Detection of Adultered Formal in and Hydrogen Peroxide in Milk

Dr. D.J. Navale[1], Dr. Shelley Gupta[2]

[1]Sinhgad Academy of Engineering, Kondhwa, Pune, Maharashtra, India

[2]Parvatibai Genba Moze College of Engineering, Waghali, Pune, Maharashtra, India

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 milk.**

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

I. INTRODUCTION

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.

II. WHAT IS ADULTERATION?

Food is the basic necessity of life. One works hard and earns to satisfy our hunger and relax 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.

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 essentional for proper growth and development.

III. MATERIALS AND METHODS

A) Test for Presence of Formalin in Milk:

I) Chromotropic Acid Test:

Reagent: Saturated solution of 1, 8-dihydroxynaphthalene-3, 6-disulphonic acid in about 72% sulphuric acid (about 500 mg/100 ml). Light straw-colored solution should result.

Procedure: Take one ml of milk sample in a test tube. Add 1 ml of the chromotropic acid reagent and mix well. Appearance of yellow color confirms the presence of formalin in the sample, whereas; control sample will remain white.

II) Hehner's Test:

Reagent: Conc. sulphuric acid.

Procedure: Take milk sample (2 ml) in a test tube and add 2 ml of 90% H_2SO_4containing traces of ferric chloride from the side of the test tube slowly. Formation of purple ring at the junction indicates formaldehyde is present in milk. If sucrose is present, distil the milk sample (25 ml) and then carry out the test on the distillate by taking 2-3 ml of distillate and adding 2 ml of formaldehyde free milk. The violet coloration does not appear usually when relatively large quantities of the formaldehyde are present.

Precaution: If H_2SO_4 is added from the top and not from the side of the test tube, it may burn the milk solids and affect the end result.

B) Test for Presence of Hydrogen Peroxide in Milk:

I) Vanadium Pentoxide Test:

Reagent: Vanadium pentoxide solution: Dissolve 1 g of vanadium pentoxide (V_2O_5) in 100 mldilute sulphuric acid (6 ml concentrated sulphuric acid diluted to 100 ml).

Procedure: Add 10 to 20 drops of vanadium pentoxide reagent in 10 ml milk sample and mix. Note the colour of the sample. Appearance of pink or red colour indicates the presence of hydrogen peroxide in milk.

II) Para-Phenylenediamine Test:

Reagent: Para-phenylenediamine solution: Weigh 2.0 g of para-phenylenediamine and dissolve it in distilled water to obtain 100 ml solution i.e. 2% aqueous solution, w/v.

Dissolution of para-phenylenediamine in water is difficult and requires thorough mixing. The solution will appear pale yellow.

Procedure: Add about 2 ml of milk in a test tube. Add equal volume of raw milk. Add two drops of 2 % of para-phenylenediamine reagent. Mix well. Observe the color of the solution in the tube. Blue color will developed in the presence of H_2O_2, whereas pure milk sample remain white in color.

III) Potassium Iodide and Starch Test:

Reagents:

A. Potassium Iodide Solution: Weigh 20 g of potassium iodide and dissolve it indistilled water to obtain a 100 ml solution.

B. Starch Solution: Take 1 g starch powder and dissolve it in distilled water by heating and make up the volume to 100 ml.

C. Potassium Iodid: starch reagent: Mix equal volumes of 20% potassium iodideSolution and 1% starch solution.

Procedure: Take 1 ml of milk sample in a test tube. Add 1 ml of the potassium iodide-starch reagent and mix well. Observe the color of the solution in the tube. Blue color will developed in the presence of H_2O_2, whereas pure milk sample remain white in color.

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 essentional Knowledge of adulteration of any food.

REFERENCES

[1]. Ai, K., Liu, Y., & Lu, L. (2009). Hydrogen-bonding recognition-induced color change of gold nanoparticles for visual detection of melamine in raw milk and infant formula. Journal of the American Chemical Society, 27, 9496–9497.
[2]. Balabin, R. M., & Smirnov, S. V. (2011). Melamine detection by mid- and nearinfrared (MIR/NIR) spectroscopy: A quick and sensitive method for dairy products analysis including liquid milk, infant formula, and milk powder. Talanta, 1, 562–568.
[3]. Chao, Y.-Y., Lee, C.-T., Wei, Y.-T., Kou, H.-S., & Huang, Y.-L. (2011). Using an on-line microdialysis/HPLC system for the simultaneous determination of melamine and cyanuric acid in non-dairy creamer. Analytica Chimica Acta, 1, 56–61.
[4]. Chen, Z., & Yan, X. (2009). Simultaneous determination of melamine and 5 hydroxymethylfurfural in milk by capillary electrophoresis with diode array detection. Journal of Agricultural and Food Chemistry, 19, 8742–8747.
[5]. Cheng, Y., Dong, Y., Wu, J., Yang, X., Bai, H., Zheng, H., et al. (2010). Screening melamine adulterant in milk powder with laser Raman spectrometry. Journal of Food Composition and Analysis, 2, 199–202.
[6]. Ding, T., Xu, J., Li, J., Shen, C., Wu, B., Chen, H., et al. (2008). Determination of melamine residue in plant origin protein powders using high performance liquid chromatography-diode array detection and high performance liquid chromatography–electrospray ionization tandem mass spectrometry. Chinese Journal of Chromatography, 6–9.
[7]. Ding, N., Yan, N., Ren, C., & Chen, X. (2010). Colorimetric determination of melamine in dairy products by Fe3O4 magnetic nanoparticles–H2O2–ABTS detection system. Analytical Chemistry, 13, 5897–5899.
[8]. Ehling, S., Tefera, S., & Ho, I. P. (2007). High-performance liquid chromatographic method for the simultaneous detection of the adulteration of cereal flours with melamine and related triazine by-

products ammeline, ammelide, and cyanuric acid. Food Additives and Contaminants, 1319–1325.

[9]. Ellis, D. I., Brewster, V. L., Dunn, W. B., Allwood, J. W., Golovanov, A. P., & Goodacre, R. (2012). Fingerprinting food: Current technologies for the detection of food adulteration and contamination. Chemical Society Reviews, 17, 5706–5727.

[10]. Elvira, L., Rodriguez, J., & Lynnworth, L. C. (2009). Sound speed and density characterization of milk adulterated with melamine. The Journal of the Acoustical Society of America, 5, EL177–EL182.

[11]. Lachenmeier, D. W., Humpfer, E., Fang, F., Schutz, B., Dvortsak, P., Sproll, C., et al. (2009). NMR-Spectroscopy for nontargeted screening and simultaneous quantification of health-relevant compounds in foods: The example of melamine. Journal of Agricultural and Food Chemistry, 16, 7194–7199.

[12]. Lutter, P., Savoy-Perroud, M.-C., Campos-Gimenez, E., Meyer, L., Goldmann, T., Bertholet, M.-C., et al. (2011). Screening and confirmatory methods for the determination of melamine in cow's milk and milk-based powdered infant formula: Validation and proficiency-tests of ELISA, HPLC-UV, GC–MS and LC–MS/MS. Food Control, 6, 903–913.

[13]. Mauer, L. J., Chernyshova, A. A., Hiatt, A., Deering, A., & Davis, R. (2009). Melamine detection in infant formula powder using near- and mid-infrared spectroscopy. Journal of Agricultural and Food Chemistry, 10, 3974–3980.

[14]. Pietrzyk, A., Kutner, W., Chitta, R., Zandler, M. E., D'Souza, F., Sannicolo, F., et al. (2009). Melamine acoustic chemosensor based on molecularly imprinted polymer film. Analytical Chemistry, 24, 10061–10070.

[15]. Saba Naz Sherazi, S. T. H., Talpur, Farah N., & Mahesar, Sarfaraz A. (2011). Rapid determination of free fatty acid content in waste deodorizer distillates using SBATR– FTIR. Journal of AOAC International. Sun, F., Ma, W., Xu, L., Zhu, Y., Liu, L., Peng, C., et al. (2010). Analytical methods and recent developments in the detection of melamine. Trends in Analytical Chemistry, 11, 1239–1249.

[16]. Turnipseed, S., Casey, C., Nochetto, C., & Heller, D. N. (2008). Determination of melamine and cyanuric acid residues in infant formula using LC–MS/MS. United States Food and Drug Administration, 1–14.

[17]. Vaclavik, L., Rosmus, J., Popping, B., & Hajslova, J. (2010). Rapid determination of melamine and cyanuric acid in milk powder using direct analysis in real time time- of-flight mass spectrometry. Journal of Chromatography A, 25, 4204–4211.

[18]. Venkatasami, G., & Sowa, J. R. Jr, (2010). A rapid, acetonitrile-free, HPLC method for determination of melamine in infant formula. Analytica Chimica Acta, 2,227–230.

[19]. Wang, Z., Chen, D., Gao, X., & Song, Z. (2009). Subpicogram determination of melamine in milk products using a luminol–myoglobin chemiluminescence system. Journal of Agricultural and Food Chemistry, 9, 3464–3469.

[20]. Wu, W.-C., Tsai, I. L., Sun, S.-W., & Kuo, C.-H. (2011). Using sweeping-micellar electrokinetic chromatography to determine melamine in food. Food Chemistry, 3, 783–789.

[21]. Yan, N., Zhou, L., Zhu, Z., & Chen, X. (2009). Determination of melamine in dairy products, fish feed, and fish by capillary zone electrophoresis with diode array detection. Journal of Agricultural and Food Chemistry, 3, 807–811.

[22]. Bordin, G., CordeiroRaposo, F., De la Calle, B., & Rodriguez, A. R. (2001). Identification and quantification of major bovine milk proteins by liquid chromatography. Journal of chromatography A, 928(1), 63-76

[23]. Dubey, P.C. And Gupta, M.P. (1986) Studies on Quality of Rabri. J. AgricSci Res 28:9-14. Milk Adultration: Methods Of Detection &RemedialMeasureswww.eshancollege.com20www.erpublication.org

[24]. Kumar M., Rao, Y.S And Gupta, M.P. (1981) Chemical Quality Of Milk Based Sweets Sold In Agra And Mathura Cities. J. AgricSci Re 23:13-17

[25]. Meisel H (1995) Application of fourth derivative spectroscopy to quantitation of whey protein and casein in total milk protein. Milchwissenschaft 50 247–251.