

## Fermented dairy products

Dear Students, in to-day's lecture, we will discuss about “**Fermentation of Dairy products and its importance**”.

### **Introduction:**

India has attained the first rank in milk production in the world. India produces 13.1% of the total milk production in the world market. Fresh milk will spoil within few hours at room temperature. Some part of the fresh milk can be maintained by preserving them in the form of fermented products. The fermentation process increases the shelf-life of the product, while enhancing the taste and improving the digestibility of milk. There is evidence that fermented milk products have been produced since 10,000 BC. A range of different *Lactobacilli* strains has been grown in laboratories a wide range of cultured milk products with different tastes. Milk has been used to produce fermented milk products as far back as 10,000 B.C, in different regions all over the world. The benefits of fermented milk products include enhanced digestibility, new and unique flavors, added probiotics, vitamins and minerals, and preservation products for a food that normally has a very short shelf life.

There is a tremendous variety of *fermented dairy products* in many regions in the world. The properties of each product depend on the local strains used for the fermentation.

### **This episode deals with:**

1. Curd and Acidophilus milk
2. Soured cream , Yogurt and Kefir
3. Butter milk and Cultured Butter milk
4. Cheese and Lassi (Chaas, Mangolessi, salted lessi, Bhang lessi and sweet lessi)
5. Bhaand and Villi

Fermented milk products, also known as cultured dairy foods, or cultured milk products, that have been fermented with lactic acid bacteria such as *Lactobacillus*, *Lactococcus*, and *Leuconostoc.spp*.

Fermented milk products used as the main vehicles for probiotic strains. Less frequently, cheeses have been used for incorporation of probiotic microorganisms, but they may offer a number of advantages compared with fermented milk products. Fermented dairy products are products that can be produced via fermentation of lactose by microorganisms especially by lactic acid bacteria. A Probiotic food enhance health after consumption and contains microorganisms which are viable, specific and effective on main systems of nutritional physiology.

## **1. Curd**

Curd is a dairy product made by curdling milk with rennet or yeast and lactic acid bacteria. Curds are used to make cheese, it can be eaten together as a dish. Curd has 'good bacteria' present in it which strengthens our immune system by fighting against several microorganisms that are present in the body. It is also useful in preventing vaginal yeast infection in women. Eat it daily to prevent infections and stay healthy.

### **Benefits of curd**

1. Curd or *dahi* improves the digestive system as it contains a host of beneficial bacteria in it.
2. It helps to cope with stomach problems.
3. Consuming curd regularly increases the capacity to absorb the nutrients and minerals from other foods as well.
4. It proves health beneficial for those who are lactose intolerant.
5. Consumption of curd provides relief from diarrhea. Know about how curd can help improve immunity.
6. Consuming curd proves beneficial for those suffering from vaginal infection.
7. It helps strengthen bones and teeth as it is high in calcium.
8. Curd also helps minimise the risk of high blood pressure.

### **Acidophilus milk:**

Acidophilus milk is a type of fermented dairy product and *L. acidophilus* is used as culture. In the fermented Acidophilus milk production, milk is heat processed at 95°C and goes through homogenisation. Later, it is cooled to 37°C and inoculated with 2-5% commercial *L.*

*acidophilus* pure culture and left for incubation for 18-24 hours. Following incubation, milk is cooled to 5°C and kept under cold conditions.. The purpose of using high temperatures is for better *L. acidophilus* growth.

Sweet acidophilus milk can be made from milk of any fat content but is usually made from lowfat (1 percent) milk. It looks and tastes like regular low fat milk and has the same nutritional value as low fat milk.

### **Sour cream :**

The original process for making sour cream was to simply let cream sour on its own. Today, a more proactive process is used: the lactic-acid-producing bacteria *Streptococcus lactis*. The flavor of sour cream is mild and the texture is thick and smooth. With a fat content between 10 to 14 percent. Sour cream also works well in baking recipes for cookies cakes, breads ect.

### **Yogurt:**

Is a semi solid fermented milk product, Ingredients include milk and bacteria. It also contains protein, fat and also a source of calcium, vitamins B2, B6 and B12. Yogurt, like other fermented milk products, is primarily cultured from cow's milk, but can be made from goat's milk also. The bacteria used to make yogurt are known as "yogurt cultures". Fermentation of lactose by these bacteria produces lactic acid, which acts on milk protein to give yogurt its texture and its characteristic taste. Worldwide, cow's milk, is most commonly used to make yogurt. Dairy yogurt is produced using a culture of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* bacteria. In addition, other *lactobacilli* and *bifidobacteria* are also sometimes added to culturing yogurt. Some countries require yogurt to contain a certain amount of colony-forming units of microorganisms. Yogurt quality is based on color, appearance, body, texture, and flavor.

### **Yogurt:**

1. Set Yogurt
2. Drinking Yogurt
3. Flavoured Yogurt
4. Stirred Yogurt

## 5. Frozen Yogurt

## 6. Concentrated Yogurt

Yogurt was created by Central Asian people in the Neolithic period. Analysis of the *L. delbrueckii* subsp. *bulgaricus* genome indicates that the bacterium may have originated on the surface of a plant. In ancient Indian records, the combination of yogurt and honey is called "the food of the gods". Dairy yogurt is produced using a culture of *Lactobacillus delbrueckii* subsp. *bulgaricus* and *Streptococcus thermophilus* bacteria. In addition, other *lactobacilli* and *bifidobacteria* are also sometimes added to the yogurt.

### **Health benefits of Yogurt.**

Yogurt is nutritionally rich in protein, calcium, vitamin D, riboflavin, vitamin B6 and vitamin B<sub>12</sub>. It has nutritional benefits beyond those of milk. Lactose-intolerant individuals may tolerate yogurt better than other dairy products due to the conversion of lactose to the sugars glucose and galactose, and due to the fermentation of lactose to lactic acid carried out by the bacteria present in the yogurt. The fat content of yogurt varies from 0-3.5%; most yogurt is low fat and contains 1–1.5% fat.

### **Buttermilk**

Buttermilk refers to a number of dairy drinks. Originally, buttermilk was the liquid left behind after churning butter out of cream. This type of buttermilk is known as *traditional buttermilk*. This fermented dairy product known as *cultured buttermilk* is produced from cow's milk and has a characteristically sour taste caused by lactic acid bacteria. This variant is made using one of two species of bacteria either *Lactococcus lactis* or *Lactobacillus bulgaricus*. Buttermilk can be drunk straight, and it can also be used in cooking. Soda bread is a bread in which buttermilk reacts with the rising agent, sodium bicarbonate, to produce carbon dioxide. Traditional buttermilk is still common in many Indo-Pakistani households but rarely found in western countries. In Southern India and most areas of the Punjab, Gujarat, buttermilk with added water, sugar and/or salt, and curry leaves.

### **Health benefits:**

Buttermilk prepared in the traditional way is considered beneficial to health as it contains probiotic microbes and is sometimes referred to as "Grandma's probiotic". It is also

soothing to stomach and skin, fat content of buttermilk is very low, because fat is removed during churning. The probiotic nature of buttermilk is beneficial to the gut and improves immunity when taken regularly. One cup of whole milk contains 157 calories and 8.9 grams of fat whereas one cup of buttermilk contains 99 calories and 2.2 grams of fat. Buttermilk contains vitamins, potassium, calcium, and traces of phosphorus. In some countries, such as India, it is a favourite traditional drink during summer as it is soothing to the stomach and alleviates minor stomach upsets. In India, flavoring ingredients such as asafoetida, coriander leaves, ginger, curry leaves and sea salt are mixed with buttermilk to enhance its digestion-aiding properties.

### **Cultured butter milk:**

Commercially available cultured buttermilk is milk that has been pasteurized and homogenized (if 1% or 2% fat), and then inoculated with a culture of *Lactococcuslactis* plus *Leuconostoccitrovorum*. Condensed buttermilk and dried buttermilk have increased in importance in the food industry. Buttermilk solids are used in ice cream manufacture, as well as being added to pancake mixes.

### **Kefir**

Kefir is a fermented yogurt-like drink. The word "kefir" is derived from the Turkish word "Keif," which means "good feeling"; a benefit this drink is said to provide for those who consume it. Kefir is produced with starter grains, known as kefir grains, which contain active microorganisms consisting of 83 to 90 percent lactic acid bacteria and 10 to 17 percent yeast. Traditionally, raw milk was mixed with kefir grains and placed in animal skin pouches to ferment.

Kefir incorporates various essential vitamins, minerals, amino acids and enzymes, particularly phosphorus, magnesium, calcium and vitamins B2, B12, D, K and A. Kefir has some merit as kefir is rich in nutrients including folic acid.

### **Cheese:**

Cheese is produced throughout the world; it is an ancient food and delicious and nutritious food that is very versatile. **Cheese** is a food derived from milk that is produced in a wide range of flavors, textures, and forms by coagulation of the milk protein called casein. During production, the milk is usually acidified, and adding the enzyme rennet causes coagulation. The solids are

separated and pressed into final form. Some cheeses have molds on the rind or throughout. Most cheeses melt at cooking temperature. There are hundreds types of cheese produced by various part of the world.

Hundreds of types of cheese from various countries are produced. Their styles, textures and flavors depend on the origin of the milk (including the animal's diet), whether they have been pasteurized, the butterfat content, the bacteria and mold, the processing, and aging. Herbs, spices, or wood smoke may be used as flavoring agents. Other ingredients may be added to some cheeses, such as black peppers, garlic etc.

### **Nutritional Facts:**

Amount Per -100 grams

Calories- 371

Protein - 18 g

Sodium - 1,671 mg

Potassium -132 mg, and also it contain vitmin,B-12,vit-A,vit-C and vit –D.

- The calcium, protein, and phosphorus in cheese may act to protect tooth enamel.
- Cheese increases saliva flow, washing away acids and sugars.

**The nutritional value** : The nutritional value of cheese varies widely. Cottage cheese may consist of 4% fat and 11% protein; some whey cheeses 15% fat and 11% protein, and some triple-crème cheeses 36% fat and 7% protein. In general, cheese supplies a great deal of calcium, protein, phosphorus and fat. Nutritionally, cheese is essentially concentrated milk: it takes about 200 grams (7.1 oz) of milk to provide that much protein, and 150 grams (5.3 oz) to equal the calcium.

### **Different types of Cheese:**

1. Soft cheese
2. Semi Soft cheese
3. Semi hard cheese
4. hard cheese
5. Fresh cheese
6. Blue cheese

## 7. Processed cheese.

**Soft cheese:** It is pale in color with a slight grayish tinge under a rind of white mold. The whitish moldy rind is typically eaten, its flavor depending largely upon the ingredients used and its manufacturing environment.

**Blue cheese:** So-called blue cheese is created by inoculating a cheese with *Penicillium roqueforti* or *Penicillium glaucum*. This is done while the cheese is still in the form of loosely pressed curds, and may be further enhanced by piercing a ripening block of cheese with skewers in an atmosphere in which the mold is prevalent. The mold grows within the cheese as it ages. These cheeses have distinct blue veins, which gives them their name and, often, assertive flavors. The molds range from pale green to dark blue, and may be accompanied by white and crusty brown molds. Their texture can be soft or firm. Some of the most renowned cheeses are of this type, each with its own distinctive color, flavor, texture and aroma. They include Roquefort, Gorgonzola and Stilton.

**Processed cheese:** Processed cheese is often sold in blocks, pressurized cans, and in packs of individual slices, often separated by wax paper, or with each slice individually-wrapped by machine.

### **Cheese ripening**

A newborn cheese is usually salty, bland in flavor and, for harder varieties, rubbery in texture. Normally cheeses are left to rest under controlled conditions. This aging period (also called ripening, lasts from a few days to several years. This transformation is largely a result of the breakdown of casein proteins and milkfat into a complex mix of amino acids, amines, and fatty acids.

Cheese ripening or alternatively cheese maturation is a process in cheese making. It is responsible for the distinct flavour of cheese. The process is "characterized by a series of complex physical, chemical and microbiological changes" that incorporates the agents of: "bacteria and enzymes of the milk, lactic culture, rennet, lipases, added moulds or yeasts. Some cheeses have additional bacteria or molds intentionally introduced before or during aging. In traditional cheese making, these microbes might be already present in the aging room; they are simply allowed to settle and grow on the stored cheeses.

## **Lassi:**

Lassi is a popular, traditional, yogurt-based drink from Bangladesh, India and Pakistan. Lassi is a blend of yogurt, water, spices and sometimes, fruit. Traditional lassi sometimes flavored with ground and roasted cumin. Sweet lassi, however, contains sugar or fruits, instead of spices. In Dharmic religions, yogurt sweetened with honey is used while performing religious rituals. With a little turmeric powder mixed in, it is also used as a folk remedy for gastroenteritis.

## **Variations**

Variations of lassi can be seen in these forms,

1. Salted lassi
2. Mango lassi:
3. Bhang lassi:

## **Sweet lassi and Salted lassi**

**Sweet lassi:** Sweet lassi is a form of lassi flavoured with sugar, rosewater and/or lemon, strawberry or other fruit juices. Saffron lassis, which are particularly rich, are a specialty of Sindh in Pakistan, and Jodhpur and Rajasthan in India. *Makkhaniya lassi* is simply lassi with lumps of butter in it (*makkhan* is the Gujarati, Hindi and Punjabi word for butter). It is usually creamy like a milkshake. Salt can be substituted in place of sugar. The resulting beverage is known as salted lassi.

## **Mango lassi:**

Mango lassi is gaining popularity worldwide. It is made from yogurt, water and mango pulp. It may be made with or without additional sugar. It is widely available in UK, Malaysia and Singapore and in many other parts of the world. In various parts of Canada, mango lassi is a cold drink consisting of sweetened kesar mango pulp mixed with yogurt, cream, or ice cream.

## **Bhang lassi:**

Bhang lassi is a special lassi that contains *bhang*, a liquid derivative of *cannabis*. *Cannabis* plants produce a group of chemicals called cannabinoids, which produce mental and physical effects when consumed. It is legal in many parts of India and mainly sold



during Holi. Uttar Pradesh is known to have licensed bhang shops, and in many places one can buy bhang products and drink bhang lassis.

### **Chaas**

Chaas is a salted drink like lassi; however, chaas contains more water than lassi and has the butterfat removed, so it is not as thick as lassi. Salt and Jeera (cumin seeds), fresh ground ginger & green chillies are normally added for taste and sometimes even fresh coriander. Chaas is popular in the Indian states Gujarat and Rajasthan, where it is drunk with the main meal and was known to aid digestion and is an excellent coolant in the Indian and Pakistani summers.<sup>1</sup>It is called 'majjige' in Kannada, 'majjiga' in Telugu, 'moru' in Tamil and 'ghol' in Bengali.

### **Blaand**

Blaand is a traditional Scottish drink made from fermented whey with minute alcoholic content, but it was not commercialized. It has recently (2005) been revived and commercialized under different brand name.

### **Mil-Mil**

Mil-Mil is a Japan originated fermented dairy product. A mixture of *Bifidobacterium bifidum*, *Bifidobacterium breve* and *Lb. acidophilus* cultures is used in the production. The product is enriched with small quantities of glucose and fructose and carrot juice. Hence, it is rich in provitamin A. Mil-Mil can also be consumed as soup.

Table 1:Some important fermented dairy products and microorganisms involved.

Sl no	name	Type of Milk	Micro-organisms involved
	Curd	Buffalo's or cow's milk	<i>L. lactis subsp. lactis</i> <i>L. delbrueckii subsp. bulgaricus</i> <i>L. plantarum</i> <i>Streptococcus lactis</i> <i>S. thermophilus</i>

			<i>S. cremoris</i>
	Yoghurt	Cow's milk	<i>L. acidophilus</i> <i>S. thermophilus</i> <i>L. bulgaricus</i>
	Cultured butter milk	Buffalo's or cow's milk	<i>S. lactis subsp. diacetylactis</i> <i>S. cremoris</i>
	Cheese	Cow's, Buffalo's, goat's milk, sheep milk	<i>L. lactis subsp. lactis</i> , <i>L. lactis subsp. cremoris</i> , <i>L. lactis subsp. diacetylactis</i> , <i>S. thermophilus</i> , <i>L. delbueckii subsp. bulgaricus</i> <i>Priopionibacterium shermanii</i> ,

### Conclusion :

Milk has been used to produce fermented milk products as far back as 10,000 B.C. in different regions all over the world. The many benefits of fermented milk products include enhanced digestibility, new and unique flavors, added probiotics, vitamins and minerals, and preservation products for a food that normally has a very short shelf life. Fermented dairy products are products that can be produced via fermentation of lactose by microorganisms especially by lactic acid bacteria. A Probiotic food enhances health after consumption and contains microorganisms which are viable, specific and effective on main systems of nutritional physiology and those products are an important part of human diet . These benefits include supporting your immune system, fighting against the growth of toxic intestinal bacteria, decreasing discomfort from lactose intolerance, treating diarrhea and normalizing carcinogens in our food. Many dairy products are sources of fermented foods that can help to produce a healthy bacteria balance in our digestive system.

