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Synthetic Milk: A Challenging Threat to Indian Dairy Industry and its Public Health Significance

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India is the world top milk producer country with annual production of about 221 million Tonn (NDDB, 2021-22) and per capita availability of milk is 444mg/day/person which are more than ICMR requirement. But the phenomenon of synthetic milk makes this achievement worthless. Liquid milk is an essential nutritional food for infants as well as the old aged people. Adulteration of natural milk with a chemically synthesized milky liquid (synthetic milk) is a matter of serious concern. Synthetic milk is not milk but an artificial imitation of natural milk with a high degree of adulteration to increase the volume of milk and thereby the profit. Main components of synthetic milk are water, pulverized detergent or soap, sodium hydroxide, vegetable oil, salt and urea. Most of these components such as urea, neutralizers and detergents are very harmful to human health. Presently the preparation of synthetic milk is practiced at village level but it is steadily spreading to urban areas in various Indian states

Components of Synthetic Milk:

1. Water is a medium component used in the preparation of synthetic milk. All other components are mixed in water medium to get equivalent consistency and appearance like natural milk.
2. Cane sugar is added in synthetic milk to adjust the sweetness of milk and it is also added to mask the sour taste developed due to the acidity in stored milk. Existing chemical test for the detection of cane sugar in milk could detect as low as 0.1% cane sugar as adulterant.

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3. Starch is added in synthetic as well as natural milk to adjust and or to increase the consistency and viscosity. The existing test for the detection of starch in milk by iodine reagent was able to detect as low as 0.1% of starch as adulterant.
4. Urea is a source of nitrogen; thus, it is generally added in synthetic milk to increase its nitrogen content and hence the level of the protein in milk. Dimethyl amino benzaldehyde (DMAB) test for the detection of the urea in milk detects 0.1% urea as adulterant in milk. Natural milk also contains urea, so which also gives a faint yellow colour when analysed with DMAB test.
5. Neutralizers are also added in synthetic milk to mask acidity. Milk turns acidic when it is stored for a prolonged time. Upon storage for a long time, the lactose in milk is converted to lactic acid by the growth of bacteria. Such milk clots easily upon boiling and become unfit for consumption. Addition of neutralizers masks the developed acidity in milk. The existing Rosalic acid test for the detection of neutralizers in milk could detect as low as 0.1% sodium carbonate. 6. Glucose is also added in synthetic milk to increase sweetness. The existing test for the detection of glucose in milk could detect 0.6%.
6. Detergents are added to make the milk frothy like natural milk. The existing test for the detection of detergents in milk could detect as low as 0.1% of adulterant.

Difference between Natural and Synthetic milk

Properties	Natural milk	Synthetic Milk
A. Physical properties		
Odor	Odor is absent	Due to presence of detergent in freshly prepared milk has a soapy smells which disappears on overnight storage at 40^0 C
Color	White	White
Taste	Palatable	Bitter
Density	1.025-1.035	1.025-1.035
Boiling	No change	Change in yellow color
Storage	Curdling but no change in	Turns yellowish after

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	color	sometime
Texture	No soapiness, clear	Give soapy feel when rubbed
B. Chemical properties		
pH	Highly alkaline, 10.5	Slightly acidic, 6.4-6.8
Urea test	Faint yellow color	Intense yellow color
Urea concentration	0.2-0.7 mg/ml	14 mg/ml
Sugar test	Negative	Positive
Neutralizers test	Negative	Positive

Harmful effects due to synthetic milk

If the milk used in the adulteration is contaminated it will lead to the harmful diseases like cholera, typhoid, shigella, polio, meningitis, and hepatitis. These are mainly caused by waterborne pathogens like protozoa, viruses and bacteria many of them are intestinal parasites. Urea has a cancerous effect on the human body. Detergent contains dioxane which carcinogenic in nature and can cause cancer on consumption. Other causes by detergents like eye and skin irritation, endocrine disruption, organ toxicity, neurotoxicity, nephrotoxicity, hepatotoxicity, developmental and reproductive toxicity, mutations and cancer. Disrupted growth and metabolic development, decreased testicular growth and sperm count, and increased mortality. A neutralizer in synthetic milk causes abdominal pain, burning sensation, shock or collapse. Sodium carbonate on ingestion may cause irritation along the digestive tract or stomach linings and may cause vomiting. Its ingestion may also cause diarrhoea which may further result in frequent, loose bowel movements.

Control

- There should be formation and implementation of strict food laws and regulations to restrict the preparation and distribution of synthetic milk or milk adulterated with harmful components.
- Proper monitoring of milk producer, sellers, milk vendors time to time.
- Provide facility for milk testing and establishing milk testing laboratories.
- Proper awareness of people.