

# AEROBIC BACTERIA AND FUNGI ASSOCIATED WITH RAW CAMEL'S MILK

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**ABSTRACT:** The objective of this study was to determine the aerobic bacteria and fungi associated with raw camel's milk. Samples were collected from farms in Bahri (Khartoum North) area in the Sudan. The isolated aerobic bacteria (one hundred and fifteen isolates) were identified as (85.26 %) Gram-negative, while (14.73 %) were Gram-positive. The Gram-negative bacteria were 39.13% *Escherichia coli* serotypes, 07.82% *Klebsiella* spp., 01.73% *Pseudomonas* spp., 03.47% *Proteus* spp. and 06.08% *Enterococci* spp. While, the Gram-positive bacteria were 07.82% *Micrococcus* spp., 05.21% *Streptococcus* spp. and 28.69% *Staphylococcus* spp. In conclusion camel milk is a source for many bacteria which may lead to health hazard for man when it is taken raw (as in many rural areas in Arabic countries including the Sudan).

**Key words:** Raw Camel Milk, Aerobic Bacteria, Fungi

ORIGINAL ARTICLE  
 Received 06 Nov., 2013  
 Accepted 05 Jan., 2013

## INTRODUCTION

The one humped camel is an essential source of food and milk in many parts of the world and especially in developing countries in Africa and Asia. The dromedary plays also economic, social and ecological roles (Warden, 1992; Ouajd and Kamel, 2009).

Milk is an ideal habitat for the growth and multiplication of microorganisms due to its nutritional constitution which contain protein, carbohydrate, mineral and vitamins. All these components support the growth of many forms of bacteria (Omer and Eltinay, 2008).

Raw camel milk may contain microorganisms pathogenic for man and their source may lie either within or outside the udder (Sinell, 1973).

Many epidemiologists reports proved that, non-heat treated milk and raw-milk products represent the major factors responsible for illnesses caused by food borne pathogens (De Buyser et al., 2001)

Ziney and Al- Turk (2007) reported that, approximately 50% of the examined raw camel's milk samples were produced and handled under poor hygienic conditions with high health risk to the consumers.

Omer and Eltinay (2008), reported isolation of 43% gram-positive cocci, 11% gram negative cocci, 30% Gram negative rods, 23% Gram positive rods, 32% for *Staphylococcus*, 15% for yeast from camel's milk.

The same authors reported that, Sixty eight samples were examined for *Bacillus cereus*, *Salmonella* spp., *Clostridium perfringens*, and *Listeria monocytogenes*. The results indicated that, all samples tested for pathogenic organisms were negative for *Salmonella* spp., *Clostridium perfringens*, and *Listeria monocytogenes*, positive for *Bacillus cereus*, *staphylococcus aureus*, and *Echerichea coli*.

Abeer et al. (2012) reported isolation of 5 *Salmonella* spp., 12 *E. coli* and 2 *Listeria monocytogenes* from a total of 185 camel's milk samples collected from Sinai, Aswan and Sharqia Governorates.

## MATERIALS AND METHODS

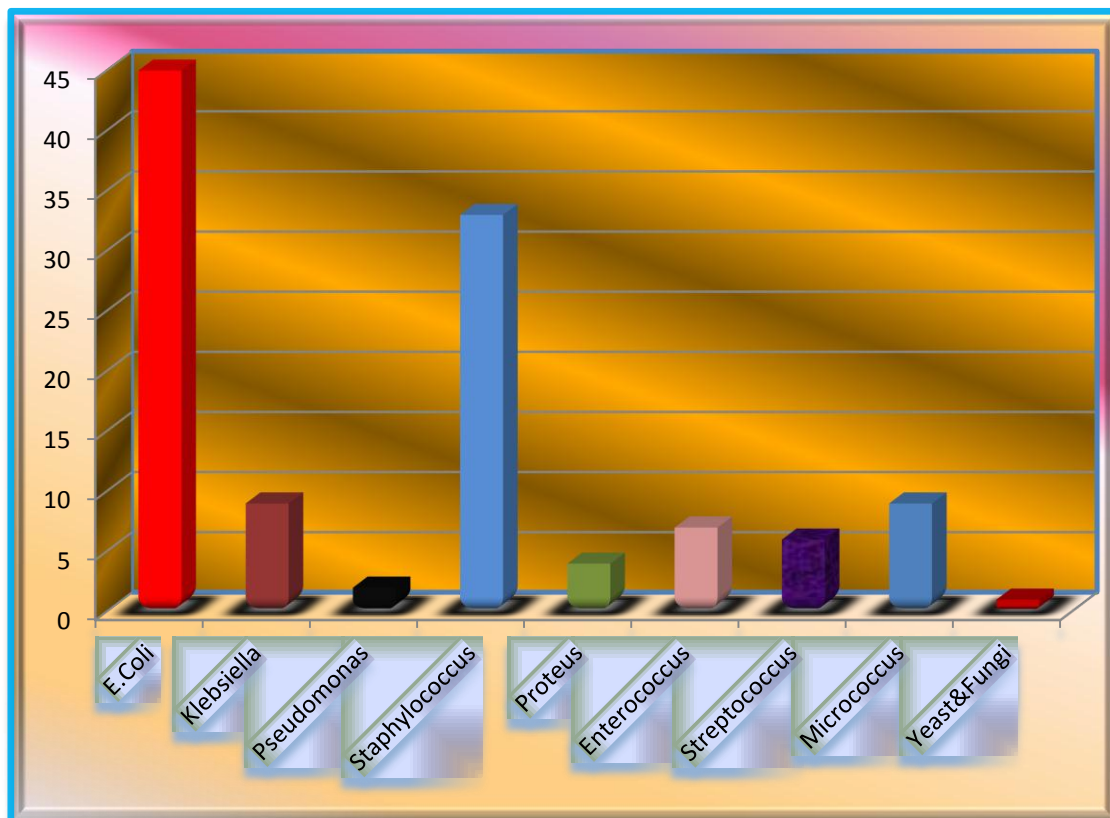
One hundred and sixty camel's milk samples were collected from camels (apparently healthy) in different farms in Bahrei area in the Sudan, the camels (*Camelus dromedarius*) are of different ages. Samples were collected in sterile bottles and transported to the laboratory in an insulated ice box. The isolation and identification of the bacteria, fungi and yeast is according to Barrow and Feltham (1993). The purified isolates of bacteria were identified according to the criteria include: Cultural characteristic of isolates; shape, colour, odour, elevation, margin, consistency, growth and size of colonies. The colonial characteristic on the different and selective media and haemolysis of blood agar; Gram's stain reaction; Motility; Aerobic growth; Biochemical tests.



The fungi were examined by Dilution plating technique, with potato dextrose agar. The plates were incubated at 22°C -25 °C for five days. For isolation of fungi the Sabouraud's agar medium was used and two sets of media were inoculated, with one set incubated at 25°C -30°C and the second set incubated at 35±2c°. All cultures were examined at least weekly for fungal growth and should be held for four to six weeks. Examine the plates for fungal colonies exhibiting typical color and morphology. Biochemical tests and serological procedures were performed to confirm findings.

## RESULTS

The main Gram-negative bacteria, which isolated were *Escherichia coli* species (39.13%), *Klebsiella* species included *Klebsiella pneumonia* (07.82%), *Proteus* species included *Proteus mirabilis* (03.47%), and *Pseudomonas* species which included *Pseudomonas aeruginosa*, *Pseudomonas diminata* which represented (01.73%) of the total isolates. The main Gram-positive bacteria were the *Staphylococcus* spp. Included *S. sacchrolyticus*, *S.aureus* and *S.epidermis* which represented (28.69%) and *Enterococcus faecalis* represented (06.08%) of the total isolates. Other groups were: *Streptococcus* and included *Streptococcus viriddans*. They represented (05.21%) of the total isolates. and *Micrococcus* species which included *Micrococcus luteus*, which represented (07.82%) of the total isolates. The fungi and yeast were not isolated from all the samples of raw camel's milk.



**Diagram 1:** The total percentage of aerobic microorganisms associated with Raw Camel's Milk.

## DISCUSSION

The present study reveals the cross- contamination of camel's milk either from the animal itself or from the workers. The important aim of the present study, were to assess the microbial quality of raw camel's milk. Noreddine (2008) reported the dominance of *enterococci* with *Enterococcus faecalis* as the main representative species. Besides *Enterococcus*, other genera including *Pediococcus* (28.2%), *Streptococcus* (4%), *Lactococcus* (8%) and *Leuconostoc* (1%). In the present study the main representative species included *Escherichia coli* species (39.130%) that may be due to the bad hygiene in small camels' farms in Sudan, or due to un- clean worker's hands or dirty utensils. So it will be recommended that; the raw camel's milk must be pasteurized before direct drinking, the udder should be washed and cleaned before milking, the worker's hands should be healthy and use clean utensils during milking protocol. On the other hand, also we can use milking machine.

These findings support results of Abdullah and Sabry (2009) who reported, *E. coli* was isolated from 33 (66%) of the 50 raw milk and product samples tested. Also Soomro et al. (2002), Chye et al. (2004) and Aly and Galal (2002) reported that *E.coli* was found to be the highest percentage of isolates from raw camel milk.

In the present work the *Salmonella* species, *Listeria monocytogenes*, *Bacillus cereus*, *Clostridium perfringens*, yeast and fungi species were not isolated from all samples of raw camel's milk which has a significant public health implication.

In conclusion, according to the presence of the previously isolated bacteria the camel's milk must be heated and pasteurized before drinking.

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