Processors' Guide & Formulations

Drinkable Yogurts and Fermented Milks

Ingredients Choices
Standards of Identity
Functionality and Processing
Trouble Shooting
Market Trends

Prepared for the Pacific Coast Coalition by the California Dairy Innovation Center, October 2024.

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Market Expectations

COMPETITIVE LANDSCAPE: PLEASE CONTACT US FOR THE LATEST MARKET INFORMATION CDIC.NET

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Dairy Ingredient Functionality

DAIRY CHOICES

MPC/MPI

WPC/WPI

Fluid Milk

UF Milk

Milk Powders

Follow links for ingredient descriptions and specifications

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Dairy Ingredient Functionality

FUNCTIONAL DIFFERENCES

	MPC	MPI	WPC	WPI	MILK POWDER	FLUID MILK	UF MILK
Pros	• Nutritional Value • Texture and Creamy • Emulsification • Flavor • Ideal for increasing protein content without straining	• Nutritional Value • Texture and Creamy • Emulsification • High Protein • Ideal for increasing protein content without straining	• High Protein • Digestible • Enhance Texture • Versatile • Cost Effective • Ideal for increasing protein content without straining	• High Protein Content • Low Lactose Content • Ideal for increasing protein content without straining	• Convenient • Cost Effective • Long Shelf life • Consistent • Versatile • Useful way to increase total solids	• Creamy • Good source of nutrients • Flavor • Familiarity	• High Protein Content • Low Carb Content • Lactose Free • Longer shelf Life
Cons	• Cost • Hydration time • Potential for Sedimentation • May have negative flavor interactions	• Cost • Hydration time • Potential Off Flavors	• Higher Lactose Content • Can produce off flavors	• Cost	• Taste • Texture • Rehydration	• Perishable • Large volume requirements	• Higher processing • Cost • Taste

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Labeling, Regulatory, Packaging

STANDARD OF IDENTITY

- What is the standard of identity for drinkable yogurt?
  - The final yogurt standard of identity: Requires yogurt contain a minimum of 3.25 percent milkfat, a minimum of 8.25 percent milk solids not fat, and a minimum of 0.7 percent titratable acidity expressed as lactic acid or maximum pH of 4.6, before the addition of bulk flavoring ingredients.
- What are the standards for fermented milk?
  - Fermented milk shall have a minimum milk protein content of 2.9 % mass by mass (m/m) and minimum titratable acidity of 0.45% (m/m as lactic acid) unless otherwise specified. Drinks based on fermented milk would contain a minimum of 40% (m/m) of fermented milk.
- https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=131.200
- https://www.frontiersin.org/articles/10.3389/fnut.2022.902642/full

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Scale Up and Commercialization

PROCESSING TYPES

Thermal Treatment

- HTST (High Temperature Short Time)
  - 72C for 15 seconds
  - Packaging: Glass Bottle/ Metal
  - Produce large volumes, increase energy efficiency, minimize contamination
  - Can help retain color and flavor but has caramelized notes
- LTLT (Low temperature Long Time)/Vat Pasteurization
  - 63C for 30 min.
  - Packaging: Glass Bottle/ Metal
  - Preserves nutrients, better flavor, lasts longer refrigerator
- Ultra Pasteurized
  - 138C for 2 seconds
  - Packaging: Cartons
  - Shelf Stable, safer than untreated milk, doesn't need preservatives
  - **De aerate milk to lower oxygen concentration and shorten fermentation time**

Homogenization

- Increases smoothness by reducing particle size of whey protein aggregates
- 100-200 bar pressure
- Can do a second step homogenization after fermentation to improve smoothness, but will reduce viscosity

Fermentation

- Culture chosen affects final product flavor, acidity, and texture
  - For drinkable use. A Exopolysaccharide to improve smoothness
- Can be fermented with Lactic acid bacteria, yeast or kefir
- Amount of culture added is dependent on amount of milk to ferment (follow supplier guidelines)
- Adds flavor and texture
- pH target 4.5-4.6

Packaging is typically in plastic bottles.

There is momentum to move to more sustainable packaging options (recyclable Tetra a

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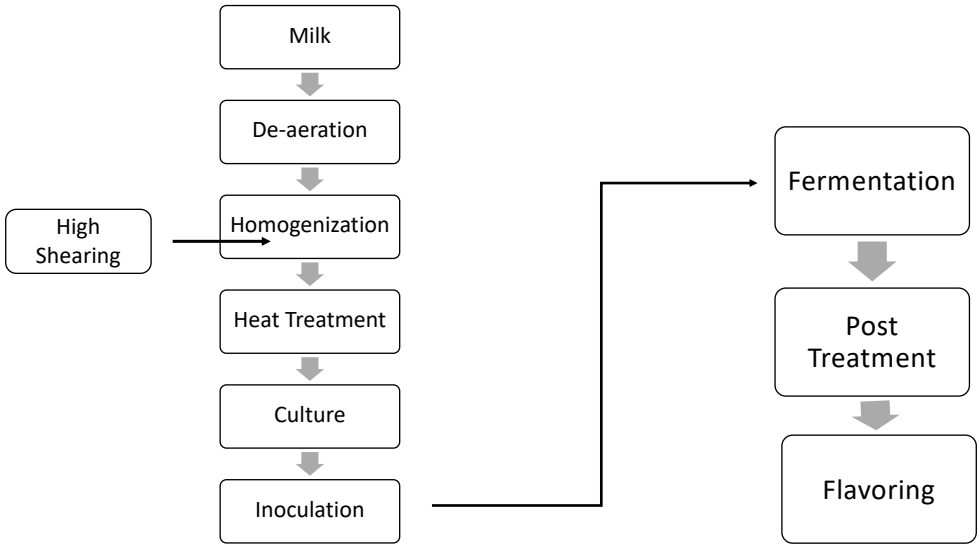
Scale Up and Commercialization

PROCESS FOR DRINKABLE YOGURT



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Scale Up and Commercialization

NEXT STEPS

1. Perform a pilot trial at a CMO (Contract Manufacturer or lab facility)
2. Perform a consumer testing study
3. Start shelf-life study
4. Determine your cost of goods (COGS) t determine financials and overall cost per unit and margins
5. Secure vendors and suppliers and obtain lead times for supply. This will enable you to develop a timeline to commercialization.
6. Determine your distribution options and where you want to launch (regional vs. national)

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Troubleshooting

SEPARATION OR CURDLING

- Main Issue:
  - Yogurt may separate into liquid whey and solid curds affecting texture or appearance of final product

- Solution:
  - Optimize Ingredients
    - Adjust ratio of milk solids and cultures
  - Control Temperature
    - Ensure consistent heating and cooling, monitor storage temperature
  - Add Stabilizer
    - Pectin or guar gum may improve stability

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Troubleshooting

CONTAMINATION

- Main Issue:
  - Yogurt can spoil if contaminated with bacteria or other microorganisms

- Solution:
  - Pasteurization
    - Ensure product is pasteurized to eliminate pathogen before fermentation
  - Proper Handling
    - Handle products with care to prevent recontamination after processing
  - Fermentation
    - Make sure to closely monitor pH during fermentation and inactive continuous fermentation

FLAVOR INCONSISTENCY

- Main Issue:
  - There can be various dependent on ingredients, fermentation time and storage

- Solution:
  - Culture
    - Changing culture type or concentration can alter the flavor of your final product.
  - Standardize Ingredients
    - Use consistent ingredients, try not to change suppliers
  - Monitor Fermentation
    - Control fermentation as much as possible, measure cultures, and monitor time and temperature of fermentation
  - Proper Storage
    - Store products under appropriate conditions to prevent flavors from degrading

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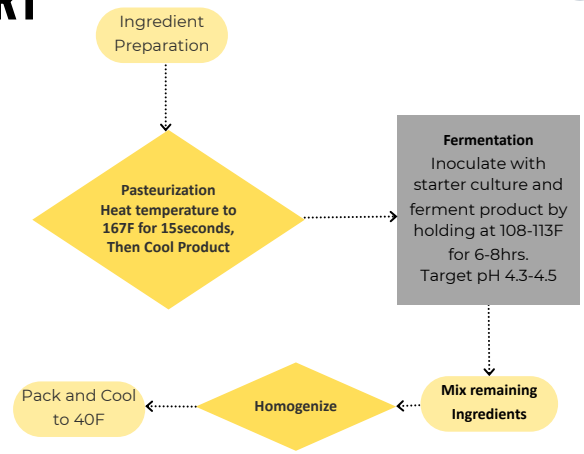
Starter Formulas

LOW-FAT DRINKABLE YOGURT

	g/100 g	Use
Skim milk	86.0	Base
Skim Milk Powder	0.5	Adjusting milk solids
Sugar	10	Feed Culture and Flavoring
Natural Flavor	0.5	Flavoring
Guar Gum	1.0	Stabilizer
Cream	1.0	Adjust fat and creaminess
Starter Culture (lactobacillus bulgaricus and streptococcus thermophilus)	0.5-1 (follow manufacturers recommendation)	Fermenting cultures and flavor



pH during pasteurization neutral
Pasteurization: 167F for 15 seconds or 145F for 30 min.
pH during fermentation: 4.3-4.5
Fermentation Time= 12-24hrs at 68-77F (20-25C)

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Purpose

MARKET SIZE

- Global fermented milk market was estimated at $330.6 billion in 2022.
- Estimated CAGR of 4.9% from 2023-2031.
- Market size to reach $493.1 Billion by 2031.
- Yogurts (drinks) dominate the market.
- Specialty stores dominate the distribution channel.
- North America dominates the segment.

Drinkable Yogurt

- A food formed by bacterial fermentation of milk
- Use different cultures to achieve different flavors
  - Streptococcus thermophilus,
  - Lactobacillus strains
  - Bulgaricus

Fermented Milk

- Fermented milk is by lactic acid bacteria and is collectively known as products such as yogurt, buttermilk, sour creams and kefir.

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Market Expectations

CONSUMER SEGMENTATION

- Drivers for this market are weight loss and overall health and wellness benefits.
- Products cater to all age groups from infants to seniors.
- Consumers are understanding the benefits from fermented and cultured dairy for health regarding immunity, bone, and heart health.
- Pre and probiotics are commonly associated with cultured dairy products.
- Flavor profiles and nutrition panels are innovative but also a risk with other alternative ingredients such as plant and precision fermentation proteins.

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For more information please consult www.dairypcc.net

The PCC-DBII is part of a national initiative to help the dairy industry address ongoing supply chain and food system challenges by offering resources for: Business plan development, Marketing and branding, and Increasing access to innovative production and processing techniques to support the development of value-added products.

This initiative currently operates in six states — Arizona, California, Nevada, New Mexico, Oregon, and Washington — and is supported by collaborative partners and grant funding which will make more than $11.4 million available to regional dairy businesses for innovation-related investments.

Additional information for California processors and entrepreneurs available at www.cdic.net

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