To Find Types of Adulteration Present in Milk Products

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***Abstract*: Milk is a pale liquid produced by the mammary glands of mammals. It is the primary source of nutrition for young mammals before they are able to digest other types of food. Early-lactation milk contains colostrums, which carries the mother's antibodies to its young and can reduce the risk of many diseases. Milk contains many other nutrients and the carbohydrate lactose. An emulsion is a suspension of droplets of one liquid into another liquid. Milk is an emulsion of fat in water. Butter is an emulsion of water in fat.**

The solute is known as the dispersed phase and the solvent is known as the continuous phase. Other examples of emulsions include margarine, mayonnaise, cream, and salad dressing. A colloidal solution is when matter exists in a state of division in between a true solution, which is sugar in water, and a suspension, which is chalk in water. The characteristics of a colloid are small particle size, electrical charge, and affinity of the particles for water molecules. In milk, the whey proteins are in colloidal solution. This paper detects various types of adulteration present in milk products.

***Keywords*: Types of adulterants and adulterations etc.**

I. INTRODUCTION

Milk is very valuable food, readily digested and absorbed. It consists of nutrients, which are needed for proper growth and maintenance of body. Milk and milk products form a significant part of the diet and a substantial amount of our food expenditures goes on milk and other dairy products. In Pakistan, milk is transported from the point of production to consumers and processing plants by middlemen called "Gawalas". They don't maintain proper hygienic conditions during this transport, which leads to increase the total viable bacterial count. They also adulterate milk to increase their profit margin by several chemicals like urea, starch, flour, cane sugar, vegetable oils, detergents etc. Various preservatives like formalin and some antibiotics are also added in milk to increase its shelf life. This addition decreases the nutritive value of milk. These adulterants, preservatives and drugs in milk cause very serious health related problems.

II. WHAT IS ADULTERATION?

Food is the basic necessity of life. One works hard and earns to satisfy our hunger and relax (enjoy) later. But at the end of the day, many of us are not sure of what we eat. We may be eating a dangerous dye, sawdust, soap stone, industrial starch, and aluminum foil and so on! Contaminated foods and drinks are common sources of infection. Often, we invite diseases rather than good health.

Food adulteration is an act of intentionally debasing the quality of food offered for sale either by the admixture or substitution of inferior substances or by the removal of some valuable ingredient.

Food Adulteration takes into account not only the intentional addition or substitution or abstraction of substances which adversely affect nature, substances and quality of foods, but also their incidental contamination during the period of growth.

III. MATERIALS AND METHODS

(1) Detection of Carbonates in Milk through Difference in Acidity before and After Boiling:

Principle: Addition of carbonate neutralizers increases the carbon dioxide content and its contribution to the acidity in milk. As carbon dioxide can be expelled from the milk by heating, difference in the acidity before and after boiling of milk can be used to detect presence of carbonate neutralizers in milk.

Procedure:

- Divide the milk sample into two portions.
- Determine acidity of one portion of the milk sample.
- Boil the other portion of the milk sample, cool and determine its acidity.
- Calculate the difference between the two acidity values.

Interpretation: Carbon dioxide, naturally present in milk, contributes to its acidity by upto 0.01% or 0.02%. A difference of more than 0.02% in the two acidity values obtained indicates presence of carbonate neutralizers.

Note: This test does not apply to heated/pasteurized milk.

(2) Detection of Carbonates/Caustic Soda in Milk:

Principle: Milk has some natural acidity. However, on improper storage and handling, it also develops acidity through bacterial action, which is due to the lactic acid

produced by the bacteria from lactose. Presence of lactic acid beyond a level in milk, which is negative for clot-on-boiling test, gives indication that it has been neutralized by using carbonates and/or caustic soda.

Reagents:

- Barium chloride solution: Dissolve 19.75 g of barium chloride in distilled water and make up the volume to 100 ml using distilled water.
- Sodium hydroxide solution: 1.32 N
- Zinc sulphate solution: Dissolve 22.5 g of zinc sulphate in distilled water and make up the volume to 100 ml using distilled water.
- Ferric chloride solution: Dissolve 5 g of ferric chloride in 100 ml of 1/8 N hydrochloric acid. This should be diluted to 1% solution before use by mixing its 1 volume with four volumes of distilled water.

Procedure:

- Take 225 ml of milk in a conical flask.
- Add 5 ml of barium chloride, 5 ml of sodium hydroxide and 5 ml of zinc sulphate solution. Add in the order mentioned.
- Shake the contents of the flask thoroughly and allow them to stand for 30 seconds.
- Filter through fluted Whatman no. 4 filter paper and collect the filtrate into a clean conical flask.
- Take 0.5 ml of 1% ferric chloride solution in a Lovibond comparator cuvette marked at 10ml. Mix the contents and place the cuvette in the right hand compartment of the Lovibond comparator.
- Prepare a blank in a similar way by taking distilled water instead of the filtrate. Place this cuvette in the left hand compartment of the Lovibond comparator.
- Insert the standard tintometer disc number 6 (covering a range of 0-0.05 % lactic acid in five steps of 0.01%, with first labeled '0' to represent the colour of the ferric chloride in the blank) into the comparator.
- Read the lactic acid content.

Interpretation: A reading of 0.03% is suspicious while a reading above 0.03% confirms presence of neutralizer, if the milk is negative for clot-on-boiling test. Normal milk has a developed lactic acid content of 0.01% to 0.02%.

Note: This test will not confirm presence of neutralizers in milk which is positive for clot–on-boiling test. However, such milk should be rejected anyway.

(3) Detection of Hypochlorite and Chloramine:

Principle: Iodine released from potassium iodide in presence of hypochlorites/chloramines under acidic conditions gives blue colour with starch.

Reagents:

- Potassium iodide solution: 7% (w/v) in distilled water. Prepare fresh.
- Diluted hydrochloric acid: Mix 2 volumes of distilled water with 1 volume of concentrated hydrochloric acid.
- Starch solution: Boil 1 g starch in 100 ml distilled water. Cool before using.

Procedure and Interpretation:

- To 5 ml of sample in a test tube add 1.5 ml of potassium iodide solution, mix thoroughly and observe colour. A yellowish brown to deep yellow colour may be formed. If unaltered, add 4 ml of diluted hydrochloric acid, mix thoroughly with a glass rod flattened at one end and note colour of curd. A yellowish brown to deep yellow colour may be formed.
- Place the test tube in a large water bath previously heated to 85ºC and allows it to remain for 10 minutes. The curd will rise to the surface. The liquid and the curd will have yellowish brown to deep blue colour.
- Next add 0.5 to 1.0 ml of starch solution to the liquid below curd. A blue purple colour will be formed if hypochlorites and/or chloramines are present.

(4) Detection of Hypochlorite:

Reagents: Stannous chloride solution: 0.025% (w/v) in 73.5% sulphuric acid (1 volume of distilled water +3 volumes of concentrated sulphuric acid).

Procedure:

- Cool 3 ml of milk in a test tube to 2-5ºC.
- In another tube, take an equal volume of the stannous chloride solution, similarly cool, and add to milk.
- Gently shake the tube while in the freezing mixture for 3 minutes.
- Pour in to a 12.5 ml centrifuge tube and centrifuge for 3 minutes at 2500 rpm.

Interpretation: A yellow-green colour indicates the presence of hypochlorite.

(5) Detection of Quarternary Ammonium Compounds (Qac, Detergent) In Milk:

Reagents:

- Indicator solution: Prepare a stock solution by dissolving 0.05 g eosin in 100 ml acetone. Shake 10 ml of stock solution with 90 ml of tetrachloroethane and 1 g citric acid and filter before use.
- Buffer: Dissolve 25 g citric acid in 100 ml distilled water and adjust to pH 3.5 with 50% sodium hydroxide solution (approximately 15 ml of sodium hydroxide solution is required).

Procedure:

- To a centrifuge tube add 1 ml milk, 5 ml distilled water, 1 ml indicator solution and 0.2 ml buffer and shake vigorously for 10 seconds.
- Centrifuge for 5 minutes at 3200 rpm.
- Observe the colour of the bottom layer.

Interpretation: If QAC is present, the bottom layer assumes a red or pink colour.

Note: The method detects presence of about 5 mg/kg of the QAC in milk. Samples containing about 1 mg QAC/kg of sample show a faint pink colour, which may not be clear and conclusive.

IV. CONCLUSION

Adulterated Milk and Milk Products are dangerous to any leaving organism. Knowledge of adulteration of any food is essentional for each and every leaving organism.

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