

Adulteration in Milk and Milk Products

What is Adulteration?

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, harvesting, storage, processing, transport and distribution.

“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:

- A substance is added which depreciates or injuriously affects it.
- Cheaper or inferior substances are substituted wholly or in part.
- Any valuable or necessary constituent has been wholly or in part abstracted.
- It is an imitation.
- It is coloured or otherwise treated, to improve its appearance or if it contains any added substance injurious to health.
- 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.

Methods for Detection of common adulterants in Milk and Milk Products :

(A) Milk

Tests which can be done at Home

S. no.	Food article	Adulterant	Method of detection	Remarks
1	Milk	Water	The presence of water can be detected by putting a drop of milk on a polished slanting surface. The drop of pure milk flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving a mark.	

2		Starch	Add a few drops of tincture of Iodine or Iodine solution. Formation of blue colour indicates the presence of starch.	Iodine solution is easily available in the medical stores.																		
3		Urea	Take a teaspoon of milk in a test tube. Add ½ teaspoon of soybean or arhar powder. Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a red litmus paper in it. Remove the paper after ½ a minute. A change in colour from red to blue indicates the presence of urea in the milk.																			
4		Detergent	Shake 5-10 ml of sample with an equal amount of water. Lather indicates the presence of detergent.																			
5		Synthetic milk	Synthetic milk has a bitter after taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating.	Synthetic milk is made by adding white colour water paint, oils, alkali, urea and detergent, etc.																		
6.		Synthetic milk- test for protein	The milk can easily be tested by Urease Strips (available in the Medical stores. Colour chart of the Urease Strip test given below will show the quantity of urea present in milk :	Urease Strip is a biostrip based on enzymatic assay.																		
			<table border="1"> <thead> <tr> <th>S.No.</th> <th>Urea in Milk (g/L)</th> <th>Colour of the strip</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0-0.2</td> <td>Yellow</td> </tr> <tr> <td>2</td> <td>0.2-0.7</td> <td>Peach</td> </tr> <tr> <td>3</td> <td>0.7-1.20</td> <td>Reddish Brown</td> </tr> <tr> <td>4</td> <td>1.20-1.70</td> <td>Pink</td> </tr> <tr> <td>5</td> <td>1.7-14.00</td> <td>Magenta</td> </tr> </tbody> </table>	S.No.	Urea in Milk (g/L)	Colour of the strip	1	0-0.2	Yellow	2	0.2-0.7	Peach	3	0.7-1.20	Reddish Brown	4	1.20-1.70	Pink	5	1.7-14.00	Magenta	
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7.		Test for Glucose / Invert Sugar	Take a strip of Diacetic Strip and dip it in the milk for 30 sec to 1 min. If the strip changes colour, then it shows that the sample of milk contains glucose. If there is no change in the colour of the strip, then glucose is absent.	Glucose, invert sugar syrup is added in milk to increase the consistency and taste.																		

Tests which have to be done in Laboratory :			
1.		Vanaspati	Take 3 ml of milk in a test tube. Add 10 drops of Hydrochloric Acid. Mix one teaspoonful of sugar. After 5 minutes, examine the mixture. The red colouration indicates the presence of vanaspati in the milk.
2.		Formalin	Take 10 ml of milk in a test tube and add 5 ml of concentrated Sulphuric acid from the sides of the wall without shaking. If a violet or blue ring appears at the intersection of two layers then it shows presence of formalin.
3.		Ammonium Sulphate	<ul style="list-style-type: none"> •Take 5 ml of hot milk in a test tube. Add a suitable acid, eg., Citric Acid. The whey obtained is separated and filtered. Take the whey in another test tube and add 0.5 ml of 5% Barium Chloride. Appearance of precipitate indicates the presence of Ammonium Sulphate. • Take 5 ml of milk in a test tube. 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 pink, it shows that the sample is free from Ammonium Sulphate.
4.		Salt	•Take 5 ml of Silver Nitrate reagent in a test tube. Add 2-3 drops of Potassium Dichromate Reagent. Add 1 ml of milk in the above test tube and mix thoroughly. If the contents of the test tube turn yellow, then milk contains salt. If it turns to chocolate colour or reddish brown, the milk sample is free from salt.

5.		Hydrogen Peroxide	<ul style="list-style-type: none"> Take 5 ml milk in a test tube. Add 3 drops of Paraphenylene Diamine and shake well. Change in colour of the milk to blue confirms that the milk is adulterated with Hydrogen Peroxide. <p style="text-align: center;"><u>or</u></p> <ul style="list-style-type: none"> To 10 ml of milk sample in a test tube add 10-15 drops of Vanadium Pentoxide reagent and mix. Pink or red colour indicates presence of Hydrogen Peroxide. 	
7.		Sugar	Take 3 ml of milk in a test tube. Add 2 ml of the hydrochloric acid. Heat the test tube after adding 50 mg of resorcinol. The red colouration indicates the use of sugar in the milk.	
8.		Sodium bi-carbonate / neutralizer	Take 3 ml of milk in a test tube and add 5 ml of rectified spirit to it. Then add 4 drops of rosolic acid solution. The appearance of red/rosy colouration indicates the presence of sodium bi-carbonate in the milk.	
9.		Boric acid	Take 3 ml of milk in a test tube. Add 20 drops of hydrochloric acid and shake the test tube or mix up the contents thoroughly. Dip a yellow paper- strip, and remove the same after 1 minute. A change in colour from yellow to red, followed by the change from red to green, by addition of one drop of ammonia solution, indicates that the boric acid is present in milk .	To prepare the yellow paper-strip, dip strips of filter paper in an aqueous solution of the turmeric, and dry it up.
10		Removal of Fat	The Lactometer reading will go above 26 .	The milk will apparently remain thick.

(B) Milk Products

Tests which can be done at Home :

1.	Khoa and its products	Starch	Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Formation of blue colour indicates the presence of starch.	
2.	Chhena or Paneer	Starch	Boil a small quantity of sample with some water, cool and add a	

			few drops of Iodine solution. Formation of blue colour indicates the presence of starch.	
Tests which have to be done in Laboratory :				
1.	Sweet Curd	Vanaspati	Take 1 teaspoon full of curd in a test tube. Add 10 drops of hydrochloric acid. Mix up the contents shaking the test tube gently. After 5 minutes, examine the mixture. The red colouration indicates the presence of vanaspati in the curd.	
2..	Rabri	Blotting paper	Take a teaspoon of rabri in a test tube. Add 3 ml of hydrochloric acid and 3 ml of distilled water. Stir the content with a glass rod. Remove the rod and examine. Presence of fine fibres to the glass rod will indicate the presence of blotting paper in rabri.	
3.	Ghee, Cottage Cheese, Condensed Milk, Khoa, Milk Powder etc.	Coal Tar Dyes	Add 5 ml of dilute Sulphuric Acid or concentrated Hydrochloric Acid to one teaspoon full of product sample in a test tube. Shake well. Pink colour (in case of dilute Sulphuric Acid) or crimson colour (in case of concentrated Hydrochloric Acid) indicates presence of coal tar dyes. If Hydrochloric Acid does not give colour, dilute it with water to get the colour to see the result.	
4 .	Ghee	Vanaspati or Margarine	Take about one tea spoon full of melted sample of ghee with equal quantity of concentrated Hydrochloric acid in a test tube with stopper and add to it a pinch of sugar. Shake for one minute and let it stand for five minutes. Appearance of crimson colour in lower (acid layer) indicates presence of vanaspati or margarine.	<p>The test is specific for sesame oil which is compulsorily added to vanaspati and margarine.</p> <p>Some coal tar dyes also give a positive test .</p> <p>If the test is positive ie. Red</p>

				colour develops only by adding strong Hydrochloric acid (without adding crystals of sugar) then the sample is adulterated with coal tar dye. If the crimson or red colour develops after adding and shaking with sugar, ensures presence of vanaspati or margarine only.
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