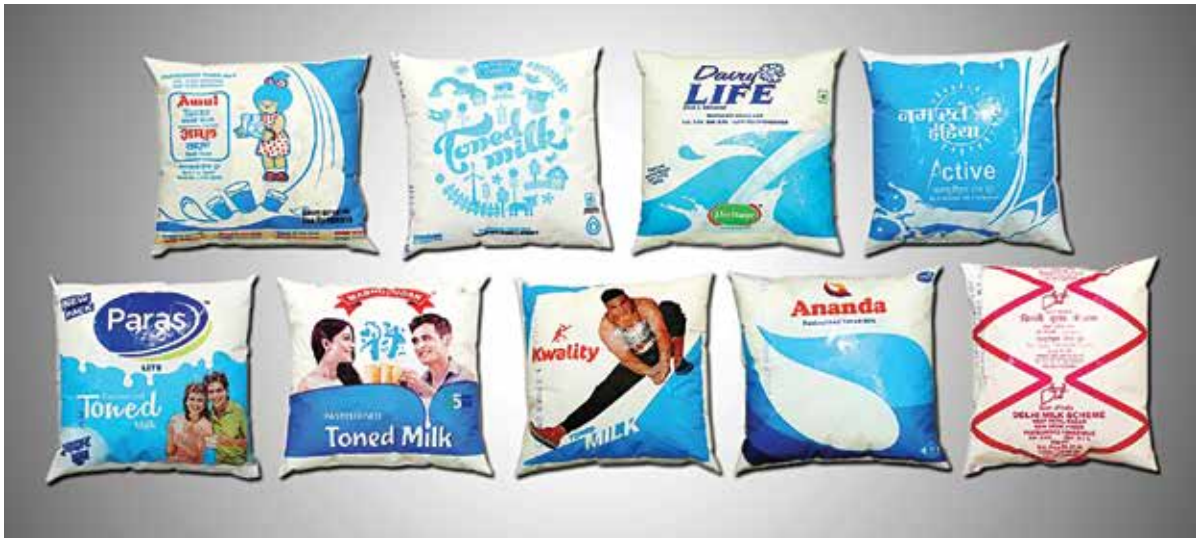


Toned Milk

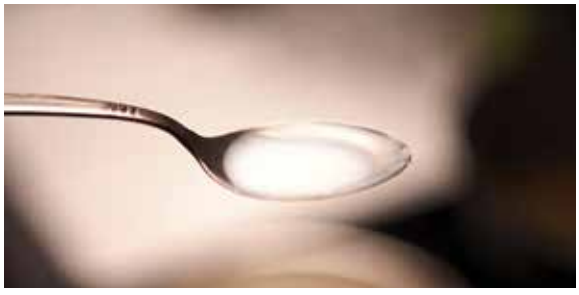
Think, know, check, and boil before you drink it

Like more fat content can be used to claim superior value for full-cream milk, health enthusiasts will vouch for the less fat in toned milk. It's all about priorities, convictions and convenience. And convenient it certainly is, getting our regular supply of milk in neat little packs, all stacked in neat little sections at the grocer's down the street. More and more consumers are switching to branded packaged milk due to concerns regarding adulteration (with water, vegetable oils, detergents, caustic soda, urea, starch, blotting paper, white paint, you name it). The perception that loose milk is fresh is not as entrenched any more. This report will, among other things, put to rest most of our concerns about milk adulteration and contamination, and affirm or dispute the health-related claims of leading brands of packaged toned milk. It may be noted that the food regulator of India prescribes certain microbiological requirements for plant level but not at retailer level. This is a yawning gap and since consumers buy their milk from retailers, we checked the samples for critical safety aspects. A couple of findings from our test results will establish that the important determinants of quality vary across brands.

A Consumer Voice Report

We tested nine popular brands of packaged toned milk on a range of quality, safety and acceptability parameters. These included milk fat, milk solids not fat, saturated fat, cholesterol, calcium and vitamin A. Milk is expected to be high in fat content as well as milk solids not fat (SNF), which is an indicator of the quality of milk. The brands were further subjected to adulteration tests, microbiological tests, tests for lead and arsenic, phosphatase test and sensory (organoleptic) tests. The tests were conducted at an NABL-accredited laboratory.

The samples were tested as per specification laid out by FSS Regulations, 2011, and relevant Indian Standard IS: 13688: 1999 reaffirmed in 2014 for 'packaged pasteurized milk' wherein the categorisation of milk has been done based on minimum quantity of milk fat and SNF present.



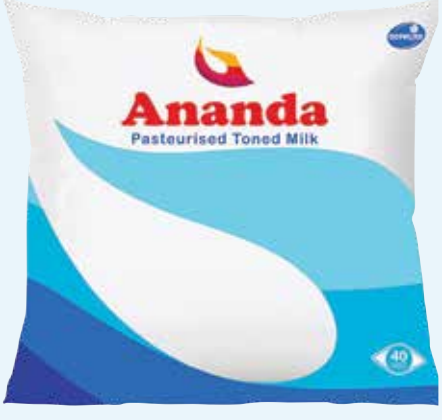
BRANDS TESTED

Rank	Total Score out of 100 (rounded off)	Brand	MRP (Rs)	Net Quantity (ml)	Manufactured/Marketed by
1	88	Ananda	21	500	Gopaljee Dairy Foods Pvt. Ltd
2	87	Kwality	21	500	Kwality Ltd
2	87	Heritage	20	500	Heritage Foods Ltd
2	87	DMS	21	500	Delhi Milk Scheme
3	86	Madhusudan	21	500	SMC Foods Ltd
3	86	Mother Dairy	21	500	Mother Dairy Fruit & Vegetable Pvt. Ltd
4	85	Namaste India	21	500	NIF Pvt. Ltd
4	85	Amul	21	500	Gujarat Cooperative Milk Marketing Federation Ltd
5	84	Paras	21	500	VRS Foods Ltd

*Score Rating: >90: excellent*****, 71–90: very good****, 51–70: good***, 31–50: average**, up to 30: poor**

CV RECOMMENDATION | TOP PERFORMER

Ananda



VALUE FOR MONEY

Heritage

Consumers are advised not to buy milk packets kept in open. Buy milk from retailers who keep it in deep freezer/refrigerator.

Comparative Test

Key Findings

- Based on the overall score, the top performer is Ananda.
- The value-for-money brand is Heritage.
- Most of the brands have standard fat content to just meet the minimum requirement of 3 per cent for fat and 8.5 per cent for SNF.
- All brands of packaged milk were found free from adulterants such as neutralizers, detergent, caustic soda, urea, formaldehyde and melamine.
- Food regulator has not prescribed microbiological-safety requirements for aerobic plate count and coliform count.
- All nine brands of milk were found within the specified limits for microbiological safety. The tested samples fulfilled the total plate count requirement at plant level (to be below 30,000 cfu/ml).
- Arsenic and lead were not detected in any of the brands.
- In sensory panel tests, Paras performed on top followed by Heritage.

Packaged milk can be categorized according to fat and solids-not-fat (SNF) content as follows:

a) **Full-cream milk:** Fat 6.0 per cent and SNF 9 per cent (minimum)

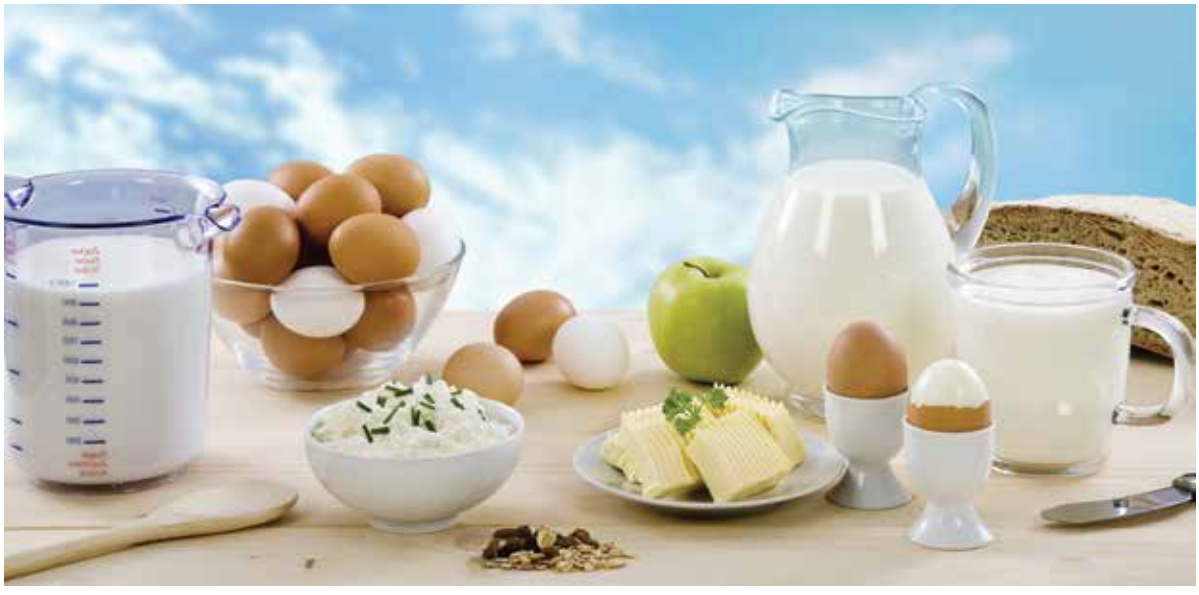
b) **Toned milk:** Fat 3.0 per cent and SNF 8.5 per cent (minimum)

c) **Double-toned milk:** Fat 1.5 per cent and SNF 9 per cent (minimum)

Full-cream milk means milk or a combination of buffalo or cow milk or a product prepared by combination of both that has been standardized to fat and solids-not-fat (SNF) percentage, by adjustment/addition of milk solids. It shall meet the minimum laid-down requirement of 6 per cent for fat and 9 per cent for SNF. Full-cream milk shall be pasteurized. It shall show a negative phosphatase test. It shall be packed in clean, sound and sanitary containers properly sealed so as to prevent contamination.

Toned milk means the product prepared by admixture of cow or buffalo milk or both with fresh skimmed milk; or by admixture of cow or buffalo milk or both that has been standardized to fat and solids-not-fat percentage by adjustment of milk solids. It shall meet the minimum laid-down requirement of 3 per cent for fat and 8.5 per cent for SNF. It shall be pasteurized and shall show a negative phosphatase test.

The terms 'pasteurization', 'pasteurized' and similar terms shall be taken to refer to the process of heating every particle of milk of different classes to at least 63 degrees Celsius and holding at such temperature continuously for at least 30 minutes, or heating it to at least 71.5 degrees C and holding at such temperature continuously for at least 15 seconds, or an approved temperature–time combination that will serve to give a negative phosphatase test.



TEST RESULTS FOR PHYSICOCHEMICAL PARAMETERS

Milk Fat | Solids Not Fat | Vitamin A | Calcium | Cholesterol | Saturated Fat

◆ Milk Fat

Fat is an essential part of any balanced diet, providing essential fatty acids, fat-soluble vitamins and a concentrated source of energy. The fat content of milk is the proportion of milk made up by butterfat. As per Indian Standard and FSS Regulations, 2011, fat content of toned milk should not be less than three per cent by mass.

- *All brands met the minimum required limit for fat content.*
- *DMS (3.30 per cent) had the highest fat content, followed by Ananda, Heritage, Madhusudan, Mother Dairy and Namaste India.*
- *Amul, Paras and Kwality (3.0 per cent each) just about fulfilled the minimum requirement.*

As per Dietary Guidelines for Indians by National Institute of Nutrition, Hyderabad, 2011, diets of young children and adolescents should contain about 30 grams to 50 grams fat per day. So, a higher amount of milk fat is better for consumers.

◆ Solids Not Fat (SNF)

Milk has mainly two parts: fat and solids not fat (SNF). Apart from fat, all other solids such as protein, lactose, vitamins and minerals together make up SNF. SNF is the most essential part of the milk. As per Indian Standard and FSS Regulations, it should not be less than 8.5 per cent by mass.

- *All brands met the minimum requirement for SNF. It was highest in DMS (8.7 per cent).*

◆ Vitamin A

Vitamin A is essential for good health – notably for eyes and skin, immune function, reproduction and bone growth. Milk is a rich source of vitamin A. And is expected to have a higher amount of it

- *Vitamin A content was found highest in Kwality (281.4 IU or international units/100 ml), followed by Ananda (134.3 IU). It was lowest in Namaste India (37.3) and Paras (42.9).*

◆ Calcium

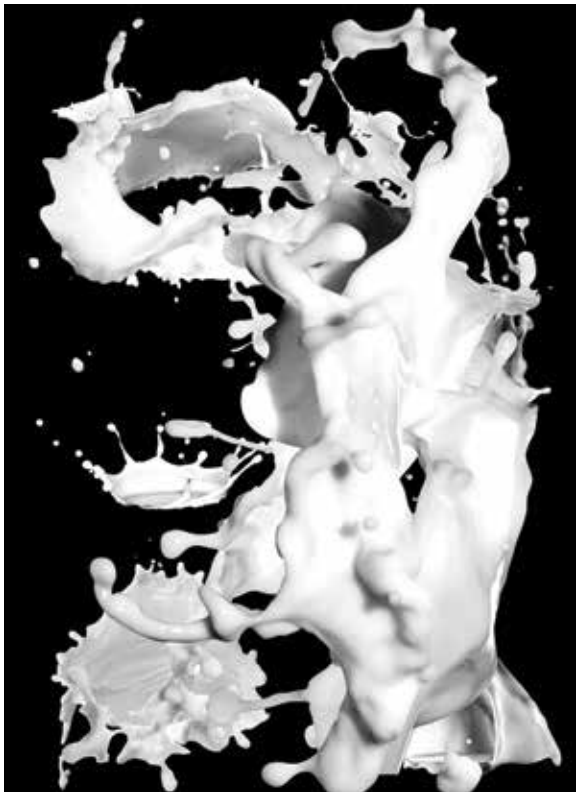
Milk is a well-known source of calcium and hence expected to be rich in calcium content.

Calcium plays an important role in building stronger, denser bones early in life and keeping bones strong and healthy later in life. Calcium deficiency can lead to rickets and poor blood clotting and osteoporosis.

- *Calcium content was highest in Namaste India (160 mg/100 ml), followed by Heritage (156.4). It was lowest in Amul (124.4).*

◆ Cholesterol

Cholesterol, especially bad cholesterol, also increases the risk of nervous-system problems, brain-synapse connectivity, gall-bladder stones and perhaps even cancer. These cholesterols are inherently found in the milk fats. The intake of cholesterol should not be more than 300 mg/day.



Cholesterol plays a central role in many biochemical processes but is best known for the association of cardiovascular disease. There are two main types of cholesterol – low-density lipoproteins or LDL (bad cholesterol), which can result in fatty deposits in our arteries, and high-density lipoproteins or HDL (good cholesterol), which absorbs cholesterol and carries it back to the liver, which flushes it from the body.

- *Paras (66.70 mg/100 ml) had the lowest cholesterol content, followed by Heritage (69.80 mg/100 ml).*
- *Namaste India (82.8 mg/100 ml) had the highest cholesterol content, followed by DMS (80.2 mg/100 ml).*

◆ Saturated Fat

Saturated fats are inherent fats in milk.

- *Saturated fat in the tested brands was in the range of 2.2 per cent to 2.4 per cent. It was highest in DMS (2.4 per cent).*

Saturated fats are mainly animal-based fats like milk fat, ghee and butter. The American Heart Association recommends aiming for a dietary pattern that achieves 5 per cent to 6 per cent of calories from saturated fat. Intake of a lot of saturated fat increases the level of bad cholesterol in the blood and it is generally acknowledged that high levels of LDL can place one at risk of heart disease.

PHYSICOCHEMICAL

Parameter ↓	Weightage (%)	Ananda	Kwality	Heritage
Milk fat	12	9.12	8.40	9.12
Milk solids not fat	12	8.40	9.12	8.40
Vitamin A	7	6.42	7.0	4.73
Calcium	6	4.72	4.90	5.35
Cholesterol	5	3.72	3.54	4.22
Saturated fat	5	3.40	3.40	3.40

Tests for Adulteration and Heavy Metals

Adulteration

We conducted tests for presence of these adulterants: neutralizer, detergent, urea, formaldehyde and melamine. These were absent in all the brands tested.

Heavy metals

Heavy metals have a relatively high density and are toxic or poisonous at high concentrations. We analysed the milk samples for presence of lead and arsenic. As per the requirement laid down by FSS Regulations, lead should not be more than 2 ppm and arsenic not more than 0.1 ppm.

All the brands cleared these tests since lead and arsenic were not found within the detection limit (detection limit being 0.02 ppm for lead and 0.01 ppm for arsenic)

Phosphatase Test

Alkaline phosphatase (ALP) is an enzyme naturally present in all raw milks and is considered to be an indicator of proper milk pasteurisation. Complete pasteurisation will inactivate the enzyme to below levels that are detectable by conventional methods. Because the heat stability of ALP is greater than that of pathogens that may be present in milk, the enzyme serves as an indicator of product safety. However, the failure to detect ALP activity does not guarantee that the product is pathogen-free.

All nine brands passed this test.

SCORES

	DMS	Madhusudan	Mother Dairy	Namaste India	Amul	Paras
	10.56	9.12	9.12	9.12	8.40	8.40
	9.84	8.40	8.40	9.12	8.40	9.12
	4.11	4.42	4.62	3.84	5.43	4.0
	4.70	5.12	4.85	5.52	3.81	4.94
	3.38	3.81	3.95	3.18	4.12	4.46
	2.80	3.40	3.10	3.40	3.40	3.40

FOR MICROBIOLOGICAL ACTIVITY

Total Plate Count | Coliform Count | Methylene Blue Reduction Time

Microbiological contamination is a very serious issue for milk. Microorganisms are responsible for many food-borne diseases. We conducted tests for total plate count, yeast and mould count, coliform count, *E. coli*, *S. aureus*, *Salmonella*, *Shigella*, *Listeria monocytogenes*, anaerobic spore count, and methylene blue reduction time (MBRT).

Food regulator FSSAI has specified requirements for microbiological safety for milk at market (retail) level. However, requirements with regard to aerobic plate count and coliform count are not applicable at market/retail level. The requirements for *Salmonella*, *Listeria monocytogenes*, *B. cereus*, sulphite-reducing clostridia and *E. Sakazakii* are applicable at retailer level.

◆ Total plate count

The total plate count is a measure of the biological activity in milk sample. This is a count of all bacteria that will grow in aerobic conditions. For pasteurized milk, microbiological requirements have been prescribed for aerobic plate count, coliform count and S. aureus only at manufacturing-process level; there is no requirement given at market/retailer level. Since consumers buy milk from retail shops, requirements should be specified accordingly. We conducted the microbiological tests on poly-packed milk purchased from retailers. As per FSS Regulations, total plate count should not be more than 30,000/gram at plant level.

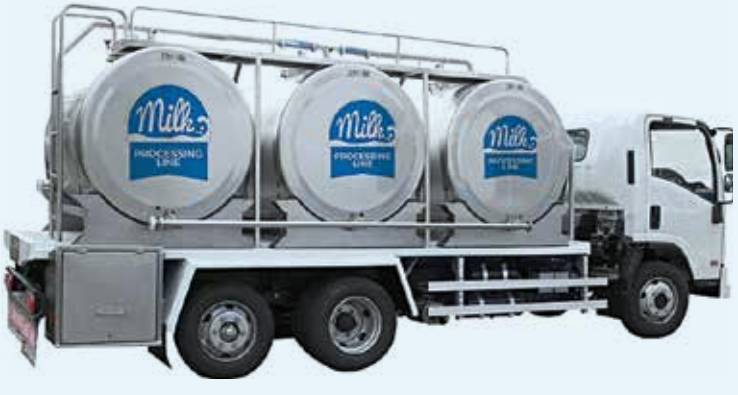
- *None of the brands exceeded the specified limit*
- *Total plate count was found highest in Paras (13,000 cfu/ml) but it was within the specified limit.*

Keeping in view the level of total plate count, all brands may be safe but we don't recommend direct consumption unless the milk is adequately boiled.

Do Not Break the Cold Chain

A high level of microbial count in milk may be due to not maintaining the cold chain during storage and transportation (below 8 degrees C) from plant to retailer as also from retailer to consumer. High levels of aerobic plate count were found in our previous studies conducted in 2011 and 2015.

Food Safety and Standards Regulations and Bureau of Indian Standards (BIS) state that milk should meet the specified requirement for aerobic count and coliform content at processing/plant level only. The fact is proper temperature needs to be maintained all the way to the delivery point – the cold chain must be maintained at 8 degrees C to avoid microbial growth. Consumers are advised to buy milk from authorized booths/retailing units of manufacturers. They should avoid buying open milk packets kept in grocery shops.



◆ Coliform count

Coliform bacteria are destroyed at a temperature of about 46 degrees C, which means pasteurisation can easily eliminate them up to a certain number. The presence of coliform bacteria in pasteurized milk indicates that there were unsanitary conditions or practices after pasteurisation and before packing in the milk plant itself.

- *All brands cleared the test.*

These were found absent: E. coli, Salmonella, Shigella, Listeria monocytogenes.

All brands cleared the tests for S. aureus and anaerobic spore count.

◆ Methylene blue reduction time (MBRT), in hour

Methylene blue reduction time is an indicative test to check the bacterial load in milk. As per Indian Standard, MBR time for milk is not less than five hours.

- *Except Paras, all other brands met the requirement for MBRT.*

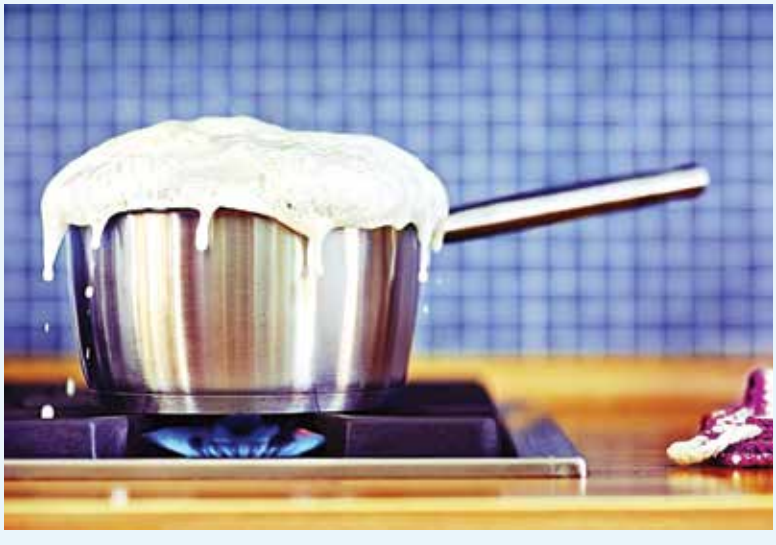
Microbiological Tests	
Brand	**Score out of 12**
Madhusudan	11.55
Heritage	11.52
Ananda	11.49
DMS	11.49
Mother Dairy	11.49
Amul	11.46
Namaste India	11.40
Kwality	11.10
Paras	8.80

Boil It!

Milk is a perishable product and tends to spoil if not stored at a holding temperature below 8 degrees C. Therefore it should be boiled before consumption to prevent microbiological contamination.

As per a study published in *The Journal of American Science*, boiling of milk is recommended as follows:

Milk boiling for two minutes provides the consumer the required safety. However, continuous stirring is essential, particularly at boiling temperature, to make sure that the formed foam is exposed to boiling temperature.



A large number of people heat and re-heat the same milk again and again, and that too at a high temperature for a long time, thus killing the nutrients. According to experts, milk subjected to less heating retains its nutrient value. Experts say milk should ideally be boiled not more than twice and not for more than 2 to 3 minutes.

FOR SENSORY ATTRIBUTES

Panel members judged the samples for these sensory attributes: colour and appearance, odour, flavour and taste. Conducted under the supervision of trained experts, these tests were based on IS: 7768-1975. Among other things, milk should be free from suspended particles, filth and foreign matters. It should not have stale, acidic or any other abnormal odour. Milk should not have any cooked, oxidized, rancid, metallic or neutralizer flavour. It should be free from any objectionable flavour due to adulterants and other additives. Milk should be free from watery, ropy and curdy body.

- *All brands performed well in the sensory tests.*
- *Paras was rated as the more acceptable brand and was followed by Heritage.*
- *The least liked brand was Kwality.*

Brand	Score out of 10
Paras	9.54
Heritage	9.42
Amul	9.33
Ananda	9.32
Mother Dairy	9.32
Madhusudan	9.30
DMS	9.06
Namaste India	8.90
Kwality	8.71

Packing and Marking

Milk should be packed in food-grade poly pack to retain its natural properties within its shelf life. Each packet of milk should be marked/ labelled with these particulars:

a) Name and type of product with proper prefix (toned, full cream, etc.)

b) Name and complete address of manufacturer and manufacturing unit/ packer

c) Batch or code number

d) Net quantity in litre/millilitre

e) 'Use by' date

f) MRP

g) Storage instructions

h) Nutritional information per 100 ml

i) Name, address, telephone number, email address of person/office to be contacted in case of consumer complaints

- *All brands were properly packed in poly packs.*
- *All brands provided all required information on their pack.*
- *Net quantity in all brands was as claimed on the packs.*

Terms to Know

Pasteurization

Pasteurization is the process of heating a food, usually liquid, to a specific temperature for a definite length of time, and then cooling it immediately. This process slows microbial growth in food.

Unlike sterilization, pasteurization is not intended to kill all microorganisms in the food. Instead, pasteurization aims to reduce the number of viable pathogens so they are unlikely to cause disease (assuming the pasteurized product is stored as indicated and consumed before its expiration date).

Pasteurization is typically associated with milk. It is the main reason for milk's extended shelf life.

Sterilization

Sterilization refers to any process that eliminates (removes) or kills all forms of life, including transmissible agents (fungi, bacteria, viruses, spore forms, etc.) contained in a food, liquid, etc.

To keep milk for longer than few days at ambient temperature, it needs to be sterilized. The traditional process involves heating milk in a sealed container at a temperature of at least 115 degrees C for 15 minutes to ensure preservation at room temperature for a period of not less than 30 days from the date of manufacture.

More recently, UHT processes have been introduced. When UHT is combined with sterile handling and container technology (such as aseptic packaging), it can even be stored unrefrigerated for 6–9 months. UHT processing holds the milk at a temperature of 135 degrees C (275 degrees F) for a minimum of one second or more in a continuous flow, after which the milk is packed to ensure preservation at room temperature for a period of not less than 15 days from the date of manufacture.

Milk simply labelled 'pasteurized' is usually treated with the HTST method, whereas milk labelled 'ultra-pasteurized' or simply 'UHT' has been treated with the UHT method.

Basically

- Do not boil milk for an extended period of time.
- Do not leave your milk out in the open after boiling; refrigerate it immediately.
- Do not heat milk repeatedly.
- Stir the milk while boiling.
- Do not use microwave ovens to heat and re-heat milk.
- Use ultra-high-temperature milk that comes in tetra packs. It guarantees both nutrition and convenience.

Dear readers: We are open to hearing your suggestions on products and services that you believe should be reviewed/tested by Team Consumer Voice. You may write to editorial@consumer-voice.org