



Comparative Study of Microbial Quality of Hawked Nono and Packaged Yogurt Sold In Bida Metropolis

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ABSTRACT: A study was undertaken to ascertain the microbiological safety and compared the level of contamination between nono and package yogurt collected from different market sources within Bida. Three (3) samples each of nono and yogurt were purchased and analysed. The microbial count was determined by surface plating using colony counter, contaminant including *E.coli* salmonella, shigella, fungi (*mucors* sp) among others. The microbial count of nono was relatively higher ranges from 2.7×10^7 cfu/ml to 4.1×10^7 cfu/ml for bacteria pathogens and fungi 9.1×10^7 cfu/ml as compared to yogurt samples which range from 1.8×10^6 cfu/ml to 7.8×10^6 cfu/ml for bacteria and fungi 3.7×10^7 cfu/ml. Total viable count (Tvc) was 6.6×10^7 cfu/ml in yogurt while in nono it was numerous (TNC). The result show that Nono is highly contaminated with microbes than yogurt, sources of contamination were found to be the milking environment/area, the utensils and equipment, the personnel/milker as well as water used for the processing. Therefore, it is recommended that nono should be properly pasteurized and adequate hygienic measures should be adopted.

Keywords: Microbial count, Contaminants, Microbes, Utensils, Nono

Introduction

Nono is a Nigerian milk food similar to yogurt and other fermented milk products that is traditionally produced and consumed particularly by the Hausa and Fulani of Northern Nigeria (Eka and Ohaba, 2012). Nono also called Nunu by some tribes in Nigeria contains good quantities of amino acid, Calcium, Phosphorus and vitamins A, C, E and B complex (Nebedum and Obiakor, 2007)

Predominantly, nono is being prepared and hawked by the nomadic Hausa/Fulani cattle herdsman, who control over 80% of Nigeria Cattle production. Consumption of nono was formally limited to Fulani/Hausa indigenes while most non-indigenous see the preparation as apparently unhygienic and since also it has poor shelf life. (Obi and Ikenebomeh, 2004) However, nono for its increased nutritional value awareness is gaining wider acceptance nowadays (Ogbonna, 2011)

Raw milk has low keeping quality and at room temperature, spontaneous microbial spoilage occurs turning the product sour. This is brought by the activity of lactic acid bacteria (Feresu and Myuzando, 2003). Depending on its preservation and process line micro-organism other than lactic acid bacteria could be found in the nono (Nebedum et al., 2007) and its acceptability depends on the texture, flavor and taste which are in turn dependent upon the inherent microbial constituents. Due to the gross unhygienic method of preparation and handling nono has been claimed to be highly contaminated with micro-organism such as *staphylococcus aureus*, *E.coli*, *salmonella*, *pseudomonas* sp, *Bacillus* spp etc (Atanda and Ikenobomer, 1988)

Yogurt is a dairy product produced by bacterial fermentation of milk. The bacteria used to make yogurt are known as "Yogurt Cultures" fermentation of lactose by these bacterial produce lactic acid which act on milk protein to give yogurt its texture and its characteristic taste (Goff, 2010). worldwide cow milk is most commonly used to make yogurt, though milk from goats, sheep, horse camels water buffalo are also used in various part of the world (Adesiyun et al., 1995) yogurt is an excellent growth medium for many kinds of microorganisms as it provides rich nutrients for microbes, exposure of yogurt to the potential for microbial contamination during processing, storage and transportation without basic sanitary practices in place and control temperature handling yogurt will quickly spoil and become unacceptable for human consumption (Goff, 2010).

In many cultures of the world, especially the western world, human continue to consume milk beyond infancy, using the milk of animals especially like cattle, goats and sheep as food product. For millennia, cow's milk has been processed into dairy products such as nono (skimmed milk) ice cream, butter, yogurt and the more durable and easily transportable product, cheese. (Eka and Ohaba, 2012)

Nono milk and yogurt are fortified with vitamin A and D which help to promote eyesight and enhance calcium, potassium absorption. Both nono milk and yogurt contain carbohydrate sugar known as lactose. Nono contain high amount of carbohydrates compared to yogurt which contain about 6% of lactose, as fermentation process digested about 20-30% into its absorbable components glucose and galactose. (Nuhu et al., 2011).

Diet that includes milk products such as skimmed milk is a good source of energy and its consumption helps in elimination of heart problems associated with high cholesterol level in the blood. Calcium and potassium play an important role in regulating and possibly lowering blood pressure, drinking skimmed milk is encourage for those following the dietary approach to stop hypertension. Milk products have frequently been implicated in transmission of human pathogen (Soomro, 2002), contamination of dairy product by coliforms is attributed to the wide distribution of coliform in nature makes them useful indicator of the extent of re-contamination after pasteurization and also the sanitary quality of the pasteurized product. Secondly, coliform themselves caused the rapid spoilage of food held under conducive to the microbial growth. Thirdly, some strain are bacteria enteric pathogen which may be disseminated by dairy products.

Materials And Methods

Sample collection

Three nono samples each at different market in Bida (makwalla, lonchita and modern markets) was collected in sterile carted plastic tubes, purchase was done between 9:00am to 10:00am. Likewise, three brand of yogurt were also purchased from different provision store, their NAFDAC number expiry date, manufacture date and batch numbers were recorded. All samples purchase were properly labeled, packed and taken to the laboratory for microbial analysis.

Microbiology analysis

For each of the sample (3 yogurt and 3 nono sample) approximately 40ml each contained in sterile screw capped plastic bottles were used for the isolation and enumeration of micro organisms in each isolation both yogurt and nono sample were shaken and diluted serially into 9ml of sterile normal saline solution and homogenized by hand shaking for about one minute followed by the further decimal dilution. The dilution factor 10^{-4} of each sample was shaken after which 1ml of each was used to inoculate freshly prepared media and surface plated. Media employed for the isolation and enumeration includes Nutrient Agar (NA) potato Dextrose Agar (PDA) MacConkey Agar (MA) and salmonella - shigella Agar (SS). All Media Were sterilized by autoclaving at 121°C for 15mm (cheesebrough, 2003)

Microbial Count

Total viable count (Tvc) of isolates were carried out by subjecting the incubated plates to colony counter for the total colony count then further for microscopy

Characterization and identification of the isolates

The isolates were characterized based on colonial morphology and microscopic appearance. The isolates were identified by the procedures described by Oyeleke and Manga (2008).

Results

Table 1. microbial count of isolates in yogurt samples

samples	E.coli (cfu/ml)	S. typhi (cfu/ml)	S. dysen. (cfu/ml)	Fungi (cfu/ml)	TVC (cfu/ml)
A	4(240cfu/ml)	10(60cfu/ml)	1(60cfu/ml)	22(1320cfu/ml)	39(2340cfu/ml)
B	2(120cfu/ml)	0(cfu/ml)	0(cfu/ml)	12(720cfu/ml)	31(1860cfu/ml)
C	7(420cfu/ml)	4(240cfu/ml)	2(120cfu/ml)	28(1680cfu/ml)	42(2460cfu/ml)

Table 2. Microbial count of isolates from Nono (Skimmed milk) samples

samples	E.coli (cfu/ml)	S.typhi (cfu/ml)	S.dysen. (cfu/ml)	Fungi (cfu/ml)	TVC (cfu/ml)
Sample 1	21 1260cfu/ml	22 1320cfu/ml	18 1080cfu/ml	34 2040cfu/ml	Numerous
Sample 2	12 720cfu/ml	18 1080cfu/ml	0cfu/ml	50 3000cfu/ml	Numerous
Sample 3	3 1980cfu/ml	28 1680cfu/ml	3 180cfu/ml	68 4080cfu/ml	Numerous

Table 3. Comparative analysis between the yoghurt and Nono samples

samples	E.coli	S. typhi	S. dysen.	Fungi (A.niger)	TVC
Yogurt	7.8×10^6 cfu/ml	3.0×10^6 cfu/ml	1.8×10^6 cfu/ml	3.7×10^7 cfu/ml	6.6×10^7 cfu/ml
Nono	3.9×10^7 cfu/ml	4.1×10^7 cfu/ml	2.7×10^7 cfu/ml	9.1×10^7 cfu/ml	Numerous (TNC)

Key

TVC: Total viable count

S. dysen. *Shigella dysenteriae*

Discussion

Three of each yoghurt and nono samples were analyzed microbiologically for the presence of *E.coli* *Salmonella* spp, shigella and fungi, frequently implicated in food safety problems. *E.coli* was used as a measure of sanitary quality as well as an index of faecal contamination, salmonella and shigella sp were used as measure of organism frequently associated with food borne disease, fungi were use as a measure of poor hygienic practices during packaging processing.

The total number of *E.coli* counted in the three (3) nono sample is greater than the total number of *E.coli* founded in yoghurt sample (table 3) this may be as a result of poor sanitary practices by nono sellers. The presence of high number of *E.coli* in nono sample is and evidence of high number of other enteric pathogens as reported by the Adesiyun et al., (1995) researches have linked the presence of *E.coli* in milk and milk product with the presence of other enteric pathogens. This result of *E.coli* obtained is consistent with that obtained by the Ogbonna (2011) and Soomro et al., (2002).

The number of salmonella spp isolated in nono sample is much more higher than obtained from yoghurt sample, the number of salmonella counted in the first sample of nono is the same with that obtained by Ogbonna (2011) but the remaining two samples of nono contradicted with that obtained by Eka and Ohaba (2012). Salmonella are pathogens that could originate from animal themselves and contamination may arise during processing, thus presence of salmonella in nono and yoghurt is not surprising since they could either be transmitted from the animal before preparation or could have come via cross contamination, and water used for processing.

The number of shigella counted from two of each sample (no significance shigella seen from one of each sample) varies with nono having the higher number compare to that obtained from yoghurt. However, shigella pathogens was significantly lower and this organism is not an intrinsic flora of the animals therefore contamination could have been handling procedures especially the number of shigella counted from nono by Fulani (nono sellers).

The total number of fungi counted from nono sample is much more higher than that obtained from yoghurt this is in agreement with Ogbonna (2011) but higher than that reported by Award (2006) from similar Product. The reason for the contradictions, could be proper hygienic practice by producers during processing and packaging.

The total number of viable counts in nono sample is numerous compare 6.6×10^7 cfu/ml of counted in the three yoghurt samples. Total variables counts significantly higher than the values obtained for other groups of organisms in all of the samples among which include *Staphylococcus* sp this result support that reported by Rita (2007), and Ogbonna (2011). *Staphylococcus* sp could be spread from humans to food by directly skin fragments also since it could be normal healthy human skin

Conclusions

The significant differences between the number of isolates of the two sample analysed (nono and yogurt) varies, with nono having the highest microbial load in each of the analysis. Thus yoghurt have lower microbial load when compare to nono. This could be lack of standardized method of nono preparation, environmental variables, producing animals, the water use for processing as well as other equipment used during processing which might have harbours numerous number of microorganisms. Contamination of nono may also arise as result of exposure of the product during selling as microorganisms are also found in air ready to contaminate well-cover food.

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