

Milk: Our First Food

Milk has been termed our first food, but over the years concerns have intensified about the presence of pesticides even in mother's milk. Indian cattle, as we know are tuberculosis ridden and don't shy away from eating plastic and other hazardous garbage littered everywhere. Now Consumer VOICE, in NABL accredited laboratory test of 12 different brands of polypacked full cream milk being sold across Indian cities to urban consumers, discovers that our outdated pasteurisation technologies do nothing for ensuring a safe supply of this everyday victual for a largely vegetarian population. By the time it leaves the manufacturing units, milk is transported via pathways that do not ensure maintenance of temperatures at which pasteurisation can continue to be effective, and by the time the milk reaches consumer kitchens, it is loaded with multiplied microbes rendering it unfit for human consumption. However, Mother Dairy pouched milk is an exception, because it is relatively safer with coliform count within limits. What saves consumers picking up an array of digestion related complications is the age old practice of every Indian household boiling its milk before consumption.

The questions that Consumer VOICE is asking are : Do consumers pay for the plastic packaging and pasteurisation processes for nothing but added risks of coliform? Why are the Indian manufacturers continuing to use outdated pasteurisation technologies when everywhere else, especially in the US, EU, Australia and other developed countries, consumers are getting safer milk treated and packaged with updated techniques. Information and precedent, both are available then why is the Indian consumer getting what puts his health at risk every single time he opts for consuming milk, what is believed to be a healthy food option. In a country like India, where heat, dust and garbage are big issues, why is a technology which is dependent on temperature control being used when even the FSSAI (Food Safety And Standard Authority of India) through a recently passed order divests itself of any responsibility for the safe delivery of milk, once it leaves the manufacturing unit.

Read our investigative report for a full story on the hazardous milk supply to Indian consumers.

Polypacked Full Cream Milk

India being basically an agricultural country, milk and dairy products are bi-products of several million agriculturalists. India is the largest producer and consumer of milk in the world. About 46% of

the total milk produced in India is consumed in liquid form. Still most consumers prefer to buy loose milk from vendors due to strong perception that loose milk is fresh. As adulteration of milk with water, vegetable oils, detergents, caustic soda, urea, starch, blotting paper,

white paint, etc. is increasing, urban consumers are switching to branded packaged milk. As cities urbanise and cattle dairies are driven out, access to raw/fresh milk becomes complicated, packaged milk is stepping in fulfilling consumer needs.



Why Full Cream Milk Tested

The focus of *Consumer VOICE* study on full cream poly packed milk was to judge the quality of milk along with all inherent properties of full cream milk like fat and SNF, which are expected to be having the similar properties like fresh and unadulterated milk.

Brands Tested

Consumer VOICE tested 12 popular brands of full cream polypacked milk. However, it was not possible to rank them as all the brands failed in the total plate count and coliform tests.

Packaged Milk- An Expensive Commodity

With increasing demand for packaged milk, the retail milk price has been steadily rising. Back in 2009, one litre of milk was available at around ₹16, but since then its price has doubled, with milk now being priced at more than ₹35 a litre (Amul at ₹38). The prices of milk and other dairy products are set to rise over the next one year. One of the major reasons behind this price hike is the so-called price rise of raw materials and increased transportation charges.

When milk prices go up there is an automatic price hike in milk-based products, the demand for which fluctuates wildly during India's frequent fasts and festivals.

What Is Pasteurisation of Milk?

The term pasteurisation refers to the process of heating every particle of milk of different classes to at least 63° centigrade and holding such temperature continuously for 30 minutes or heating it to at least to 71.5° centigrade. Such temperature is maintained continuously for at least 15 seconds or an approved temperature time combination that will serve to

Key Findings

- All brands were found microbiologically unsafe for consumption as all contained high level of microbial count as total plate count, coliform count and yeast & mould count, even after repeat tests. Mother Dairy passed the coliform test.
- All brands were found free from contamination of pathogens like E. coli, Salmonella, S. aureus, Shigella & Listeria Monocytogenes.
- Most of the brands have controlled the fat contents to meet the minimum requirement of 6%.
- Amul, Paras, DMS, Milkam & Verka could not meet the minimum requirements for milk solids not fat (SNF).
- Parag was found most acceptable in organoleptic properties like colour, appearance, odour, flavour & body.



give a negative Phosphatase Test. All pasteurised milk of different classes should be cooled immediately to a temperature of 10° centigrade, or less.

Pasteurisation is an effective safeguard against spoilage and food poisoning only if the milk is not re-contaminated after pasteurisation.

Marking

Our test found that all brands were properly marked with all necessary information on their pack.

Net Quantity

All brands were found within permissible limits.

Fat & Milk Solids Not Fat (SNF)

Milk has two parts, one is fat and the other is SNF. As per Indian Standard and FSS Regulation, fat content of full cream milk should not be less than **6%** by mass.

SNF stands for Solid Not Fat i.e. apart from fat all other solids, like vitamins, minerals, protein & lactose together make SNF. As per Indian

Standards and FSS Regulation, it should be less than **9%** by mass.

The following table gives an accurate idea of how much fat and SNF in which brand:

Brand	Fat%	Milk SNF%
Reliance	5.84	9.0
Mother Dairy	6.38	9.97
Amul	6.23	8.85
Paras	6.03	8.62
DMS	6.44	8.51
Milkam	6.32	8.26
Vita	6.80	9.06
Aarey	6.10	9.80
Verka	6.82	8.87
Sanchi	6.17	9.0
Saras	6.0	9.54
Parag	5.72	9.04

Cholesterol

Cholesterol is a sterol (a combination of steroid and alcohol) and a lipid formed in the cell membrane of all body tissues. It plays a central role in many biochemical processes but is best known for the association of cardiovascular disease. Cholesterol, especially the bad cholesterol, also

Comparative Test

increases the risk of nervous system problems, brain synapse connectivity, gall bladder stones and perhaps even cancer. These cholesterol are inherently found in the milk fats processed from animal milk. The daily

All brands of milk were found free from adulterants namely Neutriliser, Detergent, Caustic Soda, Urea, Formaldehyde and Malamine and passed the test by meeting the requirements of Indian Standard and FSS Regulation.

intake of cholesterol should not be more than 300 mg/day.

Parag was found with highest content of cholesterol.

Calcium

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. Milk is a well-known source of calcium therefore milk is supposed to be rich in calcium content.

Aarey and Paras were found with the lowest and highest calcium content respectively among the brands tested.

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 therefore it should to be high in milk.

Sanchi was found with the lowest and Parag was found with the highest content of Vitamin A.

Phosphatase Test

Phosphatase is an enzyme in milk and is inactivated by pasteurisation. This test indicates whether milk was

pasteurised effectively. All brands passed this test.

Heavy Metals

Heavy metals are metallic or chemical elements that have a relatively high density and are toxic or poisonous at high concentrations. We analysed milk for Lead, Copper, Arsenic, Tin, Zinc & Cadmium content based on the requirement of FSS Regulation.

All brands passed the test.

Microbiological Tests

Bad microorganisms are responsible for many food borne diseases. We conducted this test for Total Plate count, Yeast & Mould, Coliform count, E. coli, S. aureus, Salmonella, Shigella, Listeria monocytogenes, Anaerobic spore count in addition to Methylene Blue Reduction Test (MBRT).

Total Plate Count

It is a measure of the biological activity in milk sample. This is a count of all bacteria, fungi and yeast that will grow in aerobic conditions. For pasteurised milk, Food Safety And Standards (Food Product Standards and Food Additives) Regulation, 2011 (Part II), microbiological requirements have been prescribed at manufacturing units only. The same milk should be delivered to consumers by milk processors, so we conducted the microbiological tests by purchasing the polypacked milk from the retail points. As per FSS Regulation, total plate count should not be more than 50,000/gram.

All brands of milk we tested did not meet the requirement for total plate count, hence failed this test.

Highest Count (Beyond allowed limit)

1. Milkam
2. Aarey
3. Vita



Coliform Count

Coliform bacteria are destroyed at a temperature of about 46°C, so pasteurisation easily eliminates them when present in any reasonable numbers. The presence of coliform bacteria in pasteurised milk indicates that there was unsanitary conditions or practices after pasteurisation and before packing in milk plant itself. When coliforms are present in milk, it always indicates that spoilage bacteria are present which produce off flavours and reduce the shelf life of milk. Most coliforms do not cause disease, but a small percentage can cause illness, especially in young children, the elderly, and those with weakened immune systems.

All brands of milk were found free from the contamination of pathogens like E. coli, Salmonella, S. aureus, Shigella & Listeria Monocytogenes, therefore passed the tests for these pathogens

They also can cause rapid spoilage of milk because they are able to ferment lactose with the production of acid and gas, and are able to degrade milk proteins. As per FSS Regulation, coliform count should be less than 10/gram.

Brand Mother Dairy passed the test.

Highest Count (Beyond allowed limit)

1. Vita
2. Saras
3. Aarey

Yeast & Mould Count

Yeast & Molds are fungi that grow in the form of multicellular filaments

A Ludhiana-based NGO, Consumer Protection Force, tested 7 brands of packaged milk in 2010 to check the contamination level and found the below results which were published in a leading newspaper:

TPC – 10, 00,000 cfu/ml to 6, 60, 00,000 cfu/ml (as against the normal acceptable level-30,000 cfu/ml)

Coliform Count – 60 clu/ml to 7, 10,000 clu/ml (as against the normal acceptable level-10 clu/ml)

This result encouraged us to do a further confirmation and expand the scope by lab testing most selling full cream polypacked milk available in north India as we felt that the health of the consumers were at risk. Indeed our results confirm the fear!

called hyphae. They cause food spoilage and diseases. As per FSS Regulation, no standard provided for yeast & mould count. However, in repealed PFA Rules, it should be absent in 1 gram.

All brands of milk we tested were unable to meet the requirement for yeast & mould count, hence failed the test.

Highest Content

1. Aarey
2. Saras
3. Milkam

Anaerobic Spore Count

An anaerobic infection is an infection caused by bacteria (called anaerobes) which cannot grow in the presence of oxygen. As per FSS Regulation, no standard provided for anaerobic spore count. However, in repealed PFA Rules, it should be absent in 1 gram.

Verka, Paras, DMS and Saras failed to meet the requirement. .

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Sensory Tests

We conducted the sensory tests for colour & appearance, odour, flavor and body. These tests were conducted in the lab involving panel members under the supervision of trained experts. Sensory tests were conducted based on the Indian Standard IS: 7768-1975. As per Indian Standard, milk should be free from suspended particles, filth & foreign matters. It should not have stale, acidic or any other abnormal odour. Milk should not have cooked, oxidised, rancid, metallic & neutraliser flavour. It should be free from any objectionable flavor due to adulterants and other additives. Milk should be free from watery, ropy and curdy body.



Comparative Test

- Parag performed well in sensory tests and scored top among all brands, followed by Amul and Saras.
- In colour and appearance, Verka performed top followed by Aarey and Parag.
- In odour test, Aarey performed top followed by Amul and Parag.
- In flavour (taste & odour), Amul performed top followed by Parag and Saras.
- In body, Parag performed top followed by Verka and Amul.



Saturated Fat

Saturated fats are inherent fats, mainly animal based fats like milk fat, ghee, butter etc. An average person should limit the daily intake of saturated fat to not more than 8-10 per cent of total fat intake as these are generally bad category of fat for consumption. Eating a lot of saturated fat increases the level of bad cholesterol (low density lipoproteins - LDL) in the blood. It is generally acknowledged that high levels of LDL can cause risks of heart disease.

Changing & Updating Technologies Required

In the European countries, fresh "Extended Shelf Life" (ESL- an advanced type of pasteurisation) milk was introduced a couple of decades ago. This milk is heated by steam injection for about 3 seconds only up to 127 °C. But this process does not change its taste and smell. It lasts for even 20 to 40 days at fridge temperature. Contrary to the West, Indian shops and superstores sell milk pouches with traditional way of pasteurisation along with UHT (Ultra Heat Treatment) for long shelf life milk in tetra packs. The main reason why Indians opt for pouch milk is that consumers find it cheaper than UHT. Since the present mode of pasteurisation is delivering low quality milk, it is recommended that we adopt the ESL technology which will ensure a safer quality milk from the manufacturer's end to consumer kitchens, without having to depend on an advanced transportation mode requiring temperature maintenance.

Our Advice

- For better shelf life, store the poly packed milk 8° centigrade.
- Consume the poly packed milk after boiling, because boiling of milk kills the microbial load.
- Raw milk should also be boiled as early as possible.
- Tetra packed milk is sterilised i.e. all living organisms are killed so it is safe, no need of boiling, but expensive for most consumers.

Boiling of Milk

As per recent research study published in Journal of American Science, boiling of milk is recommended as follows:

Milk boiling for 2 minutes provides the consumer the required safety which lasts for reasonable shelf life. However, continuous stirring is essential particularly at boiling temperature, to make sure that the formed foam is exposed to boiling temperature.



Note: Consumer VOICE Technical Team has been involved in constant conversation with all the manufacturers who responded to the test results and queries appropriately.

COMPARATIVE PERFORMANCE SCORE OF POLYPACKED FULL CREAM MILK

Brand Parameter	Mother Dairy	Parag	Vita	Aarey	Amul	Sanchi	Milkam	Reliance	Saras	Paras	Verka	DMS
MRP, ₹ per 500ml	17.5	17.5	17.5	17	18	17	18	18	18	17.5	17.5	17.5
Physico-chemical Tests 57%												
Fat	7.16	6.01	7.9	6.67	6.9	6.79	7.06	6.22	6.5	6.55	7.93	7.27
Milk Solids not Fat (SNF)	9.64	7.1	7.16	9.18	6.86	7	6.33	6.97	8.47	6.65	6.88	6.55
Saturated Fat	3.32	3.8	3.23	3.49	3.45	3.58	3.37	2.68	3.59	3.56	3.06	3.31
Cholesterol	4.67	3.02	4.74	4.34	4.59	4.55	4.67	4.63	4.23	4.75	4.55	4.68
Calcium	4.56	4.02	4.41	3.25	4.34	4.39	4.4	4.54	3.94	5	3.45	4.2
Vitamin A	4.75	5	4.9	5	4.85	4.7	4.9	4.8	4.8	4.85	4.85	4.75
Phosphatase Test	2	2	2	2	2	2	2	2	2	2	2	2
Net Quantity	3	3	2.97	2.97	3	3	2.97	3	3	3	3	3
Adulteration Tests												
Neutralizer, Detergent (Cationic & Anionic), Urea, Caustic Soda, Formaldehyde, Melamine	7	7	7	7	7	7	7	7	7	7	7	7
Heavy Metals (Pb, Cu, As, Sn, Zn, Cd)	5.97	5.94	5.92	5.97	5.96	5.92	5.99	5.96	5.86	5.83	5.88	5.98
Microbiological Tests 26%												
Pathogens (E. coli, Salmonella, Staphylococcus aureus, Shigella & Listeria monocytogenes)	6	6	6	6	6	6	6	6	6	6	6	6
Total Plate Count, Yeast & Mould Count, Coliform Count, Anaerobic spore count, Methylene Blue Reduction Time	10.4	10.4	7.2	7.2	7.2	7.2	7.2	7.2	4	4	4	4
Sensory Tests 12%												
Colour, Appearance, Odour, Flavour & Body	10.72	11.78	11.28	11.42	11.76	11.2	10.08	10.56	11.47	11.28	11.4	10.15
General Parameters 5%												
Packing	2	2	2	2	2	2	2	2	2	2	2	2
Marking	3	3	3	3	3	3	3	3	3	3	3	3
Overall Score	84.19	80.07	79.71	79.49	78.91	78.33	76.97	76.56	75.86	75.47	75	73.89

Rating: >90 – Excellent *****, 71-90- Very Good ****, 51-70- Good ***, 31-50- Average **, upto 30 – Poor *

Pouched full cream milk - microbiologically unsafe but free from the contamination of pathogens and adulterants

Keeping in view the very high level of microbial count i.e. total plate count, coliform count and yeast & mould count, we do not recommend any brand as safe for consumption unless adequately boiled before consuming