Quality of Pasteurized Milk and Raw Milk and Isolating Bacteria Present in Milk: A Review

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ABSTRACT

The safety of food is a critical problem that should be prioritized on a worldwide scale, particularly in terms of nutritional quality and human health. Milk is an ideal environment for the growth and spread of a broad variety of bacteria, causing milk to degrade fast. An examination of raw milk samples and pasteurized milk after processing and before packing revealed a link between the qualities of the raw milk utilized and the attributes of the pasteurized milk produced. The microbial load can be used to assess raw milk quality. Milk production has Standard Plate, according to the International Dairy Federation criteria. A result of 104 Cfu/ml indicates acceptable hygienic methods, but a value of more than 105 Cfu/ml indicates major flaws in manufacturing hygiene. The Standard Plate Count (SPC) is the standard technique for determining the microbiological quality of raw and pasteurized milk, as well as other dairy products. MBRT and the plate count method are two effective methods for enhancing raw milk quality and decreasing waste. Lactobacillus was the major genus of lactic acid bacteria found from raw milk samples in this investigation. This suggests that quality assurance systems be implemented to assure high-quality milk and to research milk quality.

KEYWORDS

Milk, food safety, standard plate count, methylene blue reductive test (MBRT), Quality control and assurance, isolation and identification

INTRODUCTION

Food hygiene is a branch of science concerned with the safe operation, preparing, and preservation of food to prevent foodborne illness. This necessitates a number of everyday operations that must be carried out in order to avoid the emergence of potentially serious health problems Quality management is painstakingly planned and coordinated procedures that are carried out across all parts of the quality system, and hidden when required, to provide sufficient confidence that a single food item will fulfill the quality requirements hazard is a biological, chemical, or physical substance that has the potential to cause significant sickness or harm if it is not controlled. Routine actions such as maintaining personal cleanliness, correct food processing, heat treatment at a higher temperature, enough cooking before consumption, and not exposing the food to temperatures where bacteria might thrive can help to control a wide range of foodborne diseases (1) Milk is a complex biological fluid that, by definition, is an excellent growth substrate for numerous bacteria. Because it is impossible to avoid microbe contamination of milk owing to the specific product, the microbial content of milk is an important factor in determining its quality. (2) Microorganisms commonly taint milk trying to maintain strong and hygienic cows, having a clean milking environment free from dust and silt, not blending fresh milk as well as foremilk, having to wash hands often with soap as well as safe drinking water before milking, washing the udder with warm water and drying the udder with a clean dry cloth, and using clean containers for milking will all help to improve raw milk quality. In addition, mastitis-affected cows should be milked last and their milk removed, and dipping teats in an antiseptic solution will help prevent raw milk contamination. (3) Air, milking equipment, feed, dirt, dung, and grass are all potential causes of bacterial contamination in raw milk. (4) High bacterial levels suggest sloppy milk production or insufficient pasteurization. (5) Determining the initial microbial load is crucial, and numerous methods are used in the field and in the lab to accomplish this. The MBRT (methylene blue dye reduction test) has been utilized as a rapid alternative process for determining if milk is acceptable. Furthermore, microbiologists utilize the total plate count (SPC) to determine the quantitative population density of bacteria in liquid milk. (6) While the SPC has helped to ensure a safe supply of dairy products, the time necessary to secure the SPC is negative. There is a need for microbial testing procedures that will reduce this disadvantage by either swiftly detecting and enumerating microorganisms or indirectly determining the microbial count of a milk sample. (7) Raw milk quality, heat treatment intensity, post-pasteurization contamination, and storage temperature are the main factors that influence pasteurized milk storage quality. (8) India is now the world's greatest producer of milk. Milk output in India is estimated to be between 180-200 million tonnes by 2021-22, with milk production increasing at a pace of 5% per year. (9) According to peer-reviewed literature, raw milk has poor microbiological quality due to bacterial contamination. (10)Because of the unique nature of the product, it is impossible to totally eliminate microorganism contamination of milk; thus, microbial contamination of milk is an essential instrument in establishing its quality. Many bacteria, including E. coli, can get access to milk and milk products, posing a public health danger. E. coli is an indicator of milk and fruit juice contamination. (11)

MILK AND MILK PRODUCT CONTAMINANTS

Dairy product contaminants refer to the severity of numerous variables that might make food unhealthy, such as improper handling, bad storage conditions, naturally occurring toxins contained in the food, polluted water, pesticides, and medicine residues, and a lack of sufficient temperature control. Infectious and non-infectious pollutants are commonly found in milk and milk products (12)

MILK ADULTERATION

Adulteration is the deliberate act of lowering the quality of food available for sale, either by combining or substituting inferior ingredients or by omitting certain essential constituents. (Food and Drug Administration,1995). Adulterated food is hazardous to one's health since it may include a variety of poisonous compounds and may be deficient in nutrients necessary for appropriate human growth and development (13). People's milk is contaminated to such a degree that it has very little nutritional value and may also be dangerous to public health (14) pathogenic bacteria such as TB and hepatitis are normally present in milk (15) Some adulteration, such as detergents, is used to improve milk's aesthetic qualities. To give the milk a foamy appearance, detergents are added when water is poured. To whiten the milk and give it a natural look, hair removal powder and urea are added. A few grams of urea are all that is needed to return milk to its original state (16)

Table 1. COMMON ADULTERATION

Adulterant	In addition to	Detection method	Unwanted consequence	Reference
Water	Increase the amount of milk.	The freezing point cryoscopic method and the freezing point osmometry method	Malnutrition and gastrointestinal issues	(17)(18)
Melamine	Increase the milk protein content	Surface-enhanced ramen spectroscopy	In severe situations, renal failure and neonatal death may occur.	(19)
Chlorine	To compensate for the diminished milk density	Analyses of sequential injection and flow injection	Clogging in arteries and developing a heart problem	(20)
Vegetable oil and foreign fat	To generate greater financial advantage by removing milk fat	Fluorescence spectroscopy and foreign fat can be detected by analyzing triacylglycerols using gas-liquid chromatography	Heart disease	(21)
Formalin	Preservative	Take a 10-mL sample of milk. Without shaking, combine 5 m conc. sulfur ic acid and a little quantity of ferric chloride.	poisonous effect which can lead to death	(22)(23)
Detergent	Increase the foaming of milk to give it whiteness and thickness	Shake 5-10 ml of sample with an equal amount of water. Leather indicates the presence of detergents.	It causes gastrointestinal and kidney problems.	(24)

Starch	Increase the quantity and maintain SNF value in the milk	Add a few drops of Tincture of iodine or Iodine solution. Formation of blue color indicates starch	Diarrhea. Fatal to Diabetic patients.	(24)

BACTERIA SOURCES IN RAW MILK

Mammary gland cells produce milk, which is nearly sterile when discharged into the udder's alveoli. Following this stage of milk production, bacterial contamination is frequently traced back to three places: within the udder, outside the udder, and on the surface of milk handling and storage equipment. The quantity of microbiological contamination in raw milk can be influenced by a variety of factors including cow health, environment, milking practices, and equipment hygiene. The temperature at which milk is stored and the amount of time it is held before being tested and processed are both critical because they allow bacterial contamination to proliferate. The overall bacteria count (SPC) and the species of bacteria present in raw bulk tank milk will be influenced by all of these factors. (25)

TABLE 2. MBRT milk quality

TIME	QUALITY OF MILK
<1	Fair
1-2	Poor
3-4	Good
4-5	Very good
>5	Excellent

MILK MICROBIAL PATHOGENS

Presence of microorganisms in milk indicates a decrease in quality and an impact on the safety of milk consumption; in this case, environmental factors that promote the growth of pathogenic organisms in milk, as well as unsanitary practices during milk procurement and processing of these factors have an effect on the quality and safety of milk. (26) Microbiological pathogens associated with raw milk, such as *Campylobacter spp., enterohemorrhagic Escherichia coli, Salmonella spp., Listeria monocytogenes*, and others, were investigated by Food Standards Australia New Zealand (FSANZ) in 2009. (27)

DIFFERENT TYPES OF ANALYSIS

SAMPLE ANALYSIS

The microbiological quality of the milk samples was determined using the Standard Plate Count (SPC) method. Most testing began between 24 and 36 hours after the sample was taken. 15 samples were stored at 7 C for 12 hours before being examined using the impedance and SPC procedures to obtain samples with an SPC greater than 100,000 CFU/ml. (8).

ANALYSIS PHYSICAL

The physical properties of several milk samples were assessed promptly after the tests were completed (28). A digital PH meter was used to measure the P H. (HI 8314, Hanna Instruments, and Italy). The titrimetric technique was used to determine titratable acidity, as well as other parameters (28)

ANALYSIS CHEMICAL

The Lacto scanner measured many chemical characteristics of milk such as lactose, protein, and water content. (28). The Gurber Method was used to determine the total fat content of the sample (28)

ASSESSMENT OF SAMPLES

In this investigation, raw milk samples were obtained at random from stores and residential areas throughout the various zones. After adequate mixing, milk samples were collected in sterile glass bottles. After filling each sample container with the sample, it was airtight sealed. The source of the sample, the day and time of sampling, and other pertinent information were all written on the containers (29). Standard Plate count tests and Methylene blue dye reduction tests were used to examine milk samples technique (6)

MILK AND MILK PRODUCT QUALITY ASSURANCE AND CONTROL

Any rule of conduct, standard, or collection of requisites that enables stakeholders in the food supply chain to ensure compliance with what is claimed and to signal this to the end or next user is referred to as a quality assurance and certification system (QAS). In general, QAS distinguishes and guarantees goods based on their biochemical composition, provenance, and the origin of the raw material used to make them; manufacturing procedures; pesticide residues in products; animal breeding and living circumstances; and ethical elements of production (30)

Fig 1. Buffalo milk

Fig 2. Cow milk and pasteurized milk

RESULTS AND DISCUSSION

The milk was gathered from several stores and subjected to a conventional plate count and MBRT test. The high numbers might be caused by sick cow udders, unsanitary milking processes or equipment, and/or poor microbiological quality of water used to clean utensils and animals, as well as milk storage conditions. As a result, low milk quality is frequently cited as one of the key causes. (31) The production of high-quality raw milk on dairy farms is the most important requirement for the production of high-quality dairy products(32). Because high-quality dairy products begin with high-quality raw milk, producers are under constant pressure to improve their raw milk bacteria (33) The effect of heating milk at different temperatures on its microbial content was determined.

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Conflicts of interest

The authors declare no conflicts of interest.

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