به نام خدا

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گردآورنده:
سمانه نعمتی

Cultured Dairy Products

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Production of:

yogurt

buttermilk

sour cream

kefir

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Introduction

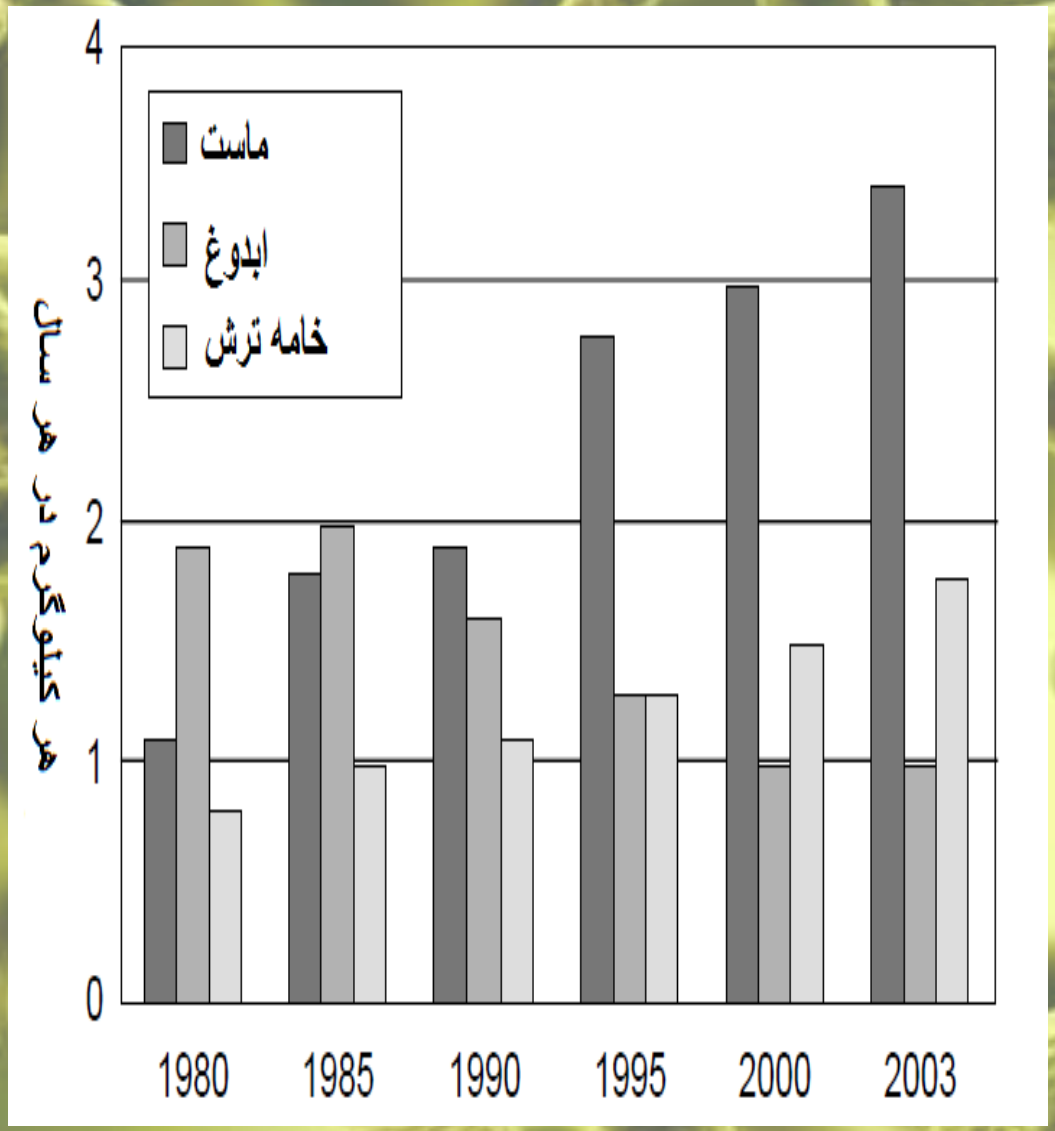
Fresh bovine milk contains 5% lactose and 3.3% protein and has a water activity near 1.0 and a pH of 6.6 to 6.7, perfect conditions for most microorganisms.

yogurt-like products:

dahi (India), laban(Egypt, Lebanon) , and jugart (Turkey)

Laban

Dahi

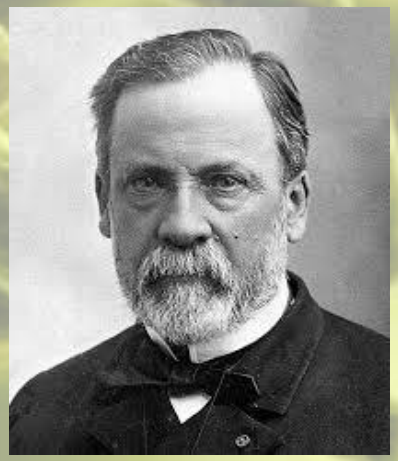


مصرف محصولات لبنی کشت شده در ایالات متحده، 1980 تا 2003

کشور	هر شخص در هر سال
استرالیا (2003)	5.9
اتریش (1999)	8.2
بلغارستان (2002)	24.7
کانادا (2003)	5.8
دانمارک (1999)	14.8
فنلاند (2001)	17.0
فرانسه (2001)	14.5
آلمان (2004)	16.8
ایتالیا (1999)	6.5
هلند (2003)	21.2
اسپانیا (1999)	7.1
سوئد (2002)	28.5
سوئیس (1999)	13.0
تونس (2002)	8.0
ترکیه (2004)	36.0
روسیه (2001)	1.5
بریتانیا (1999)	4.8
ایالات متحده (2003)	3.4

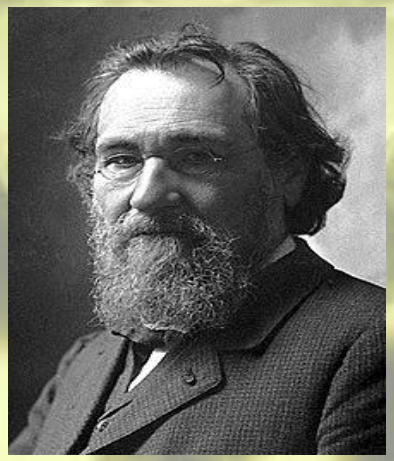
مصرف سرانه ماست

Probiotics and Prebiotics



Pasteur

existence of bacteria and their role in fermentation were first discovered by in the 1860s.



Elie Metchnikoff

The first scientist who proposed the therapeutic use of lactic acid bacteria.

Probiotics: live microorganisms which when administered in adequate amounts confer a health benefit on the host.(live and sufficient dose)

Prebiotics: carbohydrate substances that escape digestion and adsorption in the stomach and small intestine and instead reach the colon.like: actobacilli and bifidobacteria.

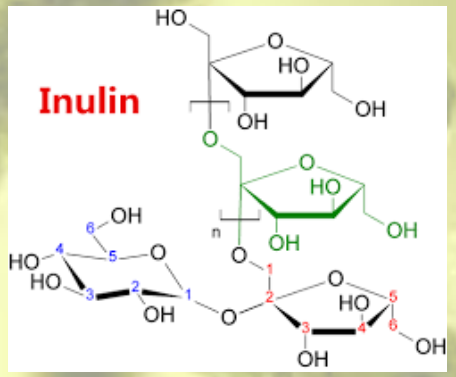
Health benefits of probiotic bacteria

1) Reduce blood cholesterol
2) Maintain intestinal health
3) Alleviate intestinal bowel diseases
4) Modulate immune system
5) Reduce incidence of gastrointestinal infections
6) Reduce incidence of urinary and vaginal infections
7) Alleviate lactose intolerance
8) Anti-carcinogenic and anti-tumorogenic
9) Reduce incidence and severity of diarrheal diseases

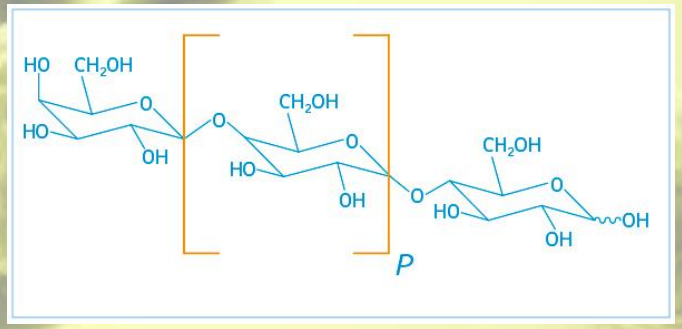
And...

Most of the prebiotics that are used commercially are either polysaccharides or oligosaccharides.For example:

Inulin, is a naturally-occurring plant polysaccharide that can be used in its intact form or as a mixture of partially hydrolyzed fructooligosaccharide (FOS) molecules.

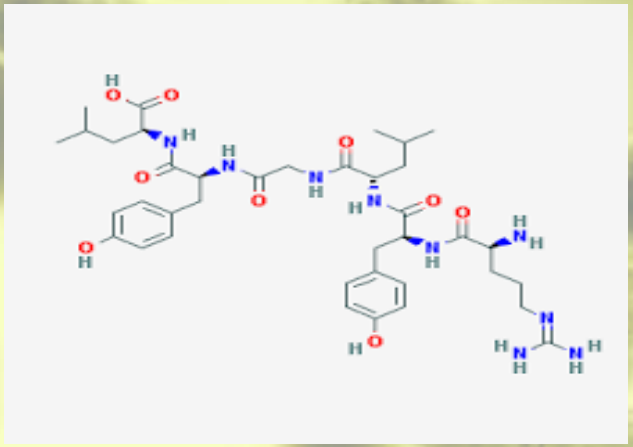


galactooligosaccharides (GOS), These oligosaccharides are built from lactose via addition of galactose residues by -galactosidases with high galactosyltransferase activity.



Syneresis is defined as the separation of water from the coagulated milk.

Manufacturers perform several steps to minimize syneresis problems:



First, the milk solids are increased, either by adding dry milk powder or by concentrating milk.

Second, the milk mixture is heated well above ordinary pasteurization conditions to denature the whey proteins, exposing more amino acid residues to the aqueous environment.

Finally, most manufacturers have incorporated stabilizers, thickening agents,and other ingredients into the formulation to further reduce syneresis.

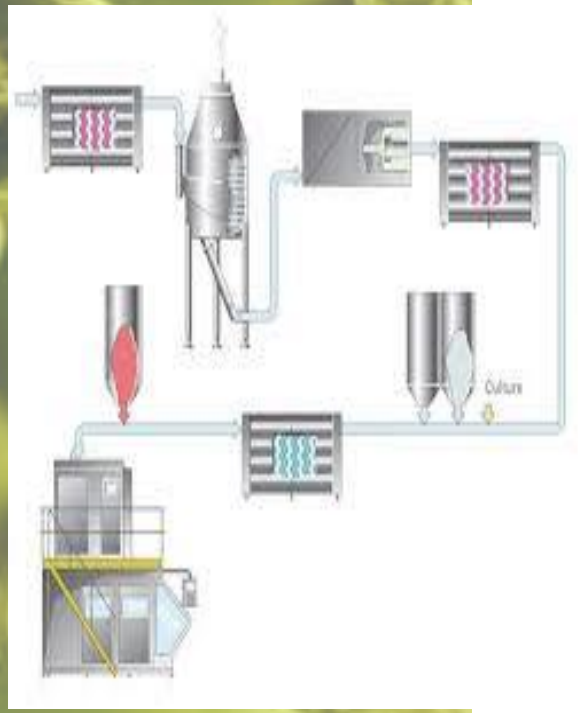
ارگانیسم	تامین کننده
Lactobacillus acidophilus NCFM	Danisco, Madison, WI, USA
Lactobacillus acidophilus SBT-2062	Snow Brand Milk Products, Tokyo, Japan
Lactobacillus casei strain Shirota	Yakult, Tokyo, Japan
Lactobacillus casei F19	Arla Foods, Skanderborgvej, Denmark
Lactobacillus fermentum RC-14	Urex Biotech, London, Canada
Lactobacillus gasseri ADH	Danisco, Madison, WI, USA
Lactobacillus johnsonii KA1 (NCC 533)	Nestle, Lausanne, Switzerland
Lactobacillus plantarum 299v	Probi, Lund, Sweden
Lactobacillus reuteri SD2112 (ATCC 55730)	Biogaia, Stockholm, Sweden
Lactobacillus rhamnosus GR-1	Urex Biotech, London, Canada
Lactobacillus rhamnosus GG (ATCC 53103)	Valio Ltd., Helsinki, Finland
Lactobacillus salivarius UCC118	University College, Cork, Ireland
Bifidobacterium longum SBT-2928	Snow Brand Milk Products, Tokyo, Japan
Bifidobacterium longum BB536	Morinaga Milk Industry, Zama City, Japan
Bifidobacterium breve strain Yakult	Yakult, Tokyo, Japan

ارگانیسم های پروبیوتیک تجاری مورد استفاده در محصولات لبنی

محصولات	ارگانیسم ها
ماست	*Streptococcus thermophilus* *Lactobacillus delbreckii* subsp. *bulgaricus*
آبدوغ	*Lactobacillus lactis* subsp. *lactis* *Lactobacillus lactis* subsp. *cremoris* *Leuconostoc lactis* *Leuconostoc mesenteroides* subsp. *dextranicum*
خامه ترش	*Lactobacillus lactis* subsp. *lactis* *Lactobacillus lactis* subsp. *cremoris* *Leuconostoc lactis* *Leuconostoc mesenteroides* subsp. *dextranicum*
کفیر	*Lactobacillus kefiri* *Lactobacillus kefiranofaciens* *Saccharomyces kefiri*

ارگانیسم هایی که در کشت های استارتر در تولید محصولات لبنی تخمیر شده استفاده می شوند

Yogurt Manufacture



شیر		استاندارد کردن (بدون چربی، کم چرب، کل) جامدات شیری بدون چربی تثبیت کننده ها، مواد دیگر
ترکیب ماست		هموژنیزه
اصلاح گرمایی		85 درجه سانتیگراد به مدت 5 دقیقه
خنک کردن		40-45°C
اغشته		کشت گرمایی 2.0 – 2.5%
اغشته	توزیع	40-45°C, 3 to 6 hours
ترکیب و توزیع	اغشته	40-45°C
خنک کردن	خنک کردن	0-4°C

2 types of yogurt:

1. cup-style

Yogurt that is mixed with flavors, fruit, or other bulky ingredients is called stirred or Swiss-style yogurt.

the mix is pumped into vats and the culture is added.The mixture is then incubated such that the entire fermentation occurs in the vat.

At the end of the fermentation, the mixture is gently agitated and cooled, and the flavor ingredients are introduced. The mixture is then pumped into containers.

1. Swiss-Style

mix can be inoculated with culture, pumped immediately into the container, and then fermented directly in the container.

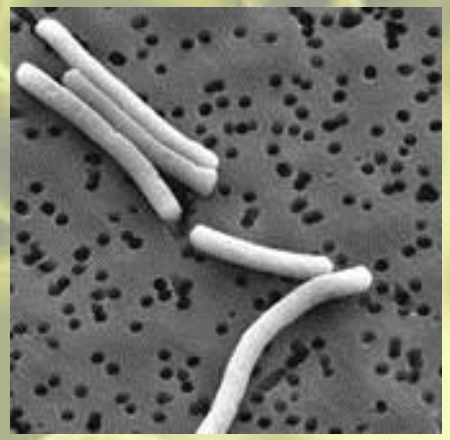
If this so-called fermented-in-the-cup style yogurt is to contain fruit or other bulky flavoring,the fruit or flavoring material is first dispensed into the cup and the yogurt mix added on top, followed by incubation and fermentation.

The consumer must do the stirring and mixing to incorporate the flavoring throughout the product

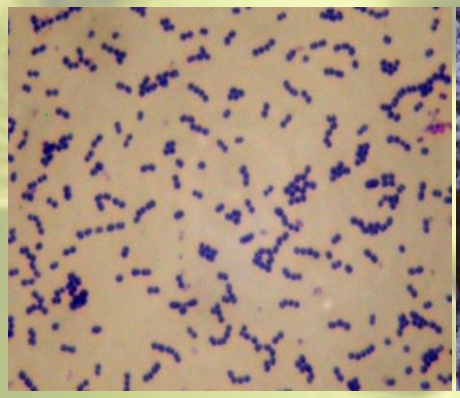
Yogurt cultures

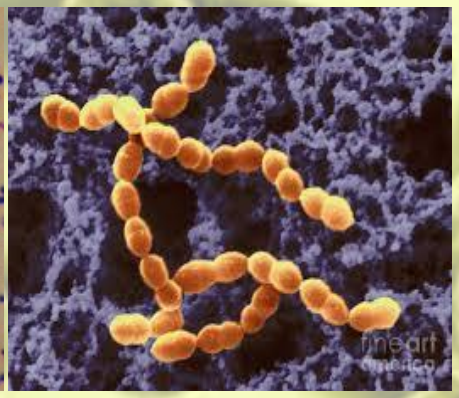
Starter cultures for yogurt consist of two organisms:

L. delbrueckii* subsp. *bulgaricus



S. thermophilus.





these bacteria grow faster and perform better when grown as a pair compared to when they are grown separately.

***S. thermophilus* is weakly proteolytic and lacks the ability to hydrolize casein.**

***S. thermophilus* lowers the pH and Eh to levels preferred by *L. delbrueckii* subsp. *bulgaricus*.**

***L. delbrueckii subsp. Bulgaricus* will produce more acid than can be tolerated by *S. thermophilus*.**

How to make acidic yogurt flavored

The cultures are added to the yogurt mix to give an initial cell concentration of about 10^7 cells per gram.

Incubated at 40°C to 45°C for four to six hours or until a titratable acidity (as lactic acid) of 0.8% to 0.9% is reached and the pH is about 4.4 to 4.6.

Growth of *S. thermophilus is favored at* temperatures below 42°C, whereas *L. delbrueckii* subsp*. bulgaricus is favored above* 42°C.

Desired properties of yogurt cultures

Stable during frozen or lyophilized storage

Able to produce the “right” consistency or body, i.e., ropiness

Viable and active after thawing or rehydration

Produces good yogurt flavor, without excess acid or acetaldehyde

Prompt growth and fermentation; short lag phase

No syneresis

Resistant to bacteriophage

No acidity produced during storage (over-acidification)

Culture metabolism

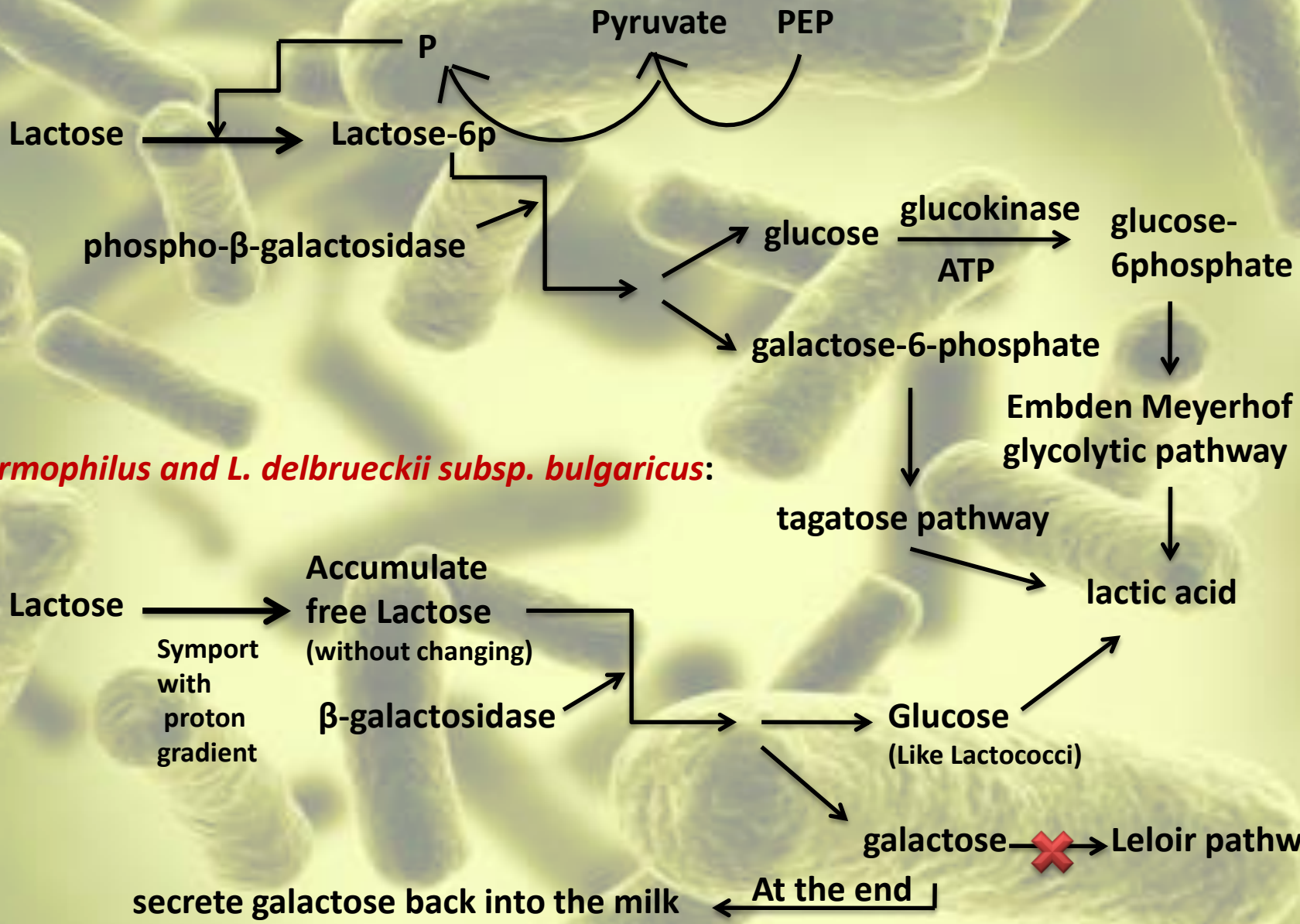
1.Mesophilic lactococci (i.e., ***Lactococcus lactis subsp. lactis and Lactococcus lactis* subsp. *cremoris)***

use *phosphoenolpyruvate* (PEP)-dependent phosphotransferase system (PTS)

***2.S. thermophilus and L. delbrueckii* subsp. *bulgaricus*,** *(the thermophilic culture* bacteria)

use a secondary transport system (called LacS) for lactose uptake.

transport of lactose across the cell membrane in Lactococci:



Post-fermentation

Cup yogurt ⟶ must be very carefully moved to coolers (0°C to 4°C) to avoid agitation which may disturb the gel, resulting in syneresis.

For **Swiss style yogurt** ⟶ where the fermentation occurs in a vat, the yogurt is typically stirred and cooled in the vat, then mixed with fruit or other flavoring, and filled into cups or containers.

Important:

during the cooling period the pH may continue to drop by an additional 0.2 to 0.3 pH units, so initiating the cooling step even when the pH is 4.8 to 4.9 may be warranted.

Yogurt Flavor and Texture

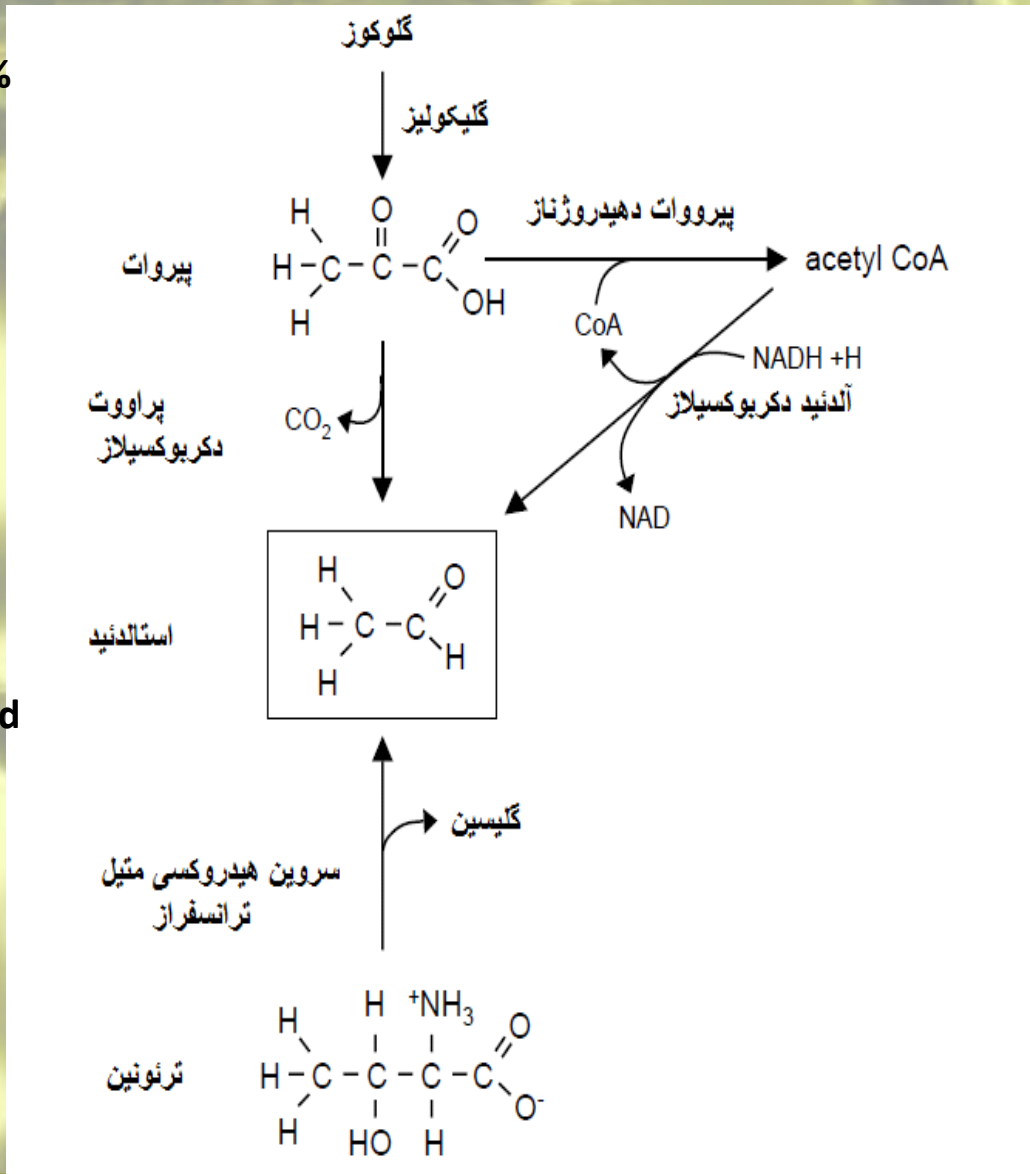
Most yogurts contain between 0.8% and 1.0% lactic acid and have a pH below 4.6.

There are other metabolic products produced by the culture that accumulate in yogurt and contribute to flavor development:The most important is acetaldehyde, a two carbon aldehyde.

Both *S. thermophilus and L. delbrueckii subsp. Bulgaricus* can produce acetaldehyde

To control yogurt manufacturers in the United States commonly add stabilizers to the mix.

The most popular stabilizers: gums and starches, including carrageenan, locust bean, and guar gums; corn starch; tapioca and pectin.Also Gelatin.



1. Some chemically-derived flavor defects in yogurt can be caused by using poor-quality milk.

2. Microbial spoilage is due to the presence of the mophilic sporeforming bacteria,like: various species of *Bacillus.*

3. The appearance of yeast or mold colonies on yogurt.

4. if yogurt pH drop to as low as 4.0 (and about 2% lacic acid).

5. Texture, body, and appearance defects.

Nutritional Benefits of Yogurt

A single 170 g serving of plain, nonfat yogurt contains about 170 calories and supplies 18% of the Daily Value requirements for protein, 30% for calcium, and 20% for vitamin B12.

yogurt contains more vitamins than the milk.

Probiotic bacteria are anti-cholesterolemic and anti-tumorigenic,

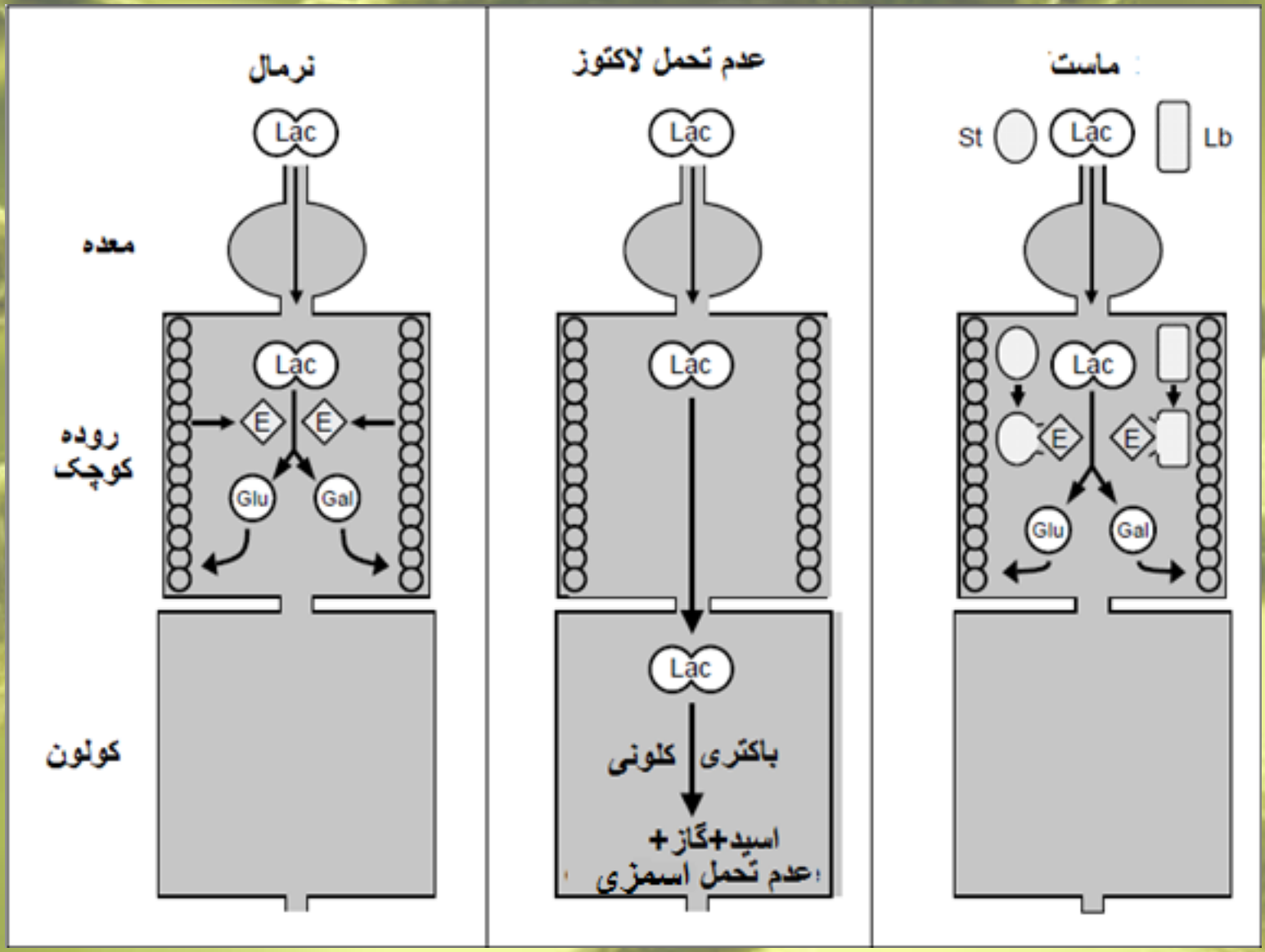
→ enhance mineral absorption,

promote gastrointestinal health, and

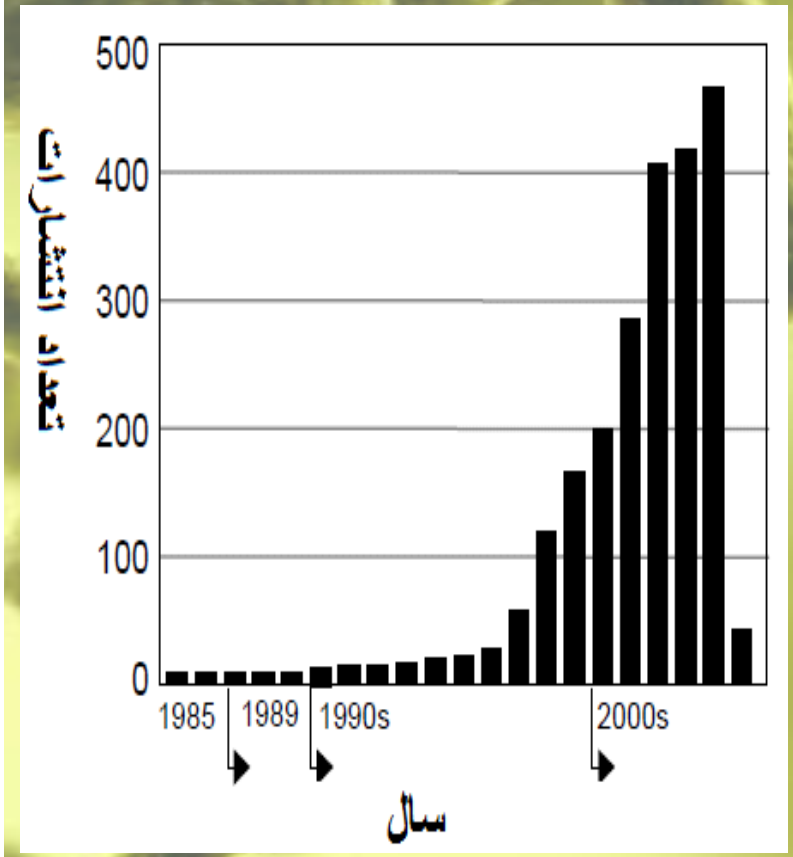
reduce the incidence of enteric infections.

yogurt organisms can reduce the symptoms associated with lactose intolerance.

And…


نرمال
معده
روده کوچک
کولون
Lac
E
Glu
Gal
عدم تحمل لاکتوز
باکتری کلونی
اسید+گاز+
عدم تحمل اسمزی
ماست
St
Lb

ویژگی	بقا	کلونیزاسیون	عملکرد	ایمنی
تحمل اسید	+			
تحمل صفرا	+			
تحمل استرس	+			
سازگاری با کشت استارتر	+			
عوامل اتصال		+		
فاکتورهای اتصال		+		
متابولیسم پرای بیوتیک		+		
نرخ رشد بالا		+		
عوامل رقابت		+		
تولید اسیدهای کوتاه زنجیره ای		+		
ایمون سازی			+	
هیپوکلسترومی			+	
ضد تومور			+	
افزایش عملکرد مانعی روده			+	
هیدرولیز لاکتوز			+	
فعالیت ضد میکروبی			+	
تحریک تولید موکوس			+	
Avirulent				+
غیر التهابی				+
عدم وجود عوارض جانبی				+
عدم انتقال ژن				+



ویژگی های عملکردی باکتری های پروبیوتیک

انتشارات پروبیوتیک در پایگاه داده PubMed.
داده ها برای فوریه سال 2005 است.

Frozen Yogurt

Some states require that the frozen yogurt products have a minimum acidity, ranging from 0.3% to 0.5%.

Frozen yogurt is a product for which no federal standard of identity exists.

In Minnesot,frozen yogurts refer to a Frozen dairy food made from a mix containing safe and suitable ingredients including, but not limited to, milk products.

Cultured Buttermilk

Is the fluid remaining after cream is churned into butter. It is a thin, watery liquid that is rarely consumed as a fluid drink. Because it is rich in phospholipids.it has excellent functional properties and is an especially good source of natural emulsifiers.

In the traditional manufacture of butter, it was common practice to add a mixed, undefined lactic culture to cream prior to churning.The lactic acid would provide a pleasant tart flavor, and the cream-ripened butter would be better preserved.The resulting by-product, the buttermilk, would also be fermented.

Cultured Buttermilk Manufacture

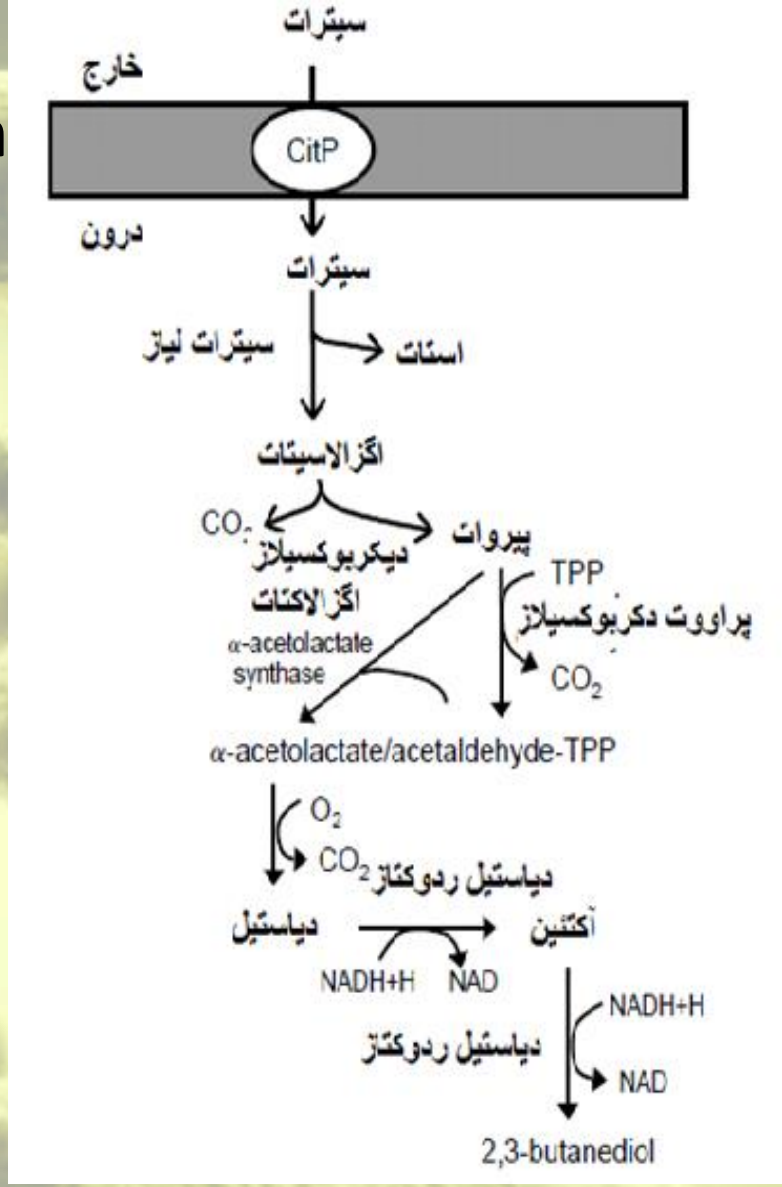
شیر	استاندارد کردن (غیر چرب، کم چرب) جامدات شیری بدون چربی تثبیت کننده ها، مواد دیگر سیترات، نمک
ترکیب ابدوغ	هموژنیزه
حرارت	85°C for 30 minutes
خنک کردن	20-22°C
اغشتن	0.5 ٪ کشت مزوفیلی (حاوی سویه های تولید کننده اسید و سیترات-تخمیر)
انکوبه	20-22°C, 12 to 16 hours
سرد و تحریک	8-10°C
توزیع	
حرارت	4°C

Factors Affecting Diacetyl Formation in Cultured Buttermilk

1. There may simply not be enough citrate in the milk.

2. Acid production is also necessary for diacetyl formation, since the citrate transport system is not activated unless the pH is below 5.5. In fact, maximum diacetyl synthesis occurs between pH 5.0 and 5.5.

3. Other factor that is critical for synthesis of diacetyl is oxygen, which can stimulate diacetyl formation by as much as thirty-fold.



Citrate fermentation pathway in lactic acid bacteria.

Sour Cream & its Manufacture

خامه
به 20% - 18استاندارد می شود
ثابت کننده و عناصر دیگر

ترکیب خامه ترش

هموژنیزه

حرارت بالا — 85°C for 25 seconds

خنک کردن — 20-22°C

اغشته شدن — کشت مزوفیل 1%

اغشته شدن — 20-22°C, ساعت 12 تا 16

خنک کردن و توزیع — 8-10°C

خنک کردن — 0-4 °C

توزیع

اغشته شدن — 20-22°C

خنک کردن

Kefir & its Manufacture

مدرن	سنتی
شیر خام ← استاندارد کردن (کم چرب، پرچرب، جامدات شیر کم چرب، تثبیت کننده ها، طعم دهنده ها، مواد دیگر)	شیر خام
هموژنیزه شدن	جوشاندن تا 10 دقیقه
حرارت در دمای 85-95 درجه سانتی گراد برای 5-30 دقیقه	سرد کردن تا 20 درجه سانتیگراد
تا 20 درجه سانتیگراد سرد می شود	تلقیح با دانه های کفیر
تلقیح با کشت استارتر کفیر	انکوبه کردن در دماي 20 درجه سانتیگراد تا 24 ساعت
انکوبه کردن در دماي 20 درجه سانتیگراد تا 24 ساعت	جدا کردن دانه های کفیر با غربال کردن
سرد و هم زدن آرام با دمای 4 درجه سانتیگراد	سرد کردن تا 4 درجه سانتی گراد و ذخیره کردن
اضافه کردن میوه ها یا طعم های دیگر	
به ظروف تزریق کنید	به ظروف تزریق کنید

باکتری ها،مخمر ها و قارچ های جدا شده از دانه های کفیر.

باکتری	مخمرها و قارچ ها
Lactobacillus brevis	*Candida kefir*[2]
Lactobacillus fermentum	*Candida maris*
Lactobacillus kefiranofaciens[3]	*Candida inconspicua*
Lactobacillus kefiri	*Candida lambica*
Lactobacillus parakefir	*Candida krusei*
Lactobacillus plantarum	*Saccharomyces cerevisiae*
Lactococcus lactis subsp. *cremoris*	*Kluyveromyces marxianus*
Lactococcus lactis subsp. *lactis*	*Geotrichum candidum*
Leuconostoc mesenteroides subsp. *cremoris*	*Zygosaccharomyces* sp.
Leuconostoc sp.	
Streptococcus thermophilus	
Acetobacter aceti	

Acetobacter aceti

Lactobacillus brevis

Candida krusei

Other Cultured Dairy Products

محصول	منشا	ارگانیسم های کشت	ویژگی منحصر بفرد
Villi	فنلاند	*Lactococcus* spp. *Leuconostoc* spp. *Geotrichum candidum*	بافت رشته ای طعم خوب
Skyr	ایسلند	*Lactobacillus delbreckii* subsp. *bulgaricus* *Streptococcus thermophilus*	غلظت بالا و محتوی پروتئین بالا
Dahi	هند	*Lactobacillus delbreckii* subsp. *bulgaricus* *Streptococcus thermophilus* *Lactobacillus* spp.	ماست مانند
Koumiss	روسیه	*Lactobacillus delbreckii* subsp. *bulgaricus* *Lactobacillus acidophilus* *Kluyveromyces* spp.	شیر مادیان بیش از 1درصد اتانول
Bulgarian Milk	بلغارستان	*Lactobacillus delbreckii* subsp. *bulgaricus*	اسید بالا (>2% lactic acid)


THANK U