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Quality Test for Raw Milk

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***Abstract*: Cow milk has long been considered a highly nutritious and valuable human's food but: it is an excellent culture medium for many microorganisms, especially bacterial pathogens. There is a constant challenge in milk production to prevent or minimize the entry and subsequent growth of microorganisms in milk. Production of milk and milk products of superior quality and prolonged shelf life with the ability to provide a safe and wholesome food for the consumers is needful. This study is therefore aimed at evaluating the microbial quality of raw cow milk from different dairy farms. Bacterial pathogens were isolated from the milk samples and the isolates were characterized and identified to be Salmonella typhi, Shigella dysentriae, Escherichia coli, Enterobacter aerogenes, Bacillus cereus, Klebsiella pneumoniae, Pseudomonas cepacia, Aeromonas hydrophillia and Pseudomonas fluorescens. Pseudomonas fluorescens was the most predominant of the isolated bacteria. The total bacterial counts of the milk samples ranged from $0.2x10^6$ CFU/ml to $4.2x10^6$ CFU/ml. Also, the total enterobacteriaceae count ranged from $0.8x10^6$ CFU/ml to $2.6x10^6$ CFU/ml while the total salmonella-shigella count was found to range between $0.5x10^6$ CFU/ml and $1.1x10^6$ CFU/ml. Antibiotic susceptibility profiles of the isolates was determined; 10% resistance and 90% susceptibility to clinically relevant antibiotics was noted amongst the isolated bacteria pathogens. Resistance to more than two antibiotics was found in Salmonella typhi. The presence of these bacteria pathogens in the samples analytics considered to be an indicator of poor hygiene and sanitation during milking and post milking processes. It is therefore recommended that good sanitary measures should be taken by the people handling the cows and it must also be ensured that the cows are always in good health Condition.**

***Keywords*: Cow milk, Antibiotic, Indicator, Microorganisms, Milk quality.**

1. Introduction

Milk is a white liquid produced by the mammalian gland of mammals; it provides the primary source of nutrition for young mammals before they are able to digest other types of food (Michael, 1981). Also, milk is a complex fluid secretion excluding colostrum, with a normal milking (manual or mechanical) of the mammalian gland of a healthy, normally-fed lactating animal (Jensen, 1995). It is a vital type of food for over 6 billion human beings all over the world and a major contributor to food security as it alleviates poverty and mitigates malnutrition (Belewu, 2006). Cow milk has long been considered a highly nutritious and valuable human food and it is consumed by millions daily in a variety of different products. Raw milk of good hygienic quality meets the nutritional needs of body better than any single food as it contains essential food constituents such as fat, proteins, carbohydrates, minerals and vitamins. As a result of the presence of these nutritional components, milk is an excellent culture medium for many microorganisms, especially bacterial pathogens (Henry and Newlander, 1997; Saeed et al., 2009). Milk is often prone to early contamination and spoilage if not handled properly. Microorganisms present in milk can be classified into two main groups: pathogenic and spoilage organisms, although some may play a dual role for example Bacillus cereus, pathogenic organisms are those capable of inducing food poisoning, thus posing a threat to public health (Logan, 2012). These pathogenic microbial contaminants in milk have been a major factor for public health concern since the early days of dairy industry (Altug and Bayrak, 2003). There is a constant challenge to those involved in milk production to prevent or minimize the entry and subsequent growth of microorganisms in milk (O' Connor, 1994). These is mainly due to the importance of producing milk of good hygienic quality, which is necessary to milk product of superior quality and prolonged shelf-life thereby to provide a safe and wholesome food for the consumers (O' Connor, 1994). Bacterial contamination can generally occur from three main sources; within the udder, outside the udder and from the surface of equipment used for milk handling and storage.

2. Materials Required

- Milk Samples (raw milk and pasteurized milk)
- Methylene blue (1:2500)
- Screw cap tubes
- Test tube holder
- Pipettes
- Bunsen burner or spirit lamp
- Matches
- Water bath

3. Procedure

- Collect raw milk sample in a sterile conical flask.
- Transfer 10ml milk sample to sterile screw cap tube.
- Add 1ml of Methylene blue solution to all screw capped tubes.
- Close the tubes with rubber stopper and gently inverted

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thrice to mix all contents.

- Control tubes with the without dye also maintained.
- Incubate all tubes in water bath at 35˚c for up to eight hours.
- Observe colour change every half an hour. Quality of milk sample is assessed on the basis of standard g.

4. Result

The result from the different raw milk tests evaluated here showed very limited correlation among each other, highlighting the fact that distinct microbial populations are targeted by these tests. Limited correlations were also observed between the raw milk microbiological test results and the results from analyses testing the sensory and microbiological

Quality of the commercially pasteurized, processed milk. Even when PPC was taken into considered (i.e., by excluding data from 11 samples that showed evidence of such contamination, as well as by analyzing relationships between the microbiological quality of the raw milk samples that had undergone laboratory).

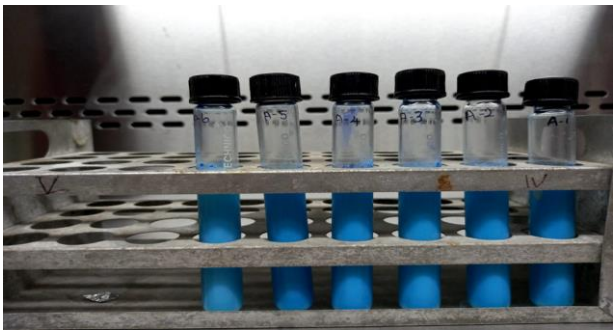

Fig. 1. Quality of raw milk sample

We thus conclude that the raw milk tests evaluated in this study have limited utility in predicting the quality of commercial HTST fluid milk. The presence of these organisms in raw milk may indicate unsanitary conditions or improper cooling procedure on the farm.

5. Discussion and Conclusion

Raw milk is milk that has not been pasteurized, a process of heating liquid foods to kill pathogens for safe consumption and extending the shell life. Proponents of raw milk have stated that there are benefits to its consumption, including better flavor, better nutrition, and the building of a healthy immune system. However, the medical community has warned of the dangers, which include a risk of infection, and has not found any clear benefit. Drinking raw milk, in her view, prevents allergies and promotes a healthy immune system. And furthermore, raw milk contains beneficial bacteria and other components such as lactoferrin that kill harmful microbes. Between 1994 and 2008 there were only 85 disease outbreak associates with raw milk, according to the FDA.

Raw milk is unpasteurized milk from any animal and can contain many harmful bacteria, parasites, and viruses.

Fig. 2. Sample of raw milk

A total of sixteen organisms were isolated from raw milk samples, the isolates were subjected to biochemical tests such as Gram staining, oxidase test, starch hydrolysis, methyl red growth at different pH and so on. They were identified to be Salmonella typhii, Shigella dysentriae, Escherichia coli (2), Enterobacter aerogens, Bacillus cereus (2), Klebsiella pneumonia (3), Pseudomonas cepacia, Aeromonas hydrophilia and Pseudomonas fluorescens (4). The distribution of the bacteria isolate in the samples is shown in Table 2 with Pseudomonas fluorescens being the most predominant and this shows that the raw milk produced in the study area could be harmful especially to immune compromised consumers. The presence of these bacteria pathogens in the samples analysed is considered to be an indicator of poor hygiene and sanitation during milking and post milking processes. The presence of some of these bacteria in the milk samples can also be linked to contamination by cows' excrement, land and water used.

Table 1
Distribution of bacterial isolates in different samples

Organisms	OSLG	ONLG	OLG	ALG	SLG
Salmonella typhi	+	-	-	-	-
Escherichia coli	-	-	+	-	+
Klebsiella pneumonia	+	+	-	-	+
Pseudomonas flurescens	+	+	+	+	-
Pseudomonas cepecia	-	-	-	-	+
Aeromonas hydrophilia	-	-	-	+	-
Shigella dysenteriae	-	-	-	+	-
Enterobacter aerogens	-	-	-	-	+
Bacillus cereus	-	+	-	-	+

+ = detected, - = not detected

Table 2
Microbial load of the raw milk samples

SAMPLE	TBC (CFU/ml)	TEC(CFU/ml)	TSSC(CFU/ml)
SLG	2.0×10^6	1.3×10^6	1.1×10^6
ONLG	3.1×10^6	1.0×10^6	1.0×10^6
OSLG	1.0×10^6	2.2×10^6	1.1×10^6
ALG	0.2×10^6	0.8×10^6	0.5×10^6
OLG	2.3×10^6	1.1×10^6	0.8×10^6

TBC: Total Bacteria Count
TEC: Total Enterobacteriaceae Count
TSSC: Total Salmonellas – Shigella Count

The total bacterial counts of the raw cows' milk samples ranged from $0.2x10^6$ CFU/ml to $4.2x10^6$ CFU/ml. Also, the total Enterobacteriaceae count ranged from $0.8x10^6$ CFU/ml to $2.6x10^6$ CFU/ml. The total salmonella-shigella count was found to range between $0.5x10^6$ CFU/ml and $1.1x10^6$ CFU/ml. The total bacterial count obtained in this study was generally high as compared to the acceptable level of $1.0x10^5$ bacteria per ml of raw cow's milk (O'Connor, 1994). This study shows that the quality of milk produced in the study areas were poor. This was evident from the high values of total bacteria count (TBC) and there is the need for adequate sanitary measures at different stages of production to consumption. Most microorganisms found in the raw milk are contaminants on the outer surface of the udder, milking utensils and milkers (Chye et al., 2004). The quality of water use for washing utensils could also be part of the reasons for obtaining a poor microbiological quality in this milk samples.

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