

Evaluation of the Safety of Commonly Sold Yoghurts in UYO Metropolis

Idongesit Abel Clement¹, Moses Bassey Ekong^{1*} and Joseph Udo Idiong²

¹Department of Anatomy, Faculty of Basic Medical University of Uyo, Uyo, Nigeria

²Department of Physiology, Faculty of Basic Medical University of Uyo, Uyo, Nigeria

Abstract

Yogurt is an important nutritional dairy product consumed in different forms by people irrespective of age, sex and socio-economic status. However, reports of food poisoning often associated with its consumption lead to this research which aimed at evaluating the safety of the commonly consumed yogurt brands in Uyo Metropolis of Nigeria. Several sachets of frozen yoghurt from 14 different brands were collected randomly at different locations in Uyo Metropolis in Nigeria. These samples were allowed to thaw, and aseptically aspirated for microbiological analysis, detection of *Escherichia coli* (*E. coli*), gram staining, and antimicrobial susceptibility tests. Results show that *E. coli* was isolated from four (4) brands (29%) of the samples, and all the detected *E. coli* were gram negative rods. The isolated *E. coli* were susceptible to peflacin, streptomycin, ofloxacin, ciprofloxacin and augmentin. Some of the *E. coli* were however resistant to nalidixic acid, gentamycin, septrin, ceporex, while all the samples were resistant gentamicin, septrin and ampicillin. In conclusion, the results of this study demonstrate that Uyo Metropolis is at serious risk of *E. coli* infection because of its isolation from some finished yoghurt products in circulation, and which could be resistant to some commonly used antibiotics.

Keywords: Yogurt; Uyo metropolis; *Escherichia coli*; Gram negativity; Antibiotics

Introduction

Yoghurt is a milk product made from bacterial fermentation of milk. The process of fermentation of yoghurt involves the conversion by the bacteria of lactose in the milk to lactic acid. This lactic acid acts on the milk protein to give the yoghurt the thick and sour presentation. The first step in yoghurt preparation is heating the milk to 80°C to kill any bacteria present and to denature the milk protein so that they set together instead of becoming curds. After, it is cooled to 45°C, then a bacteria culture is added and the milk is kept at that temperature for 4 to 8 hours to allow the fermentation process to take place [1-3]. Since yoghurts have sour taste, they are often sweetened or flavored with vanilla, honey, fruits, among others [4]. Steins [5] reported that unsweetened yoghurts were the healthiest for diabetics. The yoghurt made with low fat or fat free milk were reported to be more beneficial, while the yoghurt made with sugar substitute was reported to be healthier than sweetened yoghurt or yoghurt containing real sugar [6].

It is reported that yoghurt unlike milk is well-tolerated by lactose-intolerant individuals [7]. It enhances the immune response by increasing the percentage of B lymphocytes and the phyto-hemagglutinin and lipopolysaccharide induced proliferative responses of Peyer's patches in the intestine [8]. It is also reported to reduce the risk of high blood pressure [9]. However, often times there are general diagnosis of food poisoning after yoghurt consumption. Most of the time this is due to the presence of bacteria with *Escherichia coli* (*E. coli*) being top on the list, as *E. coli* infections are mostly attributed to dairy food products from animals [10-13]. *E. coli* are gram-negative bacteria commonly found in the intestines of birds and mammals. Only a small subset of this group of bacteria such as *E. coli* strain O157 is pathogenic to humans. *E. coli* infections are disseminated by foods, water and person-to-person contact and even milk products [14]. Thus, consumption of yoghurts may predispose one to *E. coli* infections [15-17]. This research is aimed at evaluating the safety of the commonly consumed yoghurt within Uyo metropolis against *E. coli* contamination.

Materials and Methods

The following techniques were applied; microbiological analysis, detection of *E. coli*, gram staining for gram positivity or gram negativity, and antimicrobial susceptibility test. Several sachets of frozen yoghurt processed from 14 different companies with different product names were collected randomly at different locations in Uyo Metropolis in Nigeria. These samples were allowed to thaw, and aseptically aspirated with the aid of micro pipette. They were transferred to sterile test tubes containing 9 ml of distilled water to make stock solutions. From the stock solutions, 5 fold dilutions of different samples were obtained. That is, a millilitre of the solution of samples in test tube A (stock) was aspirated into another test tube (B) containing 9 ml of distilled water. This process was repeated three (3) more times into test tubes C, D and E respectively. With the aid of a wire loop thoroughly sterilized over Bunsen burner flame, and allowed to cool, the last samples of each yoghurt dilutions were picked and inoculated on plates of Mc conkey Agar and were incubated for 24 hours at 32°C. Bacteria were grown and colonies were formed.

The samples that contained bacterial growth were aseptically transferred using a sterilized wire loop from the Mc conkey Agar plate to properly labelled clean grease-free slides containing a drop of distilled water. The slides were spread into a thin area approximately and were allowed to air-dry completely. They were then quickly passed over a flame of Bunsen burner. The smears on the slides were flooded with crystal violet for one minute and were rinsed in tap water. The slides were then flooded with iodine for one minute, then rinsed in tap

***Corresponding author:** Moses Bassey Ekong, Department of Anatomy, Faculty of Basic Medical University of Uyo, Uyo, Nigeria, Tel: +2348030868505; E-mail: mbe_flashpoint@yahoo.com

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water and with 95% ethyl alcohol for one minute to decolorize, and then were rinsed again in running tap water. The slides were flooded with safranin for 45 seconds and were washed with tap water, and were kept in a slant position to air-dry. Oil immersion was applied in to view them microscopically. Samples that contained bacteria were picked and were sub-cultured on nutrient agar as well. That is, transferring some cell from the previous culture medium to a fresh growth medium. Antibiotic sensitivity disk were introduced into the plates and the bacteria were incubated for another 24 hours against the following antibiotics; tarivid (ofloxacin), ciprofloxacin, peflacin, augmentin, gentamycin, streptomycin, ceporex, nalidixic acid, septrin, and ampicillin. These processes were carried out on weekly basis for a month.

Results

Analytical results of the commonly sold yoghurt showed that of a total number of fourteen (14) different brands of yoghurt samples evaluated, *E. coli* were isolated from four (4) brands, representing 29% of the samples. All the detected *E. coli* were gram negative rods.

The *E. coli* isolated were susceptible to the following common antibiotics; peflacin, streptomycin, ofloxacin, ciprofloxacin and augmentin. Some of the *E. coli* were however resistant to nalidixic acid, gentamycin, septrin, ceporex, and were all resistant gentamicin, septrin and ampicillin

Discussion

Yoghurt which has always been considered safe because of its intrinsic nature is reported to be involved in fatal infections [15-17]. The presence of *E. coli* as a contaminant in this dairy product is reported as one of the major cause of food poisoning, and since this dairy product is widely sold in Uyo Metropolis, this motivated the need for this study on its safety from *E. coli*. The result of this study showed that *E. coli* was detected in four (29% of the samples) different yoghurt brands from different companies, and their karyotyping showed all to be gram negative. It is reported that *E. coli* survives in dairy products such as yoghurt and colby, romano and feta cheeses, among others for several weeks [18]. This may be due to inadequate processing procedure. The present study is in line with the work of Adetunji and Arigbede [19] who reported the presence of *E. coli* in finished yoghurt products, which they attributed to the failure in the processing stages and the subsequent survival of the organisms throughout processing. This result may also be attributed to post processing contamination at the production site or from secondary users that distribute such. Dineen et al. [12] reported that even low levels of *E. coli* can cause the contamination of these finished dairy products.

Testing of the susceptibility of the *E. coli* to common antibiotics in the present study showed that the *E. coli* in the yoghurt samples were susceptible to peflacin, streptomycin, ofloxacin, ciprofloxacin, augmentin. However, some of the samples were resistant to nalidixic acid, gentamicin, septrin and ceporex, though all the samples were resistant gentamicin and septrin. Most bacteria develop intrinsic resistances to some antibiotics. These bacteria show resistance to such antibiotics like tetracycline, vancomycin, erythromycin, streptomycin, clindamycin, gentamicin, oxacillin and lincosamide [20]. While pasteurization will kill all *E. coli* bacteria, thermization may not kill all the *E. coli*, though no pathogenic *E. coli* will survive [21]. Alhelfi et al. [22] reported that contaminated milk, whether raw or pasteurized, allow the proliferation of *E. coli* O157 at room temperature. Massa et al. [23] also reported that storing contaminated raw milk at 8°C, for

1-2 weeks allows *E. coli* O157 to survive and even proliferate, which is usually considered the main cause of haemorrhagic colitis, which may lead to severe other diseases and death in humans [13,24-28]. Thus, the pH and temperature usually determine the presence or absence of these bacteria as the outbreak of *E. coli* is tolerant to acidic conditions, particularly at lower temperatures [29-31].

Conclusion

The results of this study demonstrates that Uyo Metropolis and beyond are at serious risk of *E. coli* infection because of its isolation from some finished yoghurt products in circulation, and which could be resistant to some commonly used antibiotics.

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