Innovation in Motion: R&D Case Study on Fruity Milks & Ice Cream

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"This project originated from CDIC and CMAB's gap analysis, guided by DMI insights, and the identification of a market opportunity in California by CMAB/CDIC (the 'why'). It also stems from collaborative work with Chapman University, which led to the project at Cal Poly-sponsored and owned by CDIC (the 'how')."

Outline

Introduction

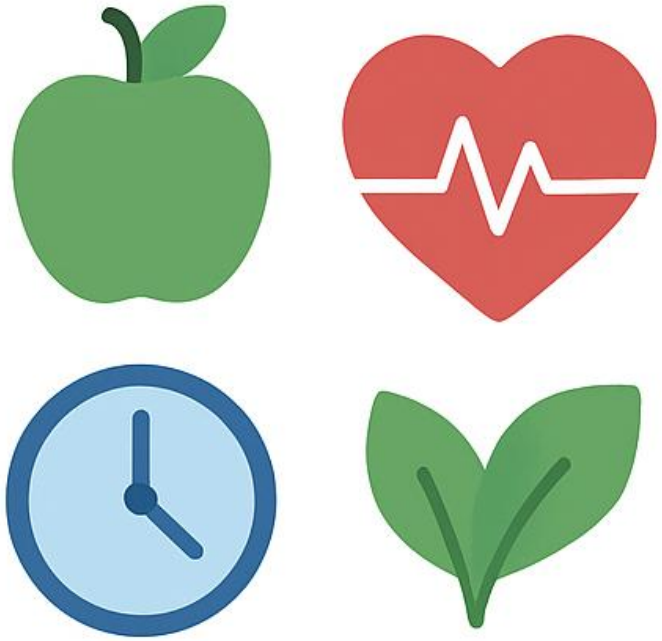
Lactose-free Fruity Milk Journey

Ice Cream innovations Journey

Key Takeaways & Q&A

Introduction

- Food trends are primarily driven by evolving consumer preferences, lifestyle changes, and cultural influences.
- Increasing demand for health, convenience, unique flavors, and sustainability shapes product innovation.
- Understanding these trends enables the dairy industry to develop products that resonate with consumers and stand out in a competitive market.



Introduction

This presentation covers the full innovation journey for fruity milks and ice cream, showing how market trends and consumer needs are transformed into successful dairy products.

7 Stages of Product Development

Identify Opportunity: Market need

Define Product Requirements: ingredients, processing, and packaging

Formulation Development: nutritional value

Prototype Testing & Analysis: sensory, storage, and shelf stability

Scale-Up & Pilot Production

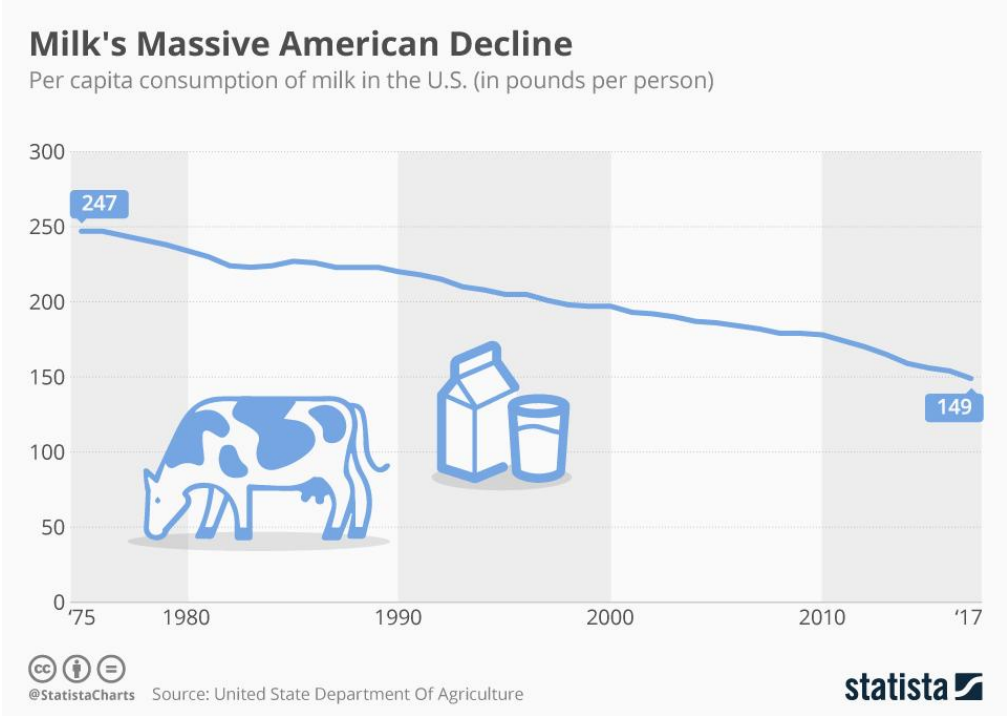
Final Optimization & Validation

Pre-Launch & Lessons Learned

Lactose-free Fruity Milk Journey

Step 1: Identifying the Opportunity

- **Opportunity:** create a lactose-free fruity milk with vibrant color, stable flavor, and shelf stability
- Consumers' increasing interest in health-oriented food choices
- In the US, lactose intolerance affects approximately
  - 15% of individuals of European descent
  - 53% of Mexican Americans
  - 80% of the Black population
- As regular pasteurized milk consumption declines, flavored milk, especially lactose-free varieties, is seeing rapid growth

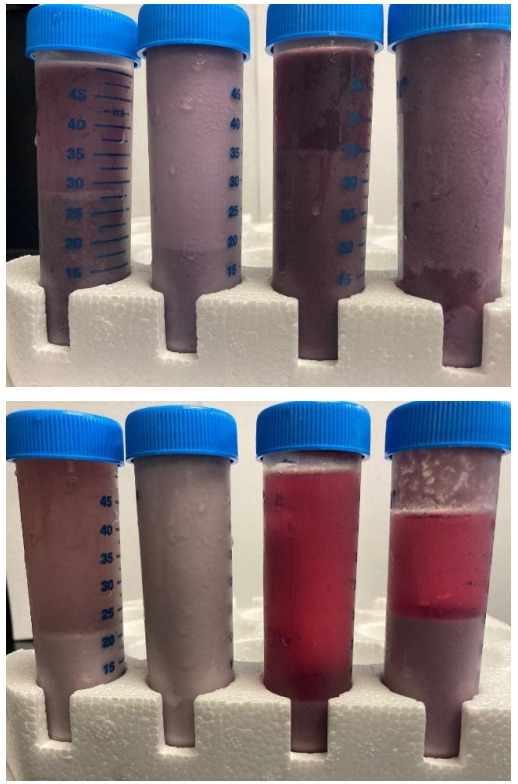


Step 2: Defining Product Requirements

- Appealing flavor (Fruity flavors such as strawberry, banana, and blueberry)
- Shelf-stable and no sedimentation (pH and heat-stable)
- Vibrant color
- Consistent viscosity (Smoothie-style beverage or refreshing fruity drink)
- Nutritional: maintain dairy's nutritional value while enhancing flavor and adding functional benefits, such as higher fiber content
- Regulatory: flavor additives, colorants, labeling compliance

Step 3: Formulation Development

- Ingredient choices: milk base, fruit flavor (blueberry puree and/or concentrate), stabilizers (pectin, gums, etc.), and sweeteners (sugar and sugar alcohols) if needed
- Challenges: phase separation, flavor fading, color degradation after heating
- Lab trials: adjusting stabilizer ratios, testing different fruit purees and concentrates



Step 4: Prototype Testing & Analysis

Analytical

Viscosity

pH

Color intensity

Particle size

Sensory

Flavor intensity

Mouthfeel

Aftertaste

Liking

Microbiology

Aerobic plate count

Coliforms

Step 5: Scale-Up & Pilot Production

- Equipment adjustments for homogenization & pasteurization
- Heat treatment effects on flavor/color
- Packaging trials: bottle opacity & light protection

Step 6: Final Optimization and Validation

- Final formulation for shelf stability & flavor and color retention
- For more information on the final formulation of the developed product, please reach out to the CDIC team: Veronique Lagrange and Ty Wagoner

Step 7: Pre-Launch Considerations & Lessons Learned

- **Color stability**: Color is a key visual cue for consumer acceptance
- **Sedimentation prevention**: Critical for product perception
  - consumers expect a smooth, uniform beverage without visible separation
- **Packaging compatibility**: Light protection to prevent color fading (bottle opacity or label wrap)
- **Positioning & sensory profile**: Determine whether the product is a smoothie-style (thicker, indulgent, high fruit solids) or a refreshing dairy drink (lighter body, clean finish).

Ice cream formulations

Step 1: Identifying the Opportunity

- **Opportunity:** Create a premium ice cream with creamy texture, rich flavor, and slow melt, offering lactose-free or reduced-sugar options to appeal to both traditional and health-conscious consumers
- 36% of consumers believe that limiting or avoiding lactose makes them healthier
- 20% of consumers actively look for low or reduced sugar claims

Step 2: Defining Product Requirements

- Smooth texture, rich flavor, target overrun %, slow melt, appealing appearance
- Nutritional: align with premium ice cream standards

Step 3: Formulation Development

- Ingredient choices: milk, Cream, NFDM, sugar, and /or sweeteners (Allulose, Zesto, Erythritol, Monk fruit, etc.), stabilizers, and flavors
- Challenges: balancing stabilizers/emulsifiers, avoiding ice crystal growth, fast meltability
- Lab trials: adjusting types of sweeteners used, and texture improvements
- Formulation developed with 25% and 50% reduced sugar; however, the SE was fixed to match the sweetness level of the sugar base

Step 4: Prototype Testing & Analysis

Analytical

Overrun measurement

Meltability tests

Texture profile analysis

Sensory

Appearance

Sweetness

Flavor

Mouthfeel

Overall liking

Step 5: Scale-Up & Pilot Production

- Continuous freezer settings, inclusion distribution, mixing times
- Troubleshooting: texture changes at scale, crystal formation
- Packaging: container sizes & seal integrity

Step 6: Final Optimization and Validation

- Achieved ideal overrun & sensory profile
- For more information on the final formulations of the developed product, please reach out to the CDIC team: Veronique Lagrange and Ty Wagoner

Step 7: Pre-Launch Considerations & Lessons Learned

- **Texture & overrun**: Achieve the target balance between creaminess, lightness, and melt resistance; overrun impacts not just mouthfeel but also cost per serving
- **Melt resistance**: Test under simulated serving conditions to ensure product integrity during consumer use
- **Flavor delivery**: Fat content and emulsifier balance can influence flavor release; optimize for both intensity and persistence.

Key Takeaways & Q&A

- **Innovation is a step-by-step process**: from identifying a market need to refining the final product, each stage shapes the product's success.
- **Fruity Milk Case Study**: Highlighted the importance of flavor appeal, vibrant color stability, prevention of sedimentation, and choosing the right packaging to match the product style (smoothie-like vs. refreshing drink).
- **Ice Cream Case Study:** Showed how market trends (growing >5% in the next 5 years, rising demand for lactose-free/reduced sugar) guide formulation choices to balance indulgence and health.

Key Takeaways & Q&A

- **Consumer-Centric Development**: Successful R&D aligns technical formulation with sensory expectations and consumer lifestyle needs.

- **Collaboration & Iteration**: Close coordination between R&D, sensory, marketing, and manufacturing teams ensures innovations are both desirable and feasible.

Questions?

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