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INTRODUCTION

Fermented foods were very likely among the first foods consumed by human beings.This was not because early humans had actually planned on or had intended to make a particular fermented food,but rather because fermentation was simply the inevitable outcome that resulted when raw food materials were left in an otherwise unpreserved state. It is remarkable that the means for producing so many fermented foods evolved independently on every continent and on an entirely empirical basis.

Milk fermentations must undoubtedly be among the oldest of all fermented foods. Given the early recognition of the importance of milk in human nutrition and its widespread consumption around the world, it is not surprising that cultured dairy products have evolved on every continent. Yogurt is also mentioned in Hindu sacred texts and mythology.And although the manufacturing procedures, the sources of milk, and the names of these products may vary considerably, they share many common characteristics. Thus,dahi (India), laban (Egypt, Lebanon), and jugart (Turkey) are all yogurt-like products whose manufacture involves similar milk handling procedures and depends on the same thermophilic culture bacteria. Other products, in particular, kefir and koumiss, evolved from Asia, and are made using various lactose-fermenting yeasts in addition to lactic acid bacteria. (Robert W. Hutkins, First edition, 2006.)

WHAT IS FERMENTATION?

FERMENTATION is defined as any of a group of chemical reactions that split complex organic compounds into relatively simple substances.in beer the most common form of fermentation is the anaerobic(oxygen-free)conversion of sugar to carbon dioxide and ethyle alcohol by yeast.stated more simply,yeast cells consume and metabolize sugars in the wort. The science of fermentation is known as zymology.

The first step, glycolysis, is common to all fermentation pathways:

$$C_6H_{12}O_6 + 2\ NAD^+ + 2\ ADP + 2\ P_i \rightarrow 2\ CH_3COCO_2^- + 2\ NADH + 2\ ATP + 2\ H_2O + 2H^+$$

TYPES OF FERMENTATION :

- Batch types fermentation,
- Fed batch fermentation,

- Continuous fermentation,
- solid state fermentation

BATCH FERMENTATION: It is a discontinuous process and the fermentor has to be cleaned after each process and a fresh batch started.

Advantages: Used where end product required in more quantities at a given period of time. Useful where the shelf life of the end product is short. Useful specifically for the product produced only at the stationary phase.

FEDBATCH FERMENTATION: This fermentation is intermediate of both batch and continuous fermentation. Sterile nutrients are added in increments .

Disadvantages of continuous fermentation: Disadvantages of continuous fermentation Complete sterilization is difficult More prone to contamination.

CONTINUOUS FERMENTATION: It is a continuous process where the nutrient is continuously added to the fermented at a fixed rate. The organisms are continuously maintained at logarithmic stage. the products are recovered continuously. The fomenters in this type are called " flow through" fermentation.

SOLID STATE FERMENTATION: The growth of microorganisms on moist solid substrate particles in the absence or mere absence of visible liquid water between the particles.

Advantage of SSF: Advantage of SSF A lower chance of contamination due to low moisture levels Ease of product separation Energy efficiencey Development of fully differentiated structures.

Disadvantage : Disadvantage Heterogeneous nature of the media,due to poor mixing characteristics.At high agitation speeds,mycelial cells may be damage. Rotary-tray or rotating-drum fermenters are often used.[b]

OBJECTIVES

Different kind of research has been carried out all over the world regarding the role of micro organism in fermented dairy foods and their nutritional value and health aspects in our human body.

The objectives of my project are-

- To Make a clear idea about fermentation process.
- To know about the process of making fermented dairy foods.
- To find out the role of different beneficial micro organisms in fermented milk products.
- To find out the health benefits of different fermented milk products.

Review of Literature

One of the major challenges for dairy sector is to develop dairy foods that promote health and well-being. Today the perception towards food has changed and now food is perceived not only a source of nutrition but also as therapeutic agent. Studies in the clinical nutrition and pathology have successfully established interrelationship between food intakes, gut microbial ecology and human health. Human intestinal tract is home to trillions of bacteria comprising hundreds of beneficial species. The friendly organisms are called probiotics, which means "for life". Probiotics are "live microbial food supplements that have beneficial effect on the host by improving its intestinal microbial balance" (Fuller, 1989; 1997). The microbial ecology in the GIT influences many functions in our body such as digestion, absorption of nutrients, detoxification and ultimately the functioning of our immune system. All these aspects make the gut a target organ for the development of functional foods that can help in maintaining the relative balance of microorganisms in the GIT. Establishment of the microbial balance by shifting it towards a beneficial one with the help of specific dietary components like probiotics, prebiotics and synbiotics have opened the gateway for the development of functional foods. The present review is focused mainly on the history, health benefits associated with plain and probiotic yoghurt, further increasing the health promoting effects of yoghurt with probiotic and whey protein concentrates (WPC).

Fermented Foods and Human History

Acidification of milk by fermentation is one of the oldest method of preserving milk, for imparting special favourable organoleptic qualities. There are different methods of carrying out this fermentation in various parts of the world which has given rise to a range of fermented milk products including Kumiss, Kefir, Acidophilus milk and Yoghurt. These products vary considerably in composition, flavour and texture according to the nature of fermenting organisms, the type of milk used and the manufacturing process (Kosikowski, 1977).The origin could be traced to the Middle East and the term Yoghurt is derived from the Turkish word called "Jugurt". It is called by various names in different parts of the world viz., Labneh (Middle east), Zabady (Egypt), Matzooa (USA) and Dahi in India (Tamime and Robinson, 1985). The process of yoghurt making is an ancient craft which dates back to thousands of years, but it is assumed that prior to nineteenth century the various stages involved in the production of yoghurt were little understood. The uniqueness of yoghurt is attributed to the symbiotic fermentation (Vedamuthu 1991).

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The Modern Fermented Foods Industry

The fermented foods industry, like all other segments of the food processing industry, has changed dramatically in the past fifty years. Certainly, the average size of a typical production facility has increased several-fold, as has the rate at which raw materials are converted to finished product (i.e., throughput). Although small, traditional-style facilities still exist, as is evident by the many microbreweries, small wineries, and artisanal-style bakery and cheese manufacturing operations, the fermented foods industry is dominated by producers with large production capacity.

Fermented Foods in the Twenty-first Century

For 10,000 years, humans have consumed fermented foods. As noted above, originally and throughout human history, fermentation provided a means for producing safe and wellpreserved foods. Even today, fermented foods are still among the most popular type of food consumed. Although fermented foods have been part of the human diet for thousands of years, as the world becomes more multicultural and cuisines and cultures continue to mix, it is likely that fermented foods will assume an even more important dietary and nutritional role. Foods such as kimchi (from Korea), miso (from Japan), and kefir (from Eastern Europe) are fast becoming part of the Western cuisine.

Varieties and classifications

Variability between types of yoghurt stems from the ingredients, how they were made, and what has been added (Tamime and Robinson 1999). Various processing steps can affect flavour and texture. Yoghurt can be made from non-fat, low-fat, and full fat milk, or additional cream can be added to yield even higher milk fat contents. Protein and carbohydrate stabilizers can affect both flavour and texture (Chandan, 2006). Vitamins and minerals can be added to fortify yoghurts, and preservatives may be added to further lengthen their shelf-lives.

Definition

According to IS:7035 (1973) yoghurt is a cultured product obtained by using S.*salivarius*subsp. *thermophilus* and or *L.delbrueckii*subsp. *bulgaricus*. The product should not exceed 0.8 per cent lactic acid while yeast and mould counts not exceeding 100/g, and coliform count of not more than 10/g. The product should be negative for phosphatase test. According to FAO/WHO (1976) "Yoghurt is a coagulated milk product obtained by lactic acid fermentation of milk through the action of *S.salivarius*subsp. *thermophilus* and*L.delbrueckii*subsp.*Bulgarcius* with or without addition of whole milk powder or skim milk powder or whey powder. The desirable microorganisms in the final product must be viable and abundant". In the United States, the definition and regulation governing yoghurt are set by the Food and Drug Administration (FDA, 1991). According to that "Yoghurt is produced by culturing cream, milk, partially skimmed milk or milk either alone or in combination with lactic acid producing bacteria viz., *L. bulgaricus* and *S. thermophilus"*. The regulations specify that yoghurt before addition of bulky flavours contains not less than 3.25 per cent milk fat, 8.25 per cent milk solids-not-fat and a titrable acidity of 0.9 per cent expressed as lactic acid. The Codex Alimentarius Commission of the Food and Agriculture Organization (FAO) and World Health Organization (WHO) set broader international standards for yoghurt in the *Codex*

Standard for Fermented Milks (2003). This document simply requires that yoghurt be the result of a fermentation by *Streptococcus thermophilus* and *Lactobacillus delbruekii*ssp. *bulgaricus* cultures, and contain a minimum of 2.7% milk protein, less than 15% milk fat, and at least 0.6% titratable acidity. If a claim regarding live microorganisms is made on the package, the Codex specifies that at least 106 colony forming units (CFU) per gram must be present.

List of Fermented Food Products JulieDaniluk.com	
Vegetables	Kimchi, sauerkraut, cultured pickles, other fermented vegetables
Dairy Alternatives	Coconut yogurt
Soy	Miso, tempeh, natto, some soy sauces
Others	Water kefir, kvass

List of some fermented food products

Properties of Fermented Foods

As noted in the previous discussion, fermented foods were among the first "processed" foods produced and consumed by humans. Their popularity more than 5,000 years ago was due to many of the same reasons why they continue to be popular today .(Baens-Arcega, L.,A.G.,Ardisher,C.G. Bellows, and 31 other authors. 1996.)

Preservation

The preservation aspect of fermented foods was obviously important thousands of years ago, when few other preservation techniques existed. A raw food material such as milk or meat had to be eaten immediately or it would soon spoil. Although salting or smoking could be used for some products, fermentation must have been an attractive alternative, due to other desirable features. Preservation was undoubtedly one of the main reasons why fermented foods became such an integral part of human diet.

Nutrition

The nutritional value of fermented foods has long been recognized, even though the scientific bases for many of the nutritional claims have only recently been studied. Strong evidence that fermentation enhances nutritional value now exists for several fermented products, especially yogurt and wine. Fluid milk is not regularly consumed in most of the world because most people are unable to produce the enzyme α galactosidase, which is necessary for digestion of lactose, the sugar found naturally in milk. Individuals deficient in α galactosidase production are said to be lactose intolerant, and when they consume milk, mildto- severe intestinal distress may occur. Many studies have revealed, however, that lactose-intolerant subjects can consume yogurt without any untoward symptoms and can therefore obtain the nutritional benefits (e.g., calcium, high quality protein, and B vitamins) contained in milk. In addition, it has been suggested that there may be health benefits of yogurt consumption that extend beyond these macronutrients. Specifically, the microorganisms that perform the actual yogurt fermentation, or that are added as dietary adjuncts, are now thought to contribute to gastrointestinal health.

Functionality

Most fermented foods are quite different, in terms of their functionality, from the raw, starting materials. Cheese, for example, is obviously functionally different from milk.However, functional enhancement is perhaps nowhere more evident than in bread and beer.When humans first collected wheat flour some 10,000 years ago, there was little they could do with it, other than to make simple flat breads.However, once people learned how to achieve a leavened dough via fermentation, the functionality of wheat flour became limitless. Likewise, barley was another grain that was widespread and had use in breadmaking, but which also had limited functionality prior to the advent of fermentation.

Organoleptic

Simply stated, fermented foods taste dramatically different than the starting materials. But there is little argument that fermented foods have aroma, flavor, and appearance attributes that are quite unlike the raw materials from which they were made.And for those individuals who partake of and appreciate Limburger cheese, the sensory characteristics between the cheese and the milk make all the difference in the world.

Uniqueness

With few exceptions there is no way to make fermented foods without fermentation. Beer, wine, aged cheese, salami, and sauerkraut simply cannot be produced any other way. For many fermented products, the very procedures used for their manufacture are unique and require strict adherence.

Economic value

Fermented foods were the original members of the value-added category. Milk is milk, but add some culture and manipulate the mixture just right, age it for a time, and the result may be a fine cheese that fetches a price well above the combined costs of the raw materials, labor, and other expenses.. Fermented foods are generally made from inexpensive commodities (e.g., wheat, milk, meat, etc.) and most products have very modest profit margins (some products,such as “current”or unaged cheese, are sold on commodity markets, with very tight margins) (Robert W. Hutkins, First edition, 2006.)

ORGANISM

When one considers the wide variety of fermented food products consumed around the world, it is not surprising that their manufacture requires a diverse array of microorganisms. Although lactic acid-producing bacteria and ethanol-producing yeasts are certainly the most frequently used organisms in fermented foods, there are many other bacteria, yeast, and fungi that contribute essential flavor, texture, appearance, and other functional properties to the finished foods. In most cases, more than one organism or group of organisms is involved in the fermentation.

YEAST-

Yeast are unicellular fungi that are found commonly in natural environments.there are about 1500 species currently known to science and it is estimated that less than 1% of all species have been described.A relatively unique trait of yeats that distinguishes them from most other life forms is that they are capable of both aerobic ana anaerobic metabolism.this quirk turns out to have an important impact on brewing,as brewers need to leverage both forms of metabolism in order to achieve a high-quality finished product.

VARIETIES OF YEAST-

There are two main species of species used the brewing of beer.the oldest is Saccharomyces cerevisiae,also known as ale yeast.Ale yeast performs best at temperatures ranging from 60 to70 degree F,and most strains fall dormant below abut 55degree F.Ale yeast is also known as top fermenting yeast because it tends to do most ot its work from the top of the fermenting liquid.

BACTERIA-

Despite the diversity of bacteria involved directly or indirectly in the manufacture of fermented foods, all are currently classified in one of three phyla, the Proteobacteria, Firmicutes, and the Actinobacteria.Within the Firmicutes are the lactic acid bacteria, a cluster of Grampositive bacteria that are the main organisms used in the manufacture of fermented foods. This phylum also includes the genera Bacillus and Brevibacterium that contain species used in the manufacture of just a few selected fermented foods.(*Arora DR. 2007 Text book of Microbiology 2nd Edition)*

Bacteria Used in the Manufacture of Fermented Foods

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cluster of Grampositive bacteria that are the main organisms used in the manufacture of fermented foods. This phylum also includes the genera Bacillus and Brevibacterium that contain species used in the manufacture of just a few selected fermented foods. The Proteobacteria contains Gram negative bacteria that are involved in the vinegar fermentation, as well as in spoilage of wine and other alcoholic products. The Actinobacteria contains only a few genera relevant to fermented foods manufacture, and only in a rather indirect manner. These include Bifidobacteriim, Kocuria, Staphylococcus, and Micrococcus. In fact, Bifidobacterium do not actually serve a functional role in fermented foods; rather they are added for nutritional purposes.

The Lactic Acid Bacteria

Lactic acid bacteria have been used to ferment or culture foods for at least 4000 years.They are used in particular in fermented milk products from all over the world,including yogurt,cheese,butter,buttermilk,kefir,and koumiss.Lactic acid bacteria refers to a large group of beneficial bacteria that have similar properties and all produce lactic acid as an end product of the fermentation process.They are widespread in nature and are also found in our digestive systems.Although they are best known for their role in the preparations of fermented dairy products,they are also used for pickling of vegetables,baking,winemaking,curing fish,meats and sausages.(*Burnaby BC,1997.)*

Lactic acid bacteria (LAB) are defined as bacteria which produce lactic acid as their major fermentation product. These are nonsporing nonmotile organisms and obtain energy through sugar fermentation. These are usually categorized as facultative anaerobes. LAB are widely distributed in intestinal tracts of various animals where they live as normal flora. The safety of Lactic acid bacteria have been evaluated by different researchers to limited extent in human beings. Lactobacillemia, antibiotic resistance, and possible production of biogenic amines in fermented products could generate undesirable adverse effects. These adverse effects rarely occur. In conclusion LAB are considered as safe (Bernardeau et al., 2008).

The genera of lactic acid bacteria

According to current taxonomy, the lactic acid bacteria group consists of twelve genera. Seven of the twelve genera of lactic acid bacteria, Lactobacillus, Lactococcus, Leuconostoc, Oenococcus,Pediococcus, Streptococcus, and Tetragenococcus, are used directly in food fermentations. Although Enterococcus sp. Are often found in fermented foods (e.g., cheese,sausage, fermented vegetables), except for a few occasions, they are not added directly. In fact, their presence is often undesirable, in part, because they are sometimes used as indicators of fecal contamination and also because some strains may harbor mobile antibioticresistance genes. Importantly, some strains of Enterococcus are capable of causing infections in humans. Likewise, Carnobacterium are also undesirable, mainly because they are considered as spoilage organisms in fermented meat products. Finally, species of Aerococcus, Vagococcus, and Weisella are not widely found in foods, and their overall significance in food is unclear.

Lactococcus

The genus Lactococcus consists of five phylogenetically- distinct species: Lactococcus lactis, Lactococcus garviae, Lactococcus piscium, Lactococcus plantarum, and Lactococcus raffinolactis .They are all non-motile, obligately homofermentative, facultative anaerobes, with an optimum growth temperature near 30°C. They have a distinctive microscopic morphology, usually appearing as cocci in pairs or short chains. One species in particular L. lactis, is among the most important of all lactic acid bacteria (and perhaps one of the most important organisms involved in food fermentations, period). This is because L. lactis is the "work horse" of the dairy products industry—it is used as a starter culture for most of the hard cheeses and many of the cultured dairy products produced around the world.

Streptococcus

The genus Streptococcus contains many diverse species with a wide array of habitats. Included in this genus are human and animal pathogens, oral commensals, intestinal commensals, and one (and only one) species, Streptococcus thermophilus, that is used in the manufacture of fermented foods. In general, streptococci are non-motile, facultative anaerobes, with an obligate homofermentative metabolism. In 1985, two species that had been referred to as "lactic streptococci" (Streptococcus lactis and Streptococcus cremoris) were also assigned to a new genus, Lactococcus.

Leuconostoc

The Leuconostoc belong to the Leuconostocaceae Family, which also contains the closely related genera Weissella and Oenococcus .Leuconostocs are mesophilic, with optimum growth temperatures ranging from 18°C to 25°C. Some species are capable of growth at temperatures below 10°C. Microscopically, they appear coccoid or even somewhat rod-like, depending on the composition and form of the growth medium. some species OF Leukonostoc are involved in food spoilage (e.g., Leuconostoc gasicomitatum), whereas others are used in food fermentations. The latter include Leuconostoc mesenteroides subsp. cremoris and Leuconostoc lactis, which are used in dairy fermentations, and Leuconostoc mesenteroides subsp. mesenteroides, Leuconostoc kimchii,and Leuconostoc fallax, that are used in vegetable fermentations.

Oenococcus

In general, however, most strains of O. oeni are slow-growing and ferment a limited number of sugars. As implied by the etymology of its name,the use of O. oeni in fermented foods is restricted to only one application, namely wine making (oenos is the Greek word for wine). Despite its limited use,however,the importance of O.oeni during the wine fermentation cannot be overstated. This is because O. oeni has the ability to de -acidify wine via the malolactic fermentation, whereby malic acid is decarboxylated to lactic acid. Moreover, given the ability of O. oeni to ferment glucose and fructose, but few other sugars, and its high tolerance to low pH and high ethanol, wine or juice would appear to be the natural habitat for this organism.

Pediococcus

The pediococci are similar,in many respects, to other coccoid-shaped, obligate homofermentative lactic acid bacteria, with one main exception. There are six recognized species of Pediococcus ;several are important in food fermentations. Two species, Pediococcus acidilactici and Pediococcus pentosaceus, are naturally present in raw vegetables, where, under suitable conditions, they play a key role in the manufacture of sauerkraut and other fermented vegetables.These same species may also be added to meat to produce fermented sausages. Despite their inability to ferment lactose, P. acidilactici and P. pentosaceus are frequently found in cheese,where they may participate in the ripening process. Pediococci are also important as spoilage organisms in fermented foods, in particular, beer, wine, and cider. One species, Pediococcus damnosus, is especially a problem in beer, where it produces diacetyl,which in beer is a serious defect.

Lactobacillus

The genus Lactobacillus consists of more than eighty species.Some species are normal inhabitants of plant and vegetable material, and they are frequently found in dairy and meat environments, in juice and fermented beverages, and in grains and cereal products.Their presence in the animal and human gastrointestinal tract (as well as in the stomach, mouth and vagina) has led to the suggestion that these bacteria have broad "probiotic activity,"meaning they promote intestinal as well as extra-intestinal health. In foods, they are involved not only in many important fermentations, but are also frequently implicated in spoilage of fermented and non-fermented foods.

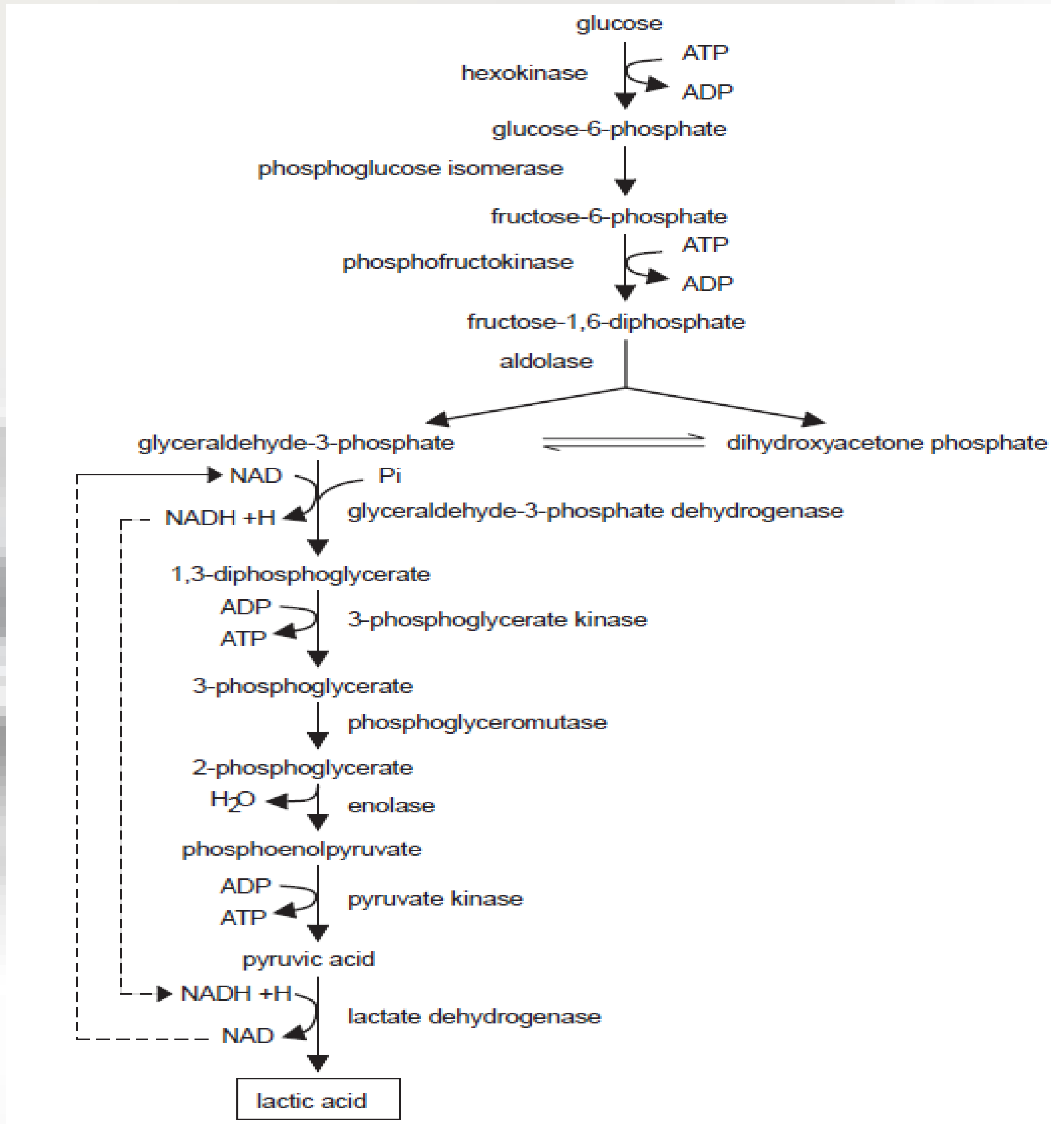
Like all lactic acid bacteria, lactobacilli are fermentative, but, again,they are more metabolically diverse than other lactics. In fact, one of the major ways in which the genus is subdivided into groups is based on the pathways they use to ferment sugars.As noted previously, lactic acid bacteria,in general,ferment sugars in either homofermentative or heterofermentative fashion.. These species, therefore, are referred to as facultative heterofermentative.(Robert W. Hutkins, First edition, 2006.)

METABOLISM

The essential feature of LAB metabolism is efficient carbohydrate fermentation coupled to substrate level phosphorylation.adenosine triphosphate(ATP) generated is subsequently used for biosynthesis.LAB as a group exhibit an enormous capacity to degrade different carbohydrates and related compounds.Generally,the predominant end product is lactic acid (>50% of sugar carbon). Based on sugar fermentation patterns,two broad metabolic categories of LAB exist;homofermantive and heterofermentive.The first category,homofermentive LAB,includes some lactobacilli and most species of enterococci,lactococci,pedicocci,streptococci,tetragenococci and vagococci,that ferment hexoes by the Embden-Meyerhof(EM)pathway.The second category,heterofermentive LAB,includes leuconostocs,some lactobacilli,oenococci and weissella species.The apparent difference on the enzyme level between these two categories is the presence or absence of the key cleavage enzymes of the E-M pathway(fructose 1,6-diphosphate)and the PK pathway(phosphoketolase).

Homofermentation

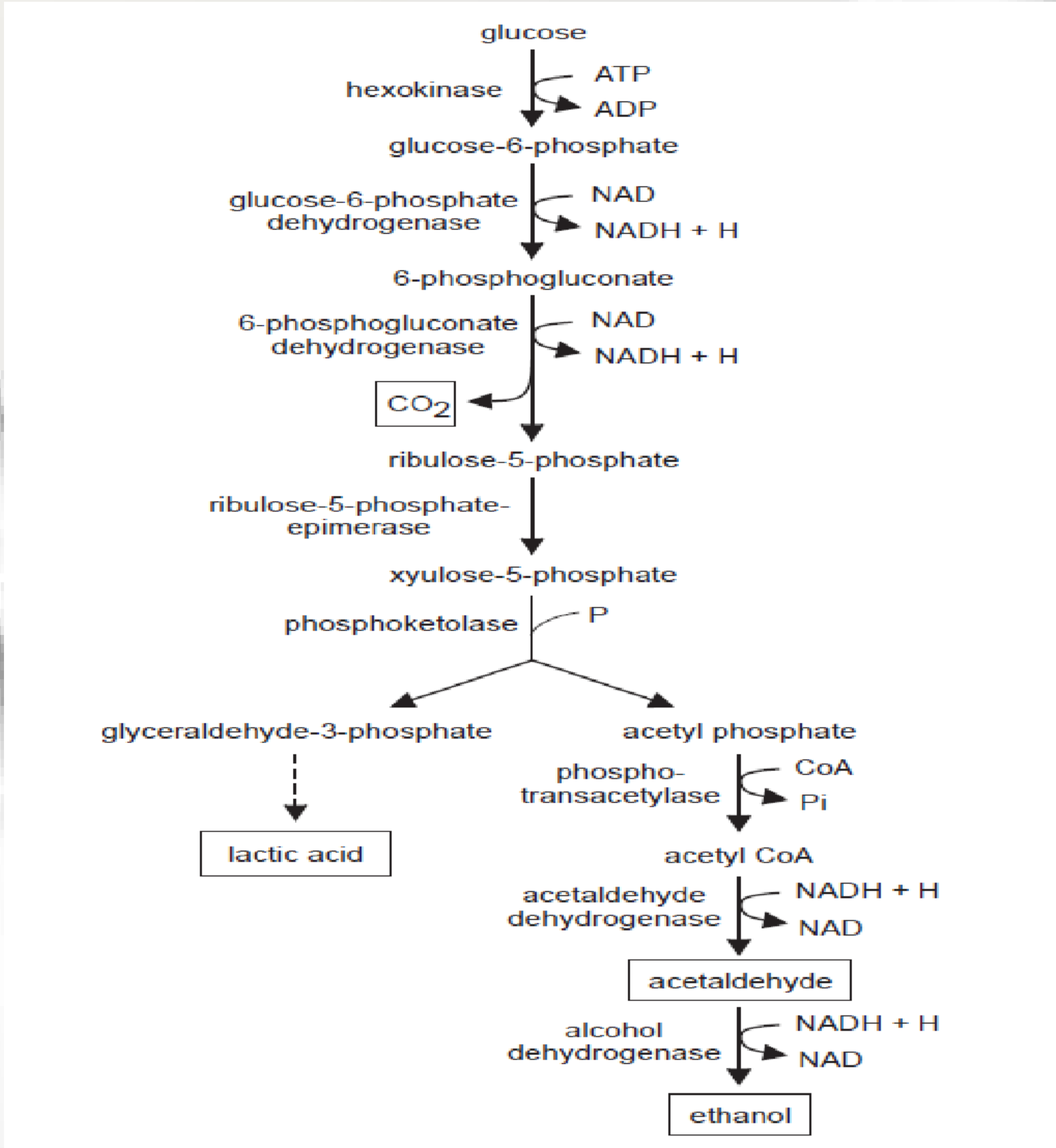
For homofermentative lactic acid bacteria, hexoses are metabolized via the enzymes of the glycolytic Embden-Meyerhoff pathway. One of the key enzymes of this pathway is aldolase, which commits the sugar to the pathway by splitting fructose-1,6-diphosphate into the two triose phosphates that eventually serve as substrates for ATP-generating reactions.



The Embden-Meyerhoff pathway used by homofermentative lactic acid bacteria.The dashed line indicated the NAD/NADH oxidation-reduction part of the pathway.

Heterofermentation

Heterofermentative lactic acid bacteria metabolize hexoses via the phosphoketolase pathway.In obligate heterofermentative bacteria, aldolase is absent, and instead the enzyme phosphoketolase is present. Approximately equimolar amounts of lactate, acetate, ethanol and CO2 are produced, along with only one mole of ATP per hexose. [c]



The phosphoketolase pathway used by heterofermentative lactic acid bacteria

OTHER BACTERIA IMPORTANT IN MILK FERMENTATIONS

In addition to the lactic acid bacteria, several other genera are involved in fermented foods. In most cases, these bacteria are used for a singular purpose, that is, they are involved in just one application and perform only one major function. one application and perform only one major function. These non-lactic acid bacteria represent several different genera and include both Gram positive and Gram negative bacteria.These non-lactic bacteria are as follows-

- ACETOBACTER
- GLUCONOBACTER
- BREVIBACTERIUM

FERMENTED DAIRY FOOD

Fermented milk products, also known as **cultured dairy foods**, **cultured dairy products**, or **cultured milk products**, are dairy foods that have been fermented with lactic acid bacteria such as Lactobacillus, Lactococcus, and Leuconostoc. 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 around 10,000 BC. A range of different Lactobacilli strains has been grown in laboratories allowing for a wide range of cultured milk products with different tastes.

PRODUCTS

Many different types of cultured milk products can be found around the world.

S.No.	Name	Type of Milk	Micro-organisms involved
1	Curd	Buffalo's or cow's milk	*L. lactis* subsp. *lactis* *L. delbrueckii* subsp. *bulgaricus* *L. plantarum* *Streptococcus lactis* *S. thermophilus* *S. cremoris*
2.	Yoghurt	Cow's milk	*L. acidophilus* *S. thermophilus* *L. bulgaricus*
3.	Cultured butter milk	Buffalo's or cow's milk	*S. lactis subsp. diacetylactis* *S. cremoris*
4.	Lassi	Buffalo's or cow's milk	*L. bulgaricus*
5.	Acdiophilus milk	Cows milk	*L. acidophilus*
6	Bulgarian butter milk	Cow's milk	*L. delbueckii* subsp. *bulgaricus*
7.	Shrikhand	Buffalo's or cow's milk	*S. thermophilus* *L. bulgaricus*
8.	Kumiss	Mare's, camel's or ass's milk	*L. acidophilus* *L. bulgaricus* *Saccharomyces* *Micrococci*
9.	Kefir	Sheep's, cow's, goat's or mixed milk	*S. lactis* *Leuconostoc sp.* *Saccharomyces* *Kefir, Torula kefir, Micrococci*
10.	Leben	Goats, sheep's milk	*S. lactis* *S. thermophilus* *L. bulgaricus* Lactose fermenting yeast
11.	Cheese	Cow's, Buffalo's, goat's milk, sheep milk	*L. lactis* subsp. *lactis*, *L. lactis* subsp. *cremoris*, *L. lactis* subsp. *diacetylactis*, *S. thermophilus*, *L. delbueckii* subsp. *bulgaricus* *Priopionibacterium shermanii*, *Penicillium roqueforti* etc.

Some important fermented dairy products

Nutritional properties of fermented dairy food

People may consumed fermented milks for several thousand years,and the belief that they are beneficial to health is probably as old.They Contain all the nutrients of milk on its own;however,the components are modified during fermentation by lactic acid bacteria (LAB),mainly in a positive way as far as nutrition is concerned.

LACTOSE-Lactose is fermented to lactic acid;this reduces pH,influence the physical properties of casein and thus promotes digestibility,improves the utilization of calcium and other minerals,and inhibits the growth of potentially harmful bacteria.Because of its lower lactose content,fermented milk can be tolerated by people with a reduced ability to digest lactose.

PROTEINS-The proteolytic activity of LAB gives rise to protein degradation;the result is some free amino acids and bioactive peptides.Bioactive peptides are a frequent supplement to functional foods,and milk proteins are currently the main source of a range of biologically active peptides such as immunopeptides, lactoferrin,lactoferricin,and phosphopeptides. The main biological activities of these peptides are immunomodulation,anti-microbial activity,anti-thrombotic activity,blood pressure regulation,and mineral or vitamin binding.Fermented milk are also a rich source of whey proteins such as α-lactalbumin,β-lactoglobulin , lactoferrin,lactoperoxidase,immunoglobulins,and variety of growth factors.

FAT-The digestibility of fat is also improved during fermentation.Milk fat is known for its high proportion of saturated fatty acids;advice is frequently given to avoid it because it contributes to an atherogenic blood profile and increased risk of coronary heart disease.however,one look at the composition of milk fat reveals that of the many different saturated fatty acids in milk omly three(lauric,mystric and palmitic)have the property of raising blood cholesterol,and that at least one-third of the fatty acids are unsaturated,with a cholesterol-lowering tendency.Furthermore,fermented milks contain components with at least protective if not hypoholesterolemic effects;these include calcium,linoleic acid ,conjugated linoleic acid(CLA),antioxidants,and lactic acid bacteria or probiotic bacteria.Milk fat contains a number of components,such as CLA ,sphingomyelin,butyric acid,ether lipids,carotene,and vitaminsA and D,with anti-carcinogenic potential.

PROBIOTICS and PREBIOTICS

Probiotics are live micro organisms that have a beneficial effect on the host by improving its intestinal microbial balance.Prebiotics are non-digestible food ingredients that have a beneficial effect on the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon;this can improve host health.

The word "Probiotic" is derived from the Greek, which means "for life" and first used by Lilly and Stillwell (1965) to describe substances secreted by microorganism, which stimulate the growth of another. Parker (1974) defined probiotic as organism and substances, which contribute to intestinal microflora.According to WHO/FAO (2002), live microorganisms which when administered in adequate amounts confer a health benefit on the host. Probiotic foods are products that contain a living ingredient in sufficient concentration, so that after their ingestion, the assumed effect is obtained. Probiotics have been used to treat diarrhea, tooth decay (*Lactobacillus* GG), vaginitis, yeast infection, canker sores, Grohn's disease (*Saccharomyces boulardii*), eczema; food allergies, HIV support (*Saccharomyces boulardii*), immune function, infection, acute pancreatic (*Lactobacillus plantarum*), ulcerative colitis, and chronic candidiasis etc. (Pedigon*et al.,* 1999). In a meta-analysis of eighteen studies, workers have reported that probiotics can reduce the duration ofacute diarrhea, especially of rotavirus in children (Huang *et al.,* 2002). If the probiotics are given to mother before childbirth and to child after birth it reduces the risk of allergic diseases in children with family history of allergy (Marschan*et al.,* 2008). In-vitro study showed that probiotic strains used in commercial products might affect the oral ecology by specifically preventing the adherence of other bacteria and by modifying the protein composition of the salivary pellicle (Haukioja*et al.,* 2008). It has been reported that high-dose probiotic and prebiotic co-therapy can be safely and effectively used for the treatment of active Crohn's disease (Fujimori *e.t al.,* 2007). Studies were conducted with conventional and probiotic yoghurt and concluded that both enhanced the stimulated production of pro-inflammatory cytokines (Meyer *et al.,* 2007). Prescott *et al.,* (2008) suggested that supplementation with probiotics in pregnancy has the potential to influence fetal immune parameters as well as immunomodulatory factors in breast milk. It has been reported that a multi-strain probiotic supplement may benefit patients with irritable bowel syndrome (Williams *et al.,*2008). It has been proposed that probiotics can be used in association with standard anti -*H. pylori* treatment, as they are able to improve patient compliance by reducing antibiotic-related adverse events, thus increasing the number of patients completing the eradication therapy (Franceschi*et al.,* 2007).

SOME FERMENTED MILK PRODUCTS

KOUMISS

Kumis is a dairy product similar to kefir, but is produced from a liquid starter culture, in contrast to the solid kefir "grains". Because mare's milk contains more sugars than cow's or goat's milk, when fermented, kumis has a higher, though still mild, alcohol content compared to kefir.Kumis is made by fermenting raw unpasteurized mare's milk over the course of hours or days, often while stirring or churning. (The physical agitation has similarities to making butter). During the fermentation, lactobacilli bacteria acidify the milk, and yeasts turn it into a carbonated and mildly alcoholic drink. Traditionally, this fermentation took place in horse-hide containers.Kumis itself has a very low level of alcohol, comparable to small beer, the common drink of medieval Europe that also avoided the consumption of . It can also be distilled into the spirit known as araka or arkhi.[d]

FILMJOLK

Filmjölk also known as fil, is a traditional fermented milk product from Sweden, and a common dairy product within the Nordic countries. It is made by fermenting cow's milk with a variety of bacteria from the species Lactococcus lactis and Leuconostoc mesenteroides.The bacteria metabolize lactose, the sugar naturally found in milk, into lactic acid which means people who are lactose intolerant can tolerate it better than other dairy products.

The acid gives filmjölk a sour taste and causes proteins in the milk, mainly casein, to coagulate, thus thickening the final product. The bacteria also produce a limited amount of diacetyl, a compound with a buttery flavor, which gives filmjölk its characteristic taste.Filmjölk is similar to cultured buttermilk or kefir in consistency and has a mild and slightly acidic taste. It has a shelf-life of around 10–14 days at refrigeration temperature. Manufactured filmjölk is made from pasteurised, homogenised, and standardised cow's milk.[e]

VIILI

Viili (**filbunke** in Swedish, or simply **fil**) is a kind of yoghurt (a mesophilic fermented milk) found in Finland that originated in Scandinavia. This cultured milk beverage is the results of microbial action of **lactic acid bacteria (LAB)**and a surface-growing yeast-like fungus **Geotrichum candidum** present in milk, which forms a velvet-like surface on viili.

The LAB identified in viili including Lactococcus lactis subsp. cremoris, Lactococcus lactis subsp. lactis biovar. diacetylactis, Leuconostoc mesenteroides subsp. cremoris. Among those mesophilic LAB strains, the slime-forming Lc. lactis subsp. cremoris produce a phosphate-containing heteropolysaccharide, named viilian. Viilian is similar to kefiran produced by kefir grains. The production of exopolysaccharides (EPS) by the strain forms the consistency character of viili and it has been claimed to have various functional benefits toward the rheological properties of milk products and the health improving potential.[f]

ACIDOPHILUS MILK

Acidophilus milk is regular milk enriched with acidophilus, a strain of healthy bacteria. This probiotic naturally lives in your digestive tract as well as your genital region, and supplementing your diet with acidophilus milk could have therapeutic benefits. This friendly bacteria is also in yogurt, tempeh and other fermented foods.

Acidophilus milk contains **Lactobacillus acidophilus**, just one of many strains of lactobacillus bacteria. People drink acidophilus milk for the potential health benefits, although not all of them have been proven. Medline Plus rates this probiotic as "likely effective" for treating children with rotavirus-induced diarrhea and "possibly effective" for treating other forms of diarrhea as well as colic, vaginal infections and irritable bowel syndrome, among other maladies.[g]

BUTTERMILK

It 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, which creates more tartness.Commercially available cultured buttermilk is milk that has been pasteurized and homogenized (with 1% or 2% fat), and then inoculated with a culture of Lactococcus lactis plus Leuconostoc citrovorum to simulate the naturally occurring bacteria in the old-fashioned product. Cultured buttermilk, often known simply as "buttermilk", was first commercially introduced in the United States in the 1920's. It was popular among immigrants, and viewed as an a food that could slow aging.Condensed buttermilk and dried buttermilk have increased in importance in the food industry. Buttermilk solids are used in ice cream manufacturing,as well as being added to pancake mixes.

One cup (237 mL) 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.[h]

SOUR CREAM

Sour cream is a dairy product obtained by fermenting regular cream with certain kinds of lactic acid bacteria. The bacterial culture, which is introduced either deliberately or naturally, sours and thickens the cream. Its name comes from the production of lactic acid by bacterial fermentation, which is called souring. [I]

KEFIR

Kefir or **kephir** alternatively **milk kefir**, or **búlgaros**, is a fermented milk drink that originated in the north Caucasus Mountains made with kefir "grains", a yeast/bacterial fermentation starter. It is prepared by inoculating cow, goat, or Sheep milk with kefir grains. The kefir grains initiating the fermentation are a combination of lactic acid bacteria and yeasts in a matrix of proteins, lipids, and sugars. Kefir grains contain kefiran, a water-soluble polysaccharide, which imparts a creamy texture and feeling in the mouth.[J]

Nutritional composition

KEFIR

NUTRITION FACTS

SERVING SIZE: 175 g

Dr. Axe
FOOD IS MEDICINE

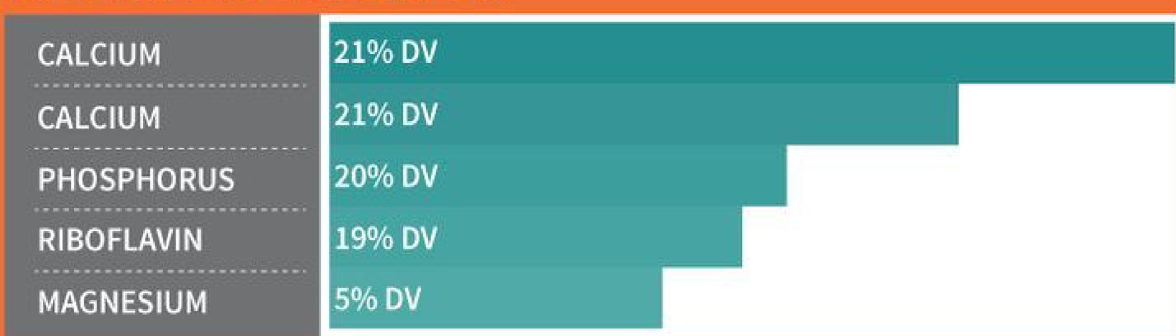
PRNCIPLE	NUTRIENT VALUE	PERCENT OF RDA
CALORIES	106 KCAL	
SAT FATS	6 G	
CARBOHYDRATES	7 G	12%
PROTEIN	6 G	
CHOLESTEROL	25 MG	7%
SUGARS	6 G	3%
SODIUM	88 MG	8%

MINERALS		
CALCIUM	210 MG	21%
MAGNESIUM	21 MG	5%
PHOSPHORUS	175 MG	20%
RIBOFLAVIN	0.3 MG	19%
IRON	.18 MG	1%
CALCIUM	210 MG	21%
POTASSIUM	263 MG	
COPPER	0.02 MG	
ZINC	0.63 MG	

VITAMINS			
VITAMIN A	0.10 MG	NIACIN	0.16 MG
THIAMIN	0.03 MG	VITAMIN C	3.06 MG
VITAMIN B2	0.30 MG	VITAMIN D	0.14 MG
VITAMIN B6	0.09 MG	VITAMIN E	0.19 MG

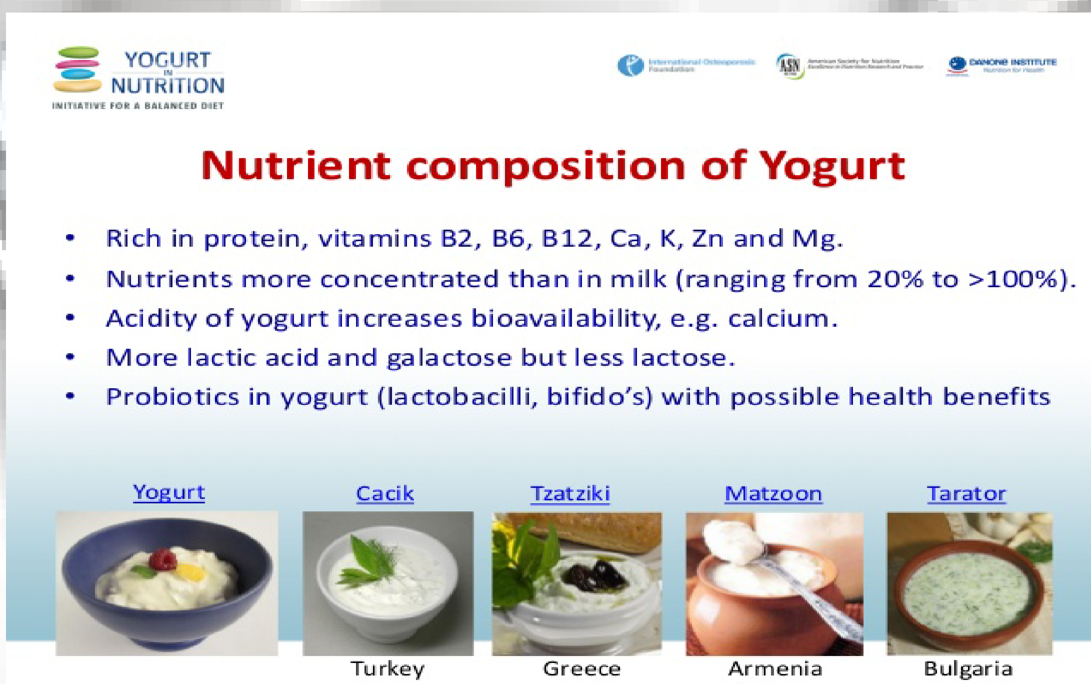
Data courtesy of http://kreyolcuisine.com/nutritionfact.asp?aliment=159&nom_aliment=Kefir,%20plain & http://users.sa.chariot.net.au/~dna/kefir-composition.htm

KEFIR NUTRIENTS



YOGURT

Yogurt, **yoghurt**, or **yoghourt** is a food produced by bacterial fermentation of milk. 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 characteristic tart flavor. Cow's milk is commonly available worldwide, and, as such, is the milk most commonly used to make yogurt. Milk from water buffalo, goats, ewes, mares, camels, and yaks is also used to produce yogurt where available locally. Milk used may be homogenized or not (milk distributed in many parts of the world is homogenized); both types may be used, with substantially different results.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 during or after culturing yogurt. To produce yogurt, milk is first heated, usually to about 85 °C (185 °F), to denature the milk proteins so that they set together rather than form curds. After heating, the milk is allowed to cool to about 45 °C (113 °F).] The bacterial culture is mixed in, and a temperature of 45 °C (113 °F) is maintained for four to twelve hours to allow fermentation.[K]



Nutritional and Therapeutic Properties of Plain and Probiotic

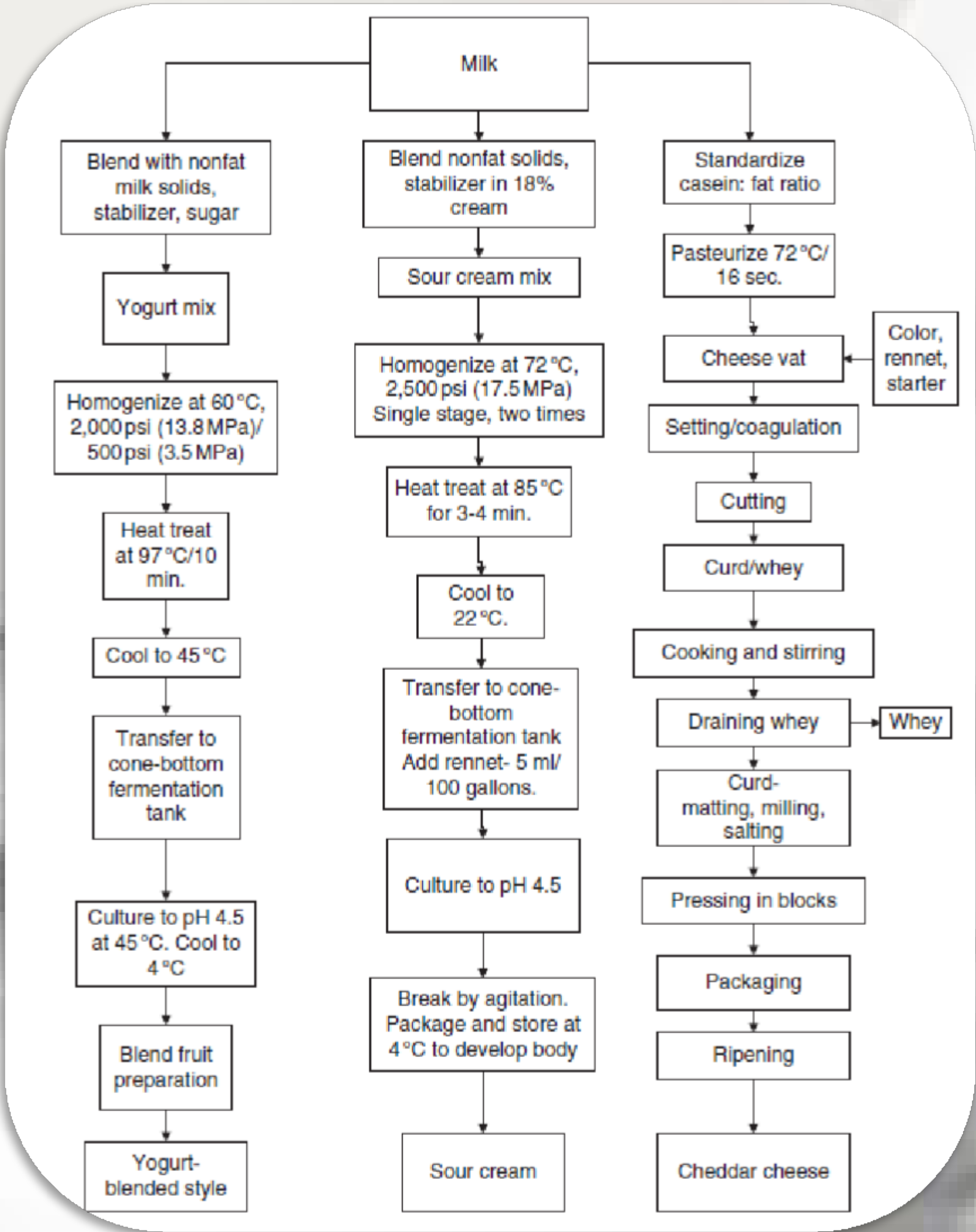
Yoghurt

In recent years there is a considerable increase in the consumption of cultured dairy products especially yoghurt which could' be ascribed to its wholesomeness in terms of nutritional and therapeutic properties (Shahani and Chandan, 1979). The starter cultures used in cultured dairy products bring about changes in physico-chemical characteristics besides enhancing the nutritional value of the resultant product.
Hydrolysis of lactose to lactic acid together with acetaldehyde impart characteristic odour and taste to yoghurt. The fermented product is highly recommended to the lactose intolerants because of the reduced lactose content. Besides this, lactic acid also helps in the absorption of calcium and phosphorous in the intestine (Renner, 1986; Kaup, 1988). Yoghurt is an excellent source of protein. Consumption of 200 to 250 ml of yoghurt meets the minimum daily protein requirement of an adult. This protein is highly digestible as most of the protein is in the digested form (Deeth and Tamime, 1981).

Consumption of yoghurt promotes growth as a result of improved lactose digestion, greater mineral absorption besides providing thiamine, riboflavin, niacin and folic acid (Renner, 1986). The antimicrobial properties of yoghurt are well established (Shahani*et al.,*1974;Shahani andchandan, 1979; Renner (1983). The antimicrobial properties have been found to be effective against pathogenic organisms especially Gram negative intestinal bacteria. Epidemiological and dietological studies have also shown that consumption of dairy products fermented by lactobacilli reduce the risk of colon cancer in both animals and humans (Renner, 1986). Even some of the specific strains of lactobacilli have been demonstrated to be effective in limiting a number of transplanted and chemically induced cancers (Tomar and Prasad, 1989). The more recent studies have revealed that yoghurt cultures are capable of controlling intestinal disorders and blood cholesterol levels (Rao, *et al.,* 1994). The addition of probiotic cultures to milk and milk products inhibits the growth of different pathogenic microorganisms by producing some bacteriostatic molecules and many bioactive substances, e.g. bioactive peptides, free fatty acids, free amino acids and oligosaccharides (prebiotics) during fermentation and storage. The addition of probiotic cultures (*Bifidobacterium longum, B. bifidum, B. infantis , L. acidophilus* and *L. delbrueckii*ssp*. bulgaricus*) inhibits the growth of pathogenic bacteria (Sartor, 2005). A number of studies have shown that yoghurt has inhibitory effect on enteropathogens. Cholesterol lowering and immunomodulatory properties of fermented milk have been reviewed by Hosono*et al.,*2002. Milk and cultured milk have a definite hypocholestrolemic effect on the consumer and leads to steady decrease in the blood triglyceride level (Chawla, 1982). Vijayendra (1994) developed direct bulk freeze-dried starter culture formulation for probiotic dahi and yoghurt. The in-vivo study was conducted to evaluate the probiotic effect of these products, containing *Bifidobacterium* spp. and *L. acidophilus* strains and was found to show probiotic properties. Sodini *et al.,* (2004) studied the effect of storage on probiotic cell counts in fermented milk processing. They reported that storage of fermented milk containing probiotic cultures (*L. acidophilus* and*L.rhamnousu*) significantly increased the probiotic cell count. Kailasapathy and Rybka (1997) successfully carried out the incorporation of *L. acidophilus* and *B. bifidum* in yoghurt to produce Acidophilus-Bifidum (AB) yoghurt having therapeutic properties and studied the probiotic attributes of AB yoghurt. AB yoghurt has been reported to attenuate diet induced hypercholestrolaemia and deposition of cholesterol and triglyceride in liver and improves antioxidant status (Rajpal, 2006). Probiotic yoghurt prepared with *L. acidophilus*and *L. casei* was found to have strong tumor inhibitory and hepato-protective activities (Singh, 2007). Probiotic yoghurt may delay the progression of chemical and dietary-induced diabetes (Yadav*et al.,* 2006). It has also been reported that yoghurt prepared with *Lactobacillus delbrueckii*ssp*. bulgaricus, Streptococcus salvarius*ssp. *thermophilus* and*Lactococcuslactis*ssp.*lactisbiovar. diacetylactis*, inhibits angiotensin-1 converting enzyme in hypertensive rats and reduces systolic blood pressure in hypertensive humans in the age group of 45 to 55 years (Ashar and Chand, 2004a;b;c). Probiotic lactobacilli appeared to increase the production of FFAs by lipolysis of milk fat, and produced CLA by using internal linoleic acid, which may confer nutritional and therapeutic value to the product (Yadav*et al.,* 2007).

Energy	406 kJ (97 kcal)
Carbohydrates	*3.98 g*
Sugars	*4.0 g*
Fat	*5.0 g*
Protein	*9.0 g*
Vitamins	
Vitamin A equiv. *beta-carotene* *lutein zeaxanthin*	*(0%)* *26 μg* *22 μg*
Thiamine (B1)	*(2%)* *0.023 mg*
Riboflavin (B2)	*(23%)* *0.278 mg*
Niacin (B3)	*(1%)* *0.208 mg*
Pantothenic acid (B5)	*(7%)* *0.331 mg*
Vitamin B6	*(5%)* *0.063 mg*
Folate (B9)	*(1%)* *5 μg*
Vitamin B12	*(31%)* *0.75 μg*
Choline	*(3%)*

	15.1 mg
Vitamin C	(0%) 0 mg
Minerals	
Iron	(0%) 0 mg
Magnesium	(3%) 11 mg
Manganese	(0%) 0.009 mg
Phosphorus	(19%) 135 mg
Potassium	(3%) 141 mg
Sodium	(2%) 35 mg
Zinc	(5%) 0.52 mg
Other constituents	
Selenium	9.7 µg
Water	81.3 g



General processing outlines for manufacture of yogurt, sour cream, and Cheddar cheese

APPLICATIONS OF FERMENTED FOODS IN FOODS AND

HEALTH ASPECTS

ANTIMICROBIAL COMPOUNDS AS NATURAL FOOD PRESERVATIVES-

Due to a strong demand for natural and minimally processed foods,there has been a growing interest in the use of antimicrobial compounds produced by LAB as a safe and natural way of food preservations.In addition to nisin which has been widely used in foods,another antimicrobial compound that has been proposed for use in food preservations is reuterin produced by Lb. reuteri.Antimicrobial compounds can be applied to foods either as purified chemical nagents,or as viable cultures in the case of fermented products.Novel purified antimicrobial compounds require data to substantiate their lack of toxicity in order to abtain approval for their use in foods.Traditional fermented products that naturally contain antimicrobial compounds have been consumed for centuries,and starter culture with selected antimicrobial properties may be used to replace those used in traditional fermented foods.However,problems may arise with respect to retaining the flavor and texture of the products.(February 2007.Meyer et al.,)

DAIRY FOODS AND BONE HEALTH

Benefits to bone health of including dairy products in the diet or risks of excluding dairy products vary with the life stage. The relationship between milk products and bone mineral content and BONE MINERAL DENSITY (BMD) was reviewed by US Department of Health and Human Services (USDHHS) and US Department of Agriculture (USDA) (2005), which found that milk, foods fortified with dairy calcium and calcium supplements all had comparable effects, increasing skeletal mass in younger subjects and reducing loss of skeletal mass in older subjects.

DAIRY AND ORAL HEALTH

Tooth decay is an increasing problem in developing countries as diets change to include more sweet and processed foods. In an in vitro study, yoghurt containing casein phosphopeptides prevented demineralization of tooth enamel and enhanced its remineralization . The exact mechanism by which certain dairy products are anticariogenic is still unclear, but the current evidence suggests that consumption of these milk products can protect against dental caries. WHO and FAO (2003) reported that both hard cheese and milk probably decrease risk of dental caries, and that hard cheese also possibly decreases the risk of dental erosion.

PROTECTION AGAINST GASTROINTESTINAL INFECTION

Gastrointestinal infections including diarrhoea result from a change in the gut microflora caused by an invading pathogen. It is suggested that viable lactic acid bacteria interfere with the colonization and subsequent proliferation of food borne pathogens, thus preventing the manifestation of infection .L. bulgaricus, L. acidophilus, S. thermophilus and B. bifidum have been implicated in this effect. The beneficial effects of lactic acid bacteria and cultured milk products have also been attributed to their ability to suppress the growth of pathogens either directly or through production of antibacterial substances. Antibiotics have been reported to kill normal bacteria as well, often resulting in disruption of the bacterial flora, leading to diarrhoea and other intestinal disturbances. Replenishing the flora with normal bacteria during and after antibiotic therapy seems to minimize disruptive effects of antibiotic use. Probiotics have been reported to effective in prevention of various gastrointestinal infections .There are reports of benefits for sufferers of rotavirus infection, traveler’s diarrhoea & antiobiotic induced diarrhea.

ANTICARCINOGENIC EFFECT

It has been reported that fermented milk products can protect against certain types of cancers. Some of epidemiological support is also there. Consumption of yoghurt, gouda cheese, butter milk protect against breast cancer. Animal studies have shown that lactic acid bacteria exert anticarcinogenic effect either by prevention of cancer initiation or by suppression of initiated cancer. Anticarcinogenic effects of yoghurt and milk fermented with L. acidophilus have been reported in mice. Different potential mechanisms by which lactic acid bacteria exert antitumor effects have been suggested such as changes in faecal enzymes thought to be involved in colon carcinogenesis, cellular uptake of mutagenic compounds, reducing the mutagenicity of chemical mutagens and suppression of tumors by improved immune response .

IMMUNE SYSTEM STIMULATION

The immune system provides the primary defense against microbial pathogens that have entered our bodies. The immunostimulatory effects of yoghurt are believed to be due to its bacterial components .Animal and some human studies have shown an effect of yoghurt or lactic acid bacteria on enhancing levels of certain immunoreactive cells or factors. Milk components such as whey protein, calcium, certain vitamins and trace elements are also capable of influencing immune system. Studies have shown that cytokine production, phagocytic activity, antibody production, T-cell production etc. are increased with yoghurt consumption or with lactic acid bacteria.

LOWERING OF SERUM CHOLESTEROL

Reports indicate that fermented milk products to have hypocholesteraemic effect .It is suggested that intake of large quantities of fermented milk furnish factors that impair the synthesis of cholesterol. It has been reported that L. acidophilus has exhibited the ability to lower serum cholesterol levels. This promotes the potential healthful aspects of dairy products fermented with L. acidophilus (or other lactic acid bacteria), since hypercholestermia is considered to be one of the major factors contributing to cardiovascular disease. However, it is likely that some strains may demonstrate this property while others do not.

ALLEVIATION OF CONSTIPATION

Constipation is common problem in subjects consuming the western diet and also in elderly people. Several studies with lactobacillus preparation and fermented milks have been published. Reported benefits include alleviation of constipation using L. acidophilus NCDO 1748, L. casei Shirota and Lactobacillus GG.

ANTIHYPERTENSIVE ACTIVITY

Casein hydrolysate, produced by an extracellular proteinase from L. helveticus (CP790) has been reported to show antihypertensive activity in rats. Two antihypertensive peptides have also been purified from sour milk fermented with L. helveticus and Saccharomyces cerevisiae. These two peptides inhibit angiotensin-converting enzyme that converts angiotensinogen I to angiotensinogen II, which is a potent vasoconstrictor. It has been reported that consumption of certain lactobacilli, or products made from them, may reduce blood pressure in mildly hypertensive people.

ANTIALLERGENIC QUALITIES

Probiotics may help prevent allergic reactions in individuals at high risk of allergies, such as food allergies. Probiotic bacteria help to reinforce the barrier function of the intestinal wall, thereby possibly preventing the absorption of some antigens.(Parmjit S. Panesar)

SUMMARY

Milk is a composite liquid that provides nutrients and biological active compounds which enhance the postnatal adaptation of newborn by improving the digestive maturity, development of gut-associated lymphoid tissues and synbiotic microflora.Skim milk is produced by removing all the milk fat from whole milk. Skim milk has less fat as compared to whole milk, and nutritionists recommend it for persons who are trying to reduce or maintain a healthy weight. The skim milk fat content ranges between 0.1-0.3%. Drinking milk is an extensive nutritional source for the children as well as for adults. Milk is the mixture of bioactive components such as vitamins, proteins, saccharides and lipids which regulate the development of gastrointestinal tract .Milk contains several antimicrobial agents which show bactericidal and bacteriostatic effects. Milk proteins play important role in food intake, satiety and obesity related disorders. Enzymes with antimicrobial and antioxidant properties are important in milk stability and protection of mammals from pathogens .The dairy products with high protein content particularly whey proteins may help in minimizing the deposition of fat and improve insulin sensitivity .Dairy peptides and proteins also enhance the availability of minerals and trace elements (calcium, zinc, iron, magnesium, manganese, selenium. Fermented dairy products are the economical source of many nutrients .Lactic acid is produced by fermentation of lactose. It reduces the pH, affects the casein physical properties and consequently enhances digestibility. It also meliorate usage of calcium and different other minerals and suppresses the development of potentially injurious bacteria. Fermented milk can be endured by individuals having a reduced ability for lactose digestion due to its smaller lactose content. Fermented dairy products include cheese, buttermilk, yoghurt, kefir, doogh, ice cream etc. Fortunately lactobacilli, lactic acid bacteria and streptococci are the dominant bacteria in fermented milk that effectively suppress the pathogenic and spoilage micro-organisms. Fermentation was used in the former days to inhibit the proliferation of some pathogens and harmful bacteria during the manufacturing of indigenous milk products. The fermented products nature varies from region to region. Therefore, it depends upon the local microbial culture that reflects the climatic environment of a particular region.(Muhammad Saeed1, Iqra Yasmin1* and Wahab Ali Khan)

CONCLUSIONS

Cultured dairy products have been providing vital importance in the human diet. However, further research into areas of the products as anticarcinogens, antitumor agents, and in the area of cholesterol will yield even more potential for cultured dairy products as an important component of human nutrition. However, careful selection of specific strains combined with proper production and handling procedures will be necessary to ensure that desired benefits are provided to consumers. At large, the opinion is in favour of probiotics and fermented foods. The challenge would be to find out the most suitable candidate organism for fermentation, select different protective and carrier media, evolve a suitable technology to design foods which contain and maintain large populations of viable bio-active organisms during processing and post harvest processing periods and have longer shelf life. The products must also be readily acceptable as regular foods. Definitely, fermented dairy products containing probiotic combinations promise a healthy, “functional food package” for improved longterm health benefits.

If powered milk products containing probiotic bacteria are to be supplied for developing countries the potential benefits of controlling intestinal infections and improving nutrient (primarily lactose) utilization should be considered. To achieve this may require providing more than one strain and/or species of probiotic bacteria in the product. One strain of one species should not necessarily be expected to provide more than on benefit. The culture(s) should be selected on the basis of being able to provide the desired result. It also must be stable during drying and storage in the milk powder. This might be accomplished using existing cultures or may involve the need to isolate and develop new strains. The biggest challenge will be ensure stability during storage of the dried product.

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