

## RESEARCH ARTICLE

# Discernment of Adulterants in Milk Samples from Some Local Dairy Farms of Hyderabad

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## ABSTRACT

Milk is rich in nutrients like proteins, fats, carbohydrates, vitamins and various minerals important for maintaining health and is regarded as a complete food. It is consumed as it is or may be taken in the form of dairy products. As an agricultural product, milk is extracted from mammals of nonhuman origin. India is the world's largest producer of milk and skimmed milk powder. However, the adulteration of consumable products such as milk is a common practice in India. The addition of urea, detergent, sugars, Vanaspati and other synthetic chemicals render it unfit for consumption according to the standards that define the quality of milk. In the present study, adulterants were investigated in market milk sold by the local vendors in the vicinity of Hyderabad during the year 2020. Sixty samples (n = 60) from different milk producers and dairy shops were collected and examined. Samples were collected in clean, dry, and sterilized glass bottles. Milk samples were tested for the adulterants like water, glucose, starch, skimmed milk powder, neutralizers, urea, detergents, salt, hydrogen peroxide, formalin using a commercially available Adulteration test kit. The study observed that milk was found adulterated with water, skimmed milk powder, starch, glucose, urea, sodium chloride, formalin and neutralizers, proving it unfit for human health.

**Keywords:** Adulteration, Detergents, Health, Milk, Urea.

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## INTRODUCTION

When present in its natural form, milk is alimentative and provides nutrients like quality proteins, fats, carbohydrates, vitamins, and minerals<sup>1</sup>. It is regarded as a complete food and is easily digested and absorbed. It is important for infants, nursing women, children, and elderly people. Milk is a staple food for infants and children since it contains amino acids needed for growth and is fortified sometimes with many nutrients necessary for them.<sup>2</sup> Milk contains nine essential nutrients, namely calcium which builds healthy bones and teeth and maintains bone mass, proteins which serves as a source of energy and builds muscle tissue, potassium which helps to maintain healthy blood pressure, phosphorus which helps to strengthen bones and generate energy, vitamin D, which helps in maintaining bones, vitamin B12 which maintains healthy red blood cells and nerve tissue, vitamin A, which maintains the immune system and helps to maintain normal vision and skin, riboflavin (B2) which converts food into energy and Niacin used in energy metabolism in the body.

The quality of the milk may become low due to unorganized and non-regulated marketing systems.<sup>3</sup> To maintain the

freshness of milk, some substances are unethically added to prevent milk's financial losses due to the spoilage during its movement from the production to the consumer.<sup>4</sup> Water is added to increase the volume of milk whereas thickening agents like starch, flour, skimmed milk powder, whey powder or other ingredients are added to balance the dilution. To compensate for the fats, carbohydrates or protein content of diluted milk, vegetable oil, sugarcane, or urea is added. To increase storage life of milk, chemicals like antibiotics, hydrogen peroxide, carbonates, bicarbonates, and caustic soda are added. Ice is added to enhance the shelf life and to enhance the cosmetic nature. Calcium thioglycolate or potassium thioglycolate or calcium salts of thioglycolic acid and urea are added to whiten milk and give it a genuine look.<sup>5</sup>

Adulteration is the act of addition of substances to make it poorer in quality which may be intentional or accidental. Milk adulteration is common in developing countries and has an effect on the characteristics and quality.<sup>6</sup> The adulteration of milk is one of the most common practices done since the olden days. According to the World Society for the Protection of Animals and the National Dairy Development Board India,

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India is the largest producer and consumer of milk. In the year 2018, India was ranked among the top five countries in the world, producing 187.7 million tonnes of milk<sup>7</sup>. Whereas in the year 2015-16, India ranked first, producing 155.48 million tons as reported by the Agriculture Ministry accounting for 19 percent of the world production.<sup>8</sup> Quality Survey to assess the quality of milk is carried out in more than 130 cities across India collecting samples to test for fats and SNF content and other common adulterants.<sup>9</sup>

Adulteration deteriorates the quality of milk resulting in health hazards for human beings. For instance, high levels of chloride in the milk alter the acid-base balance and blood PH. Ammonia, if present, may cause regression, loss of acquired immunity, kidney problems and sensory disturbances. Hydrogen peroxide disturbs the antioxidants in the body and hence the immunity is altered. Formalin causes vomiting, diarrhea, and abdominal pain and affects the optic nerves, causes blindness, and is a potent carcinogen. Boric acid causes urticarial, metabolic acidosis, asthma and convulsions in few cases.<sup>10-13</sup> Starch causes displacement of nutrients resulting in obesity.<sup>14</sup> The Journal of American Heart Association reported in 2007 that consumption of Vanaspati elevates cholesterol levels in the body, causing diabetes and coronary ailments. A national survey shows that about 70% of the produced milk is adulterated with detergent, neutralizers but impure water was the major contaminant. Detergents when added, increase the SNF value of milk, which may cause health issues.<sup>15</sup> The present work aims to analyze the adulterants present in fresh milk samples collected so that the consumers have an awareness of the milk's quality and be selective in their milk choice.

## MATERIALS AND METHODS

A total of 60 milk samples were collected from different local milk vendors in and around the city of Hyderabad, Telangana, India. Samples were collected in clean, dry, and sterilized 100 mL glass bottles. All the samples were stored and tested in proper conditions to avoid any type of errors.

### Screening of Adulterants and Preservatives

The milk samples were tested for the presence of various adulterants and preservatives commonly present by using an adulteration milk kit (ATM) available with Hi-Media Pvt. Ltd, India. The kit includes glucose test, starch test, skim milk powder test, neutralizers test, urea test, detergent test, sodium chloride test, hydrogen peroxide test, formalin test. All the tests were performed as per the instructions given in the ATM kit under sterile conditions.

### Screening of Added Water

The presence of extraneous water added in milk samples can be detected by depression of freezing point through Cryoscope. It can be calculated by the formula<sup>16,17</sup> given below:

$$\% \text{ Water added} = \left[ \frac{\text{Freezing point base} - \text{observed freezing point}}{\text{Freezing point base}} \right] * 100$$

## RESULTS

All the milk samples from the local milk vendors were screened for the presence of extraneous water, adulterants, and preservatives shown in Table 1. All the milk samples showed the presence of extraneous water (44%), glucose (13.33%), starch (16.66%), skimmed milk powder (55.33%), neutralizers (41.6%), salt (33.33%), urea (23.33%), detergents (30%), formalin (15%) and hydrogen peroxide (35%)

## DISCUSSION

Consumers have the absolute right to assume that the milk is pure and unadulterated. The dairy industry must adhere to the quality provided, and care should be taken to provide good quality milk. Nearly half of the samples had extraneous water. Milk is deliberately adulterated with water to increase its volume. In fewer cases, it may be due to accidental additions during production or processing.<sup>8</sup> Around eight samples were detected for glucose and 10 for starch, respectively, which can be responsible for an increase in thickness of milk and can cause serious conditions like diarrhoea.<sup>19</sup> The present study results showed 53.33% skim milk powder as an adulterant, which can be the reason for an increase in the weight of natural milk.<sup>20</sup> Neutralizers were found in 25 samples which acted as preservatives and may cause an imbalance of hormones in the body.<sup>21</sup> Nearly 1/4<sup>th</sup> of samples showed the presence of urea which increases the whiteness of milk and SNF. This may cause renal failure and can also cause swollen limbs and impaired vision.<sup>22</sup> Around 30 samples had added detergents to emulsify and dissolve the oil in water. Added detergents have octyl phenol and nonylphenol and may cause breast cancer.<sup>23</sup> About 1/3<sup>rd</sup> samples had salt, which is added to mask the higher amount of extraneous water. This may affect the acid-base balance in the body and sensory functions.<sup>24</sup> Hydrogen peroxide and formalin were found in 21 and 9 samples which also act as an added preservative and increases the shelf life of milk. It may cause intestinal disturbance and bloody

**Table 1:** Results of the adulterants test in milk

S. No.	Name of the test	No. of samples tested positive (n = 60)	Percentage of the samples tested positive (%)
1	Water test	26	44
2	Glucose test	8	13.33
3	starch test	10	16.66
4	Skimmed milk powder test	32	53.33
5	Neutralisers test	25	41.6
6	Urea test	14	23.33
7	Detergent test	18	30
8	Sodium chloride test	20	33.33
9	Hydrogen peroxide test	21	35
10	Formalin test	9	15

(Where n is the number of samples tested)

diarrhoea.<sup>25</sup> Natural milk is adulterated with various illegal substances to increase its marketability and do not conform to the legal standards.<sup>26</sup> Moreover, the adulteration of milk affects the quality, quantity, stability, and other parameters of milk-derived products like Khoa, paneer, cheese, and others.

## CONCLUSION

It can be concluded from the examination of the samples procured that the samples did not match the standards prescribed by the Food Safety and Standards Authority. Almost all the samples collected from local milk vendors in and around the city of Hyderabad contained extraneous water and traces of salt, skim milk powder, detergents, neutralizers, hydrogen peroxide, formalin which is health concerns. The nutrition value of milk is compromised due to malpractice, and consumers have every right to procure best quality milk. Moreover, it is important to educate the persons involved in milk production and vendors at various levels until it reaches the consumers about standard quality maintenance. However, the government is vigilant, and sample testing is done from time to time to ensure quality milk is sold to the people. These findings may help the concerned government regulatory bodies to monitor the quality of the milk commercially available in the market.

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