

# Detection of Adulteration Present In the Buffalo and Cow Milk Samples

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**Abstract:** 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. This paper detects various types of adulteration present in the Buffalo and Cow milk samples.

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

## I. INTRODUCTION

Cow's milk, like the majority of dairy and animal products, is an acid-forming food. As with all foods, the pH nature of milk in the body is determined by the end products resulting from metabolizing it, not by the pH of the milk itself. A 3.5-ounce serving of either whole or skim milk is only slightly acid-forming, placing an acid load on the kidneys of 0.7 milliequivalents, or 1/1,000 of an equivalent. Whole, evaporated milk is only slightly more acid-forming, giving the kidneys an acid load of 1.1 milliequivalents. By comparison, a 3.5-ounce serving of plain, processed cheese made from cow's milk creates a potential acid load of 28.7 milliequivalents, and is much more acid-forming than milk. The main effect of eating a diet high in acid-forming foods is twofold: it depletes your body's alkali reserves and promotes acidosis, or acid buildup. Your body has a complex series of physiological mechanisms to neutralize and then eliminate excess acid buildup, primarily through the kidneys, lungs and skin. It utilizes its reserved alkalizing compounds to buffer the acids so they don't damage delicate tissues as they're eliminated. Because your kidneys can only eliminate a certain amount of solid acids each day, acidosis occurs when you over-consume acid-forming foods. Acidosis disrupts normal cell functioning and can set the stage for a variety of health issues, including osteoporosis, gout and rheumatoid arthritis.

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.

## II. WHAT IS ADULTERATION?

The 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 subtraction or abstraction of substances which adversely affect nature, substances and quality of foods, but also their incidental contamination during the period of growth, harvesting storage, processing, transport and distribution.

The term 'Adulterant' means any material which is or could be employed for making the food unsafe or sub-standard or misbranded or containing extraneous matter.

Food is adulterated if its quality is lowered or affected by the addition of substances which are injurious to health or by the removal of substances which are nutritious. It is defined as the 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 is declared adulterated if,

1. A substance is added which depreciates or injuriously affects it.
2. Cheaper or inferior substances are substituted wholly or in part.
3. It is an imitation.
4. Any valuable or necessary constituent has been wholly or in part abstracted.

5. It is coloured or otherwise treated, to improve its appearance or if it contains any added substance injurious to health.
6. For whatever reasons its quality is below the standard.

Adulterated food is dangerous because it may be toxic and can affect health and it could deprive nutrients essential for proper growth and development.

### III. MATERIALS AND METHODS

#### 1] DETECTION OF UREA:

Like ammonium sulphate, urea is a chemical fertilizer, which is added to watered milk to make up its density (lactometer reading) Being an important ingredient of synthetic milk, it is also used in milk to raise its SNF content Several methods have been developed to detect adulteration of milk with added urea. It is noteworthy that urea is also a natural constituent of milk. The average content of urea in cow milk is about 50 mg/100 ml whereas in buffalo milk it is present to the extent of 35 mg/100 ml (average). It is also important to note that feeding of urea as a protein supplement in the ration of dairy animals does not help to increase the urea content of milk substantially. However, concerted investigations need to be taken up in this direction as the menace of urea adulteration in milk is rising day by day.

**Test (i)** Take 5ml milk and add equal volume of 24 percent trichloroacetic acid (TCA) to precipitate fat and proteins of milk. Filter and collect filtrate take 1 ml.filtrate and add 0.5 ml. sodium hypochlorite (2%), 0.5ml. sodium hydroxide (2%) and 0.5 ml phenol solution (5%) and mix. A characteristic blue or bluish green colour develops in presence of added urea whereas pure milk remains colourless.

**Test (ii)** Take 5 ml milk in a test tube, add 0.2 ml urease (20 mg/ml) Shake well at room temperature and then add 0.1 ml Bromothymol Blue (BTB) solution (0.5%) Appearance of blue colour after 10-15 min. indicates the presence of urea in milk. Normal milk shows faint blue colour due to natural urea present in milk.

**Test (iii)** Take 5 ml milk in a test tube and add 5 ml of p – Dimethyl Amino Benzaldehyde (DMAB) reagent (1.6% in ethyl alcohol containing 10% HCl) Development of distinct yellow colour denotes the presence of added urea. The pure milk sample shows a slight yellow colour due to the presence of natural urea in milk. Processing treatments such as chilling, pasteurization and boiling of milk as well as adulterants and neutralizers do not affect the determination of added urea in milk (Bector et al 1998) The test is more sensitive when it is conducted on protein free filtrate obtained as in case of test (i).

#### 2] TEST FOR DETECTION OF AMMONIUM SULPHATE

The presence of sulphate in milk increases the lactometer reading.

5 ml of hot milk is taken in a test tube. A suitable acid for e.g. citric acid is added and the whey obtained is separated and filtered. The whey is taken in another test tube and 0.5 ml of 5% barium chloride is added. Appearance of precipitate indicates the presence of ammonium sulphate.

Take 5 ml of milk add 2.5 ml of 2% sodium hydroxide, 2.5 ml of 2% sodium hypochlorite and 2.5 ml of 5% phenol solution. Heat for 20 seconds in boiling water bath. If bluish colour turns to deep blue it indicates the presence of ammonium sulphate, however in case it turns to pink it shows that the sample is free from Ammonium sulphate.

#### 3] DETECTION OF COLOURING MATTER

It is a common practice to adulterate buffalo milk with water and sell it as cow milk after adding some yellow colour to it. The following colours are generally used:

- (a) Artificial colours
- (b) Coal tar dyes
- (c) Annatto
- (d) Turmeric

Some of these dyes are permitted only in some dairy products but none in milk. These are often detected as follows:

##### Test (i)

To 10 ml milk in a test tube, add 10 ml diethyl ether and shake vigorously. Allow to stand. Presence of any colour is indicated by yellow colour of the ethereal layer.

##### Test (ii)

Add sodium bicarbonate to milk to make it alkaline. Immerse a strip of filter paper for 2 hours. Red yellow colour observed on filter paper indicates the presence of annatto. Treatment of paper with stannous chloride turns pink.

##### Test (iii)

Add a few drops of hydrochloric acid to milk. Development of pink colour indicates azo (coaltar) dyes.

#### 4] DETECTION OF SYNTHETIC MILK

Take 5 ml milk in a test tube and add 0.2ml urease (20 mg. per ml) Shake well and then add 0.1 ml of BTB solution (0.5%) Appearance of dark blue colour indicates the presence of synthetic milk. The methods for detection of urea and synthetic milk are same; the only difference is appearance of dark blue colour in case of synthetic milk.

#### 5] DETECTION OF SODIUM CHLORIDE:

Sodium chloride (common salt) is added to make up the density (lactometer reading) of watered milk. Take 2 ml of milk and add 0.1 ml of 5 percent potassium chromate and 2 ml of 0.1 N silver nitrate. Appearance of Yellow precipitate indicates the presence of sodium chloride.

#### 6] DETECTION OF REMOVAL OF FAT BY SKIMMING

The following indicates this:

- (i) Lower percentage of fat

- (ii) Higher density reading
- (iii) Higher ratio of SNF: fat,

#### IV. CONCLUSION

This study concluded that low income group respondents were least educated, had low awareness about their rights and responsibilities and food adulteration. So this group needs to be armed with lot of information and training on the issues of food adulteration and ways to raise their voice when felt cheated. They had limited income, so they could not reach the standard items of their choice. On seeing such condition of consumer, our government has made sincere efforts to curb the fraudulent practices by enactment of various laws.

It is highly unlikely that more legislation or increasing fines and jail terms alone will help reduce adulteration, particularly given the corruption that exists in the enforcement area and the low conviction rate. Greater consumer vigilance and action alone can help improve the situation. But such efforts are not fruitful unless consumers themselves are aware of their rights and responsibilities. Under these circumstances, consumer literacy is the need of the hour with special attention to low income groups who suffer the most. Adulterated Milk and Milk Products are dangerous to health of any leaving organism. Leaving organism has must essential Knowledge of adulteration of any food.

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