Microbiological Quality of Cattle Milk Obtained from Dairy Farms around Quetta Valley

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Abstract

Milk is significant sources of protein and other nutrients but can be infected by pathogenic agents. Milk itself possesses small number of micro-organism when it leaves the normal udder however, it may get contaminated from manure, water, soil, milker's hands, utensil and flies. In milk the microbial load is a major factor to determining its quality, which shows the cleanliness of the milking tools, condition of storage, manner of transport as well as the cleanliness of the udder of the individual animal. The aim of this study was to examine the microbiological quality of cattle milk. The milk samples were collected from dairy farms existed in and around Quetta Balochistan. The result showed that the microbial quality of milk obtained from dairy farmer was very low due to the isolation of E. coli and Staphylococcus aureus. The E. coli and Staphylococcus aureus were confirmed by Indole, Methyl Red, Vogues Proskeur, Citrate, Nitrate Production, Cagulase and Mannitol Fermentation tests.

Key words: Staphylococcus aureus; Escherichia coli; Cattle

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INTRODUCTION

Milk is considered an outstanding food source, as it is rich in proteins, fats, carbohydrates, minerals and vitamins. Yet the quality of the milk produced is often a major barrier to its marketing (Smith et al., 2005). Milk considered to be of good quality must have satisfactory organoleptic, nutritional, sensory, microbiological and physical-chemical characteristics. Due to its constitution, milk is an excellent culture medium for the growth of microorganisms, and responsible for transmission of harmful zoonoses. Therefore, its quality is an important public health concern (Amaral et al., 2004).

The dairy industry has an importance hare in the domestic product. Therefore, the milk from affected animal may harbor the organisms potentially pathogenic for humans (zoonoses) and processing of such milk results in sub optimal output of sub standard finished fermented products like yogurt, cheese, etc. (Muhammad et al., 1995). Infection caused by bacteria that are part of the normal teat skin flora and oral cavity of calves that suck on each other, or by microorganisms present in the environment of these animals (bedding, manure) that are transmitted by flies.

Pasteurization of raw milk is effective in eliminating all the thermo uric microorganisms of the genera *Mycobacterium*, *Micrococcus*, *Streptococcus*, *Lactobacillus*, *Bacillus*, *Clostridium*, and occasionally some Gram-negative rods. Since milk is currently handled and stored at low temperatures, these organisms hinder efforts to increase the shelf life of pasteurizes milk (Coorevits et al., 2008). Milk composition is affected by a number of factors including genetic and environmental factors. The microbial load of milk is a major factor in determining its quality. It indicates the hygienic level exercised during milking, that is, cleanliness of the milking utensils, condition of storage, manner of transport as well as the cleanliness of the udder of the individual animal. Milk from a healthy udder contains few bacteria but it picks up many bacteria from the time it leaves the teat of the cow until it is used for further processing. These microorganisms are indicators of both the manner of handling milk from milking till consumption and the quality of the milk (Welearegay et al., 2012). Milk produced under hygienic conditions from healthy animals should not contain more than 5×10^5 bacterial/ml. The milk and products derived from milk of dairy cows can harbor a variety of microorganism and can be important sources of food borne pathogens. The conditions during storage and transport in refrigerated tanks cause the raw milk microbiota to change from predominantly Gram-positive to predominantly Gram-negative organisms as they grow. Gram-negative bacteria usually account for more than 90%

of the microbial population in cold raw milk that has been stored (Zubeir et al., 2009).

MATERIALS AND MATHODS
Study area
Pakistan has five provinces in which Balochistan is the largest one containing 47% total area of Pakistan having six division and thirty districts. Quetta is the capital of Balochistan, the present study was conducted in Quetta city.
Sampling size and sampling procedure
A total of 100 samples were taken from dairy farms around Quetta Balochistan. The sample collections were done from 2014 to 2015.
Sample collection
Almost five (5) ml milk from the udder was taken in sterilized tube. The screening of samples was done by the help biochemical test. These samples will be brought immediately to the laboratory of under cool chain condition for microbiological analysis.
Isolation and identification of bacteria from milk
The isolates were inoculated in MacConkey agar and Eosin methyl blue agar, Mannitol salt agar and BHI broth. The inoculated samples were incubated in aerobic condition at 37C for 24 to 48 hrs. Colonies with morphology suggestive was further identified by gram staining, Sugar fermentation test, Indole production test, Methyl red test, Nitrate reduction test, Hydrogen sulfide production test, Catalase test and Gelatin liquification test.

RESULTS
Microbiological quality of cattle milk was studied and for this study purpose the milk samples were collected from dairy farm under administrative control of government of Balochistan as well as from the dairy farms beings operated by private entrepreneurs. For isolation of (*E.coli*) from the milk samples various microbiological tests were performed which included Indole, Methyl Red, Vogues Proskeur, and Citrate tests. The aim of conducting different microbiological tests was to examine accuracy of detection of microbiological organism of the milk samples. For detection of *(Staphylococcus aureus)* in the milk samples the microbiological tests employed were Catalase, Oxidase, Indole, Nitrate Production, Methyl Red, Vogues Proskeur, Cagulase and Mannitol Fermentation. The data in relation to isolation of (*Escherichia coli*) is presented in Table-1, while the data for (*Staphylococcus aureus*) is shown in Table 2.
Isolation and Biochemical characterization of *Escherichia coli*
The data in regards to the prevalence of *Escherichia coli* in cow milk samples collected from the dairy farms being operated under Government as well as public sector entrepreneurship are presented in table 1. *Escherichia coli* was detected in 30 percent milk samples where isolated was identified by Gram staining, Sugar fermentation test, Indole production test, Methyl red test, Nitrate reduction test, Hydrogen sulfide production test, Catalase test and Gelatin liquification test as show in table 1.

Table 1: *Escherichia coli* in milk samples collected from dairy farm Quetta.

Biochemical test	Result	Biochemical test	Result
Indole	+	Hydrogen sulfide production test	-
Methyl red	+	Gelatin liquification test	-
Vogues Proskeur	-	Oxidase	-
Citrate	-	Catalase Test	+
Uease	-	Nitrate reduction test	-
Phenylalanine deaminase	-	Motility	+
Lysine decarboxylase	+	Mannitol	+
Maltose	+	Lactose	+

Isolation and Biochemical characterization of *staphylococcus aureus*
The prevalence of (*staphylococcus aureus*) was detected in cow milk samples through various microbiological test such as Catalase, Oxidase, Indole, Nitrate Production, Methyl Red, Vogues Proskeur, Cagulase and Mannitol Fermentation. The milk sample were collected from the dairy farm operated are reported in table 2. It was observed that the (*staphylococcus aureus*) was isolated from 20 percent as shown in table 2

Table 2: Prevalence of staphylococcus aureus in milk samples collected from dairy farms Quetta.

Biochemical test	Result	Biochemical test	Result
Indole	+	Hydrogen sulfide production test	-
Methyl red	+	Gelatin liquification test	+
Vogues Proskeur	+	Oxidase	-
Citrate	+	Catalase Test	+
Cagulase test	+	Nitrate reduction test	+
Mannitol fermentation	+	Motility	-
Maltose	+	Lactose	+

DISCUSSION
The study was carried out to examine the microbiological quality of cattle milk using milk samples collected from dairy farms existed in and around Quetta Balochistan. (*E. coli*) was isolated by Indole, Methyl Red, Vogues Proskeur, Citrate,

Oxidase and Nitrate Production tests. Highest prevalence of (*Escherichia coli)* was detected in 30 percent milk samples while (*staphylococcus aureus)* was isolated from 20 percent milk samples.

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