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Bacteriological and Physicochemical Qualities of Raw Cow Milk from Major Milking Centers in Owo, Ondo State, Nigeria.

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Short Communication

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ABSTRACT

Raw cow milk samples were collected from Rufus Giwa, Ikare Junction and Aba Ebira and analysed for their bacteriological and physicochemical qualities. Bacteriological test reveals the total coliform count of Rufus Giwa Polytechnic milk to be 54 x 10^3cfu/ml, Aba Ebira was 62x10^3cfu/ml and Ikare Junction was 46x10^3cfu/ml. The total bacteria count was 216x10^3cfu/ml for IkareJunction,116x10^3cfu/ml for Aba Ebira while Rufus Giwa was TNTC. Total *E.coli* count for the three studied areas ranged from 8x10^3cfu/ml, 9x10^3cfu/ml and 11x10^3cfu/mlrespectively. Physicochemically, the results showed that fat content of milk from Rufus Giwa, (3.7%) was higher than that of Aba Ebira(3.44%) andIkare Junction 2.81%. However, protein content, lactose level, and ash content of these milk samples were lower than those of the standard .Milk sample from Ikare Junction had the highesttotal solid (12.25%) and compared favourably with the standard values. There is no significant difference in total titratable acidity among the three studied areas.

INRODUCTION

Milk is a translucent white liquid produced by the mammary glands of mammals. It provides the primary source of nutrition for young mammals before they are able to digest other types of food. The early lactation milk is known as colostrum, and carries the mother's antibodies to the baby[1]. The exact components of raw milk vary by species but it contains significant amounts of fat, protein and calcium. In addition to cattle, the milk of buffalo, goat, sheep and yak is used in our country by humans for manufacture of dairy products. In the western world the today, cow's milk is produced on an industrial scale and is by far the most commonly form of milk. The largest producers of dairy products and milk today are India followed by the United States, Germany and Pakistan [1]. Milk, being major constituents of the diets, its quality assurance is considered essential to the health and welfare of a community. Milk may contain few organisms when it leaves the udder, also milk gets contaminated at various stages be it from the cow, milkier (manual as well as automated) extraneous dirt or unclean process water [2]. The threat posed by diseases spread through contaminated milk is well known and the epidemiologic impact of such disease is considerable [3]. With the aim of minimizing milk associated health hazards, restrictions and legislation on the marketing of unpasteurized milk have been introduced in most countries [4].However, this doesn't necessarily guarantee the safety of milk products. Outbreaks of milk borne diseases have occurred despite pasteurization, caused either by improper pasteurization or by re-contamination[5].

Milk, a natural liquid food is one of our most nutritionally complete foods, adding high quality protein, fat, milk, sugar, essential minerals, and vitamins to our diets. However, milk contains bacteria that when improperly handled may create conditions where bacteria can multiply. Most of the bacteria in fresh milk from a healthy animal are either harmless or beneficial. But rapid changes in the health of an animal or the milk handler, or contaminants from polluted water, dirt, manure vermin, cuts and wound can make raw milk potentially dangerous [6]. Milk is article of food for mankind ante dates the earliest recorded history. It is the normal secretion of the mammary glands of mammals. Nature designated milk as a food for the young. Mankind, thousands of years ago, learned the possibilities of milk and milk products as a food not only for the young but also for adults [6].

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MATERIALS AND METHODS

Collection of Raw Milk Sample

Raw cow milk used for this project was purchased from 3 major dairy farms in Owo. It was collected into a sterile bottle and was transported to the microbiology laboratory and kept in refrigerator until the commencement of analysis the same day.

Preparation of Samples

Samples were diluted in 0.17% peptone water (11ml of samples in 99ml of 0.1% peptone water from initial dilution). Subsequent decimal dilutions up to 10^3 were prepared with the same diluents and appropriate dilutions were used.

Physicochemical Analysis

The physicochemical constituents of the milk (total solid, fat, protein, lactose, titrable acidity and ash) were determined by the modified methods of[7].

Bacteriological Analysis

The raw milk samples from the studied areas were assessed for their bacteriological quality using the standard plate count method to determine total bacteria count, total *E.coli* and total coliform using the method described by[8].

RESULT AND DISCUSSION

Table 1: Bacterial Density of Raw Cow Milk Samples

Milk Samples	Total Bacterial Count (cfu/ml)	Total Coliform Count (cfu/ml)	Total E.coli Count (cfu/ml)
Rufus Giwa Polytechnic	TNCN	54	08
Ikare Junction	216	62	07
Aba Ebira	116	46	111

Table 2: Physicochemical Qualities of Raw Cow Milk Samples

Milk Samples	Total Solid (%)	Fat (%)	Protein (%)	Ash (%)	Total Titratable Acid (%)	Lactose Level (%)
Rufus Giwa Polytechnic	11.69	3.7	3.93	0.37	0.13	4.01
Ikare Junction	12.3	2.81	3.65	0.40	0.17	3.99
Aba Ebira	11.25	3.44	2.98	0.42	0.14	4.11

TNCN - Too Numerous Count

The bacterial count total bacterial count, total coliform count and total *E.coli* count raw cow milk potentially reveals the general conditions of sanitation and temperature control under which raw milk were produced, handled and held. The bacteriological analysis of raw cow milk samples is presented in table 1. The results above showed that the total bacteria count of Ikare Junction is greater than that of Aba Egbira(216 x 10^3cfu/ml and 116 x 10^3cfu/ml respectively) while that of Rufus Giwa Polytechnic was too numerous to . The results found in this present work indicate that raw milk samples were heavily contaminated. Possible reasons for the high counts of bacterial could be due to infected udders of the cows, lack of cooling after milking and lack of heat treatment which contributes to the poor hygiene quality of raw milk as described by [9].

The level of coliform count of Ikare Junction, Aba Egbira and Rufus Giwawere 62 x 10^3cfu/ml, 46 x 10^3cfu/ml and 54 x 10^3cfu/ml respectively. These counts were in accordance with ones reported by [7]. Many reports dealing with the occurrence of coliforms in raw milk have been accumulated. In those studies, various rates of coliforms were reported as 100, 96, 88.7, 90, 41.3, 80 and 100% of examined raw milk samples by [7][9-14]respectively. The presences of large number of coliforms bacteria are suggestive of unsanitary conditions or practices during production, processing, distribution or storage [9]. According to [9], total coliforms of raw milk intended for further processing should be <500 cfu/ml.

The overall level of *E.coli* count of Aba Egbira sample which was 11 x 10^3cfu/ml .It was greater than sample of raw cow milk from Rufus Giwa and Ikare Junction which were 8 x 10^3cfu/ml and 7 x 10^3cfu/ml respectively. *E.coli* may be considered as indicator microorganism of faecal contamination and other enteric

pathogens. Pathogenic bacteria may also be present in raw cow milk as a direct consequence of clinical or subclinical mastitis [15].

The result of fat, protein, ash, total solid, total titratable acidy and lactose level were given in Table 2 as 3.7%, 3.93%, 0.37%, 11.69%, 0.13% and 4.01% in raw milk sample from Rufus Giwa respectively, while Ikare Junction has fat 2.81%, protein 3.65%, Ash 0.40%, Total solid 12.3%, titratable acidity 0.17% and lactose level 3.99%, the sample from Aba Ebirahas fat 3.44%, protein 2.98%, Ash 0.42%, total solid 11.25%, total titratable acidity 0.14% and lactose level 4.11%.The analysis of variance showed low significant variations from the source of raw milk samples from Ikare Junction and Aba Ebira. The composition of raw cow milk in this present analysis was compared favourably with the composition of raw cow milk in Northern Europe, which contains fat of 4.3%, protein of 3.4%, lactose of 46%, ash of 0.73%, total solid of 13.3% [7]. These results also agree with that reported by [10] for raw cow milk.

The total titratable acidity of samples of Rufus Giwa, Ikare Junction and Aba Ebira which is 0.13%, 0.17% and 0.14% respectively, was found to be similar with the one reported in earlier study by [16][7]stating that the mean value of total titratable acidity was 0.18%.Lactose level obtained which were lower than the standard (2.82±0.24% <3.43±0.24%<4.90±0.15%) were justified by the higher content in chloride of milk according to [17][18] .Total protein from the three sampling points; Rufus Giwa, Ikare Junction and Aba Ebirawere 3.93%, 3.65% and 2.98% respectively. There were found to be within the recommended values of 2% to 4% for the total protein content of milk according to [16].

The amount of Ash obtained from raw milk of the three sampling points; Rufus Giwa polytechnic, 3.7%, Ikare Junction, 2.81% and Aba Ebira 3.44% were in agreement with those reported by [19] .There was a significant different in fat % among the three studied areas. Raw cow milk sample from Rufus Giwa (3.7%) is greater than that of Ikare Junction (2.81%) and Aba Ebira (3.44%).There was a slight difference in the percentage of total solid of milk samples from the three studied areas. Ikare Junction has 12.3%, Rufus Giwa polytechnic has 11.69%while Aba Ebirahas 11.25%. The composition of total solid in this present study favourably compared with composition of total solid of raw milk in Northern Europe, which contained total sold of 13.3%[7, 20].

CONCLUSION

The bacteriological analysis(the total bacteria count (TBC), Total coliform count (TCC) and Total *E.coli* count) results showed that the quality of milk in the studied areas was poor. Nevertheless, physicochemical qualities such as the total solid, total titratable acidity, lactose level, protein, fat, and ash content results showed that these milk samples were of good quality.The real danger of these milk samples was their bacterial prevalence. Indeed, it was found that raw cow milk from three studied areas (Rufus Giwa, Ikare Junction and Aba Ebira) which had traditional dairy practices without training was very contaminated because of their high prevalence of coliforms. The bad milking process is known to cause poor hygienic quality of milk which becomes so unfit for consumption.

REFERENCES

1. Gupta. Milk for Health and Wealth" (ftp://ftp.fao.org/docrep/fao/011/i052ie/i052100pdf) FAO Diversification Booklet Series 6, Rome, October, 18th, 2013.
2. Hayes MC, TD Brook. Raw milk and Fluid milk products. In: Marth E.H, Steele J.L, Eds. Applied Dairy microbiology. 2nd Ed. New York, Maxcel Dekker, Inc. USA, 2001:59-76.
3. Foster. Investigation of Milk and some dairy products for fecal pollution indicators. Dairy Microbiology, 1, (Ed. Robinson, R.K). London, New York, Elsevier Applied Science, 1990, pp: 171
4. Ballou LU, M Pasquini, RD Bremrl. Factors affecting herd milk composition and milk plasma at four levels of somatic cell counts. J Dairy Sci. 1995; 8(10):2186-2195.
5. Da Silva. Influence of Production Conditions on the Bacteriological quality of refrigerating farm bulk tank milk – a review. J Applied Bacteriol. 1998;34:659 – 677.
6. Clarence. Present situation of Urban and Peri-Urban Milk Production and Quality of Raw milk produced in West Shewa Zone, Oromia Region. M.Sc. Thesis Haramaya University, Ethiopia, 1990.
7. Tasci F. Microbiological and Chemical properties of raw milk consumed in Buxdur. J Anim Vet Adv. 2011; 10:635–41.
8. Aneja O. Manual of Food Quality control Microbiological Analysis. 4 Rev. 1Food and Agriculture Organization of the United Nations Pub. 2002.
9. Ombui ET. Evaluation of the hygienic quality of market milk of Khartoum State (Sudan). International J Dairy Sci. 1995;2(1):33-41.
10. El Zubeir, Ibtisam, EM, Wigdan, M Abdalla , OAO El Owni.Chemical Composition of fermented milk (roub and mish) in Sudan.Food Control. 2005;16:633-637
11. Al-Tarazi Y, Al-Zamil A, Shaltout F, Abdel-Samei H. Sanitary Status of raw cow milk marketed in Northern Jordan, Assiut Vet Med J. 2003;49:180-94.

12. Harold.Bacteriological Quality and Safety of raw milk in Malaysia. Food Microbiol. 1984;21:535-541.
13. Roger LJ and Mleko I. In: MikrobiologizaZivilZivalskejaizvoro (Eds: Bem, Z. Adamic, J. Zlender. B. SmoleMozina S. Gasperlin L). Ljubljama, Biotehniskafakultera, Oddelekza Zivil Stuo.2003, pp: 515 – 538.
14. Soomoro AH, Arain MA. Isolation of *Escherichiacoli* from raw milk and milk products in relation to public health sold under market conditions at Tandojan. Pak J Nutr. 2002;1:151-2
15. Pandya,Haenlin. Bacteriological quality and safety of raw milk in Malaysia. Food Microbiol. 2009; 21:535 – 541.
16. Al-Zenki SF, Al-Mazeedi HM, Al-Hooti SN et al. Quality and Safety Characteristics of milk sold in the state of Kuwait. J Food Proc Pres. 2007;31702-13.
17. Varman, Sutherland.Prevalence of *Escherichia coli* serotypes in raw milk and some dairy products. Assuit Vet Med. 2011;
18. Walstra, P and Jenness, R. 1984, Dairy Chemistry and Physics; John Wiley &Sons; New York
19. Steele MH. 1997, Composition of milk and factors that influence it. Bulletin 421. Pretoria: Directorate of Agricultural Information, Department of Agricultural 1979.
20. Adesiyun AA, L Webb, S Rahman. Microbiological quality of raw cow milk at collection centres in Trinand. J Food Prod. 1995;58:448