the health of consumers. Therefore, improved sanitary conditions in slaughter houses, hygienic disposal of the condemned parts as well as treatment of parasitic affections in animals before slaughter must be practiced to produce meat and meat by-products of good quality and protect the consumers.

Conclusion

Many causes accounted for the condemnations of camel's liver in Tambool slaughterhouse. The most prevalent parasitic cause was hydatidosis. Bacterial causes of liver lesions were found to play a significant role in camel's liver condemnation. Better control of liver abscesses should be implemented since they continue to be a prevalent condition of slaughtered animals and are associated with reduced animals performance and economic loss.

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