FUTURE OF PACKAGING FOR NOVELTY DAIRY DESSERTS
ABOUT PTR

Dr. Claire Sand thinks “all food packaging all the time”

Claire’s mission is to enable a more sustainable food system with science and value chain innovations that more sustainably increases food shelf life and prevents food waste

- 35+ years of food packaging experience
- Ranks innovative packaging science and value chain solutions to extend shelf life
- Generates implementation roadmaps and aligns business cases
- IFT Fellow, Riester-Davis-Brody life-time achievement in food packaging award recipient
- Doctorate in Food Science and Nutrition at University of Minnesota
- MS and BS in Packaging at Michigan State University

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Owner

Adjunct Professor

Monthly Columnist

Current Leadership & Editorial Boards

Recent Awards

612.807.5341 / claire@packagingtechnologyandresearch.com / PackagingTechnologyAndResearch.com
Provide tailored packaging science & value chain solutions to the food & packaging industry
TAKE-AWAYS
Future of Packaging for Novelty Dairy Desserts

Role of packaging protecting novelty desserts

Packaging technologies for the future of novelty desserts

Fundamental shifts in novelty dessert packaging

Role of clusters novelty desserts

FUTURE OF PACKAGING FOR NOVELTY DAIRY DESSERTS
ROLE OF PACKAGING I
Oxidation Assessment

Are unsaturated fats present?

No
No oxidation issues

Yes
Lipid Oxidation is an issue

What is the shelf life?

<3 months
High OTR pkg
Medium MVTR pkg
Mask oxidation

3-6 months
Medium OTR pkg
Medium MVTR pkg
Antioxidants
Light barrier

6-12 months
Low OTR pkg
Medium MVTR pkg
Antioxidants
Light Barrier
Oxygen Scavengers

Chilled Frozen
Low OTR pkg
Vacuum pkg
Low MVTR pkg
Light Barrier

High OTR pkg
Medium MVTR pkg
Mask oxidation

Medium OTR pkg
Medium MVTR pkg
Antioxidants
Light barrier

Medium OTR pkg
Medium MVTR pkg
Antioxidants
Light barrier
ROLE OF PACKAGING

Moisture Gain/Loss Assessment

What is product vs. storage $a_w$ difference

- Large Difference
  - Moisture is an issue
  - In what form is the water lost?
    - Liquid
      - <3 months Shelf life
        - Low/Medium MVTR pkg
          - Moisture absorber
      - 3-12 months Shelf life
        - Medium MVTR pkg
          - Vacuum pkg
          - Low OTR
    - Vapor
      - <3 months Shelf life
        - Medium MVTR pkg
          - CAP pkg
          - Medium OTR
      - 6-12 months Shelf life
        - Medium MVTR pkg
          - Medium OTR
      - Chilled/Frozen
        - High MVTR pkg
  - Small difference or short shelf life
  - No moisture issues

- Shelf life
  - <3 months
  - 3-12 months
  - <6-12 months
  - Chilled/Frozen
Role of Packaging

Microbial Assessment

What is the water activity of the product?

- < 0.60: No Microbial, Yeast, or Mold Growth
- 0.60 < x < 0.80: Yeasts and Molds can grow
- > 0.80: Microbes can grow

Is there a risk of microbial contamination?

- No
- Yes

What is the distribution temperature?

- Chilled
- Ambient
- Frozen

- Pasteurization
- Irradiation
- Antimicrobials
- CAP
- Retort
- HPP
- Microwave
- Irradiation
- Hot Filled
- Ohmic
- Aseptic
- Dehydration
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FUTURE OF PACKAGING FOR NOVELTY DAIRY DESSERTS
Packaging Solutions that Prevent Food Waste as a Function of Feasability and Impact

- Odor Absorbers
- Consumed Within via Time-Temperature
- Edible water vapor and oxygen barriers
- Map–Oxygen absorbing sachets, films and labels, carbon dioxide emitters
- Edible antimicrobials
- Flex-Pack
- In-store MAP
- Water Vapor Barriers
- Food Shelf Donation Packaging
- Consumed Within via Time-Temperature indicators
- Reduce Package Headspace
- Packaged multi-ingredient Meal Solutions
- Sensors activated via pH, oxygen, microbial growth
- Ease of finding/storing Refrigerator Packaging
- Returnable climate-controlled shipping
- Light Barriers
- In-home MAP
- Ease of finding/storing Freezer Packaging
- Resealable Packaging
- Rework Enable packaging
- Microbial/Bio Phage released from package
- Sensors activated by CO₂, Microbial, Toxins
- IoT end of shelf life date
- Responsive packaging
- Superabsorbent / Regular Moisture Absorbers
- Hydrogels - Oxygen, Microbial, Moisture, pH
- Partial Processing

Feasability

Low

0 Food Waste Reduced 3 billion USD
MAP
- ATMOSPHERE CONTROLS
  - HIGH BARRIER PACKAGING
  - OXYGEN SCAVENGERS
  - OXYGEN ADDITIONS

MOISTURE & ODOR CONTAINMENT
- MOISTURE ABSORBERS OR EMITTERS
- PURGE ABSORBERS
- ODOR ABSORBERS OR EMITTERS
- HYDROGELS

ANTI-MICROBIALS
- REACTIVE PACKAGING
  - ANTIMICROBIALS
  - EDIBLE ANTIMICROBIALS

FLOW MANAGEMENT
- CONTROLLED DIFFUSION
  - MICROWAVE SUSCEPTORS
Antimicrobial Packaging

ARRAY OF SOME ANTIMICROBIAL CHOICES FOR FOOD PACKAGING

**Bacteriocins & Enzymes**
- Nisin
- Natamycin
- Lacticin
- Pediocin
- Lysozyme
- Lactoferrin
- Lactoperoxidase

**Antimicrobial Polymers**
- 8-12 length carbon chains
- Chitosan

**Metal Ions & Nanoparticles**
- Silver
- Zinc
- Titanium dioxide

**Essential Oils & Extracts**
- Grapefruit seed extract
- Green tea extract
- Pomegranate seed extract
- Thymol
- Carvacrol
- Eugenol
- Within thyme, clove, cinnamon, basil, oregano, turmeric, sage, lemongrass

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5 solutions were most viable
- Nisin
- Oregano
- Grapefruit seed extract
- Zinc Oxide
- Temperature Activated Venting

11 Solutions were partially viable
- Natamycin
- Lacticin
- Pediocin
- Acetic acid
- C8 – C12 fatty acids
- Garlic
- Green tea extract
- Silver
- Chlorine dioxide
- Ethanol
- Chitosan

20 Solutions were not viable
- Lysozyme
- Lactoferrin
- Lactobacillus
- Benzoic acids
- Parabens
- Sorbates
- Propionic acid
- Lactic acid
- Basil and Rosemary
- Cinnamon
- Grape seed extract
- Mustard (Allyl isothiocyanate)
- Titanium oxide
- Sulfur dioxide
- e-Phenylurea
- pH responsive hydrogels and bioactive films
- pH & Temperature responsive packaging
- Enzyme-based
- Mechanically responsive hydrogels
- Electric field responsive hydrogels
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FUTURE OF PACKAGING FOR NOVELTY DAIRY DESSERTS
Fundamental Shifts I
Short term Investment in Packaging

- Packaging better aligned with consumer needs - Reseal
- Price – Pack – Architecture
- Optimize packaging to eliminate components
> Big Data for Democratization and Values-Based Interactions
> XR Expands Tacit Knowledge
> Beta-Packaging Provides Agility
> AI to Achieve Planet-Centered Design
Externalities

- Natural disasters (drought, fires, flood, typhoon, hurricane, tornado)
- Human struggles (virus, famine, political upheaval)
- Power reliability (outages, internet, production)
- Variable sustainability pressures (bans, taxes, policies)

Fundamental Shifts I
Why we need agility in frozen novelty packaging
Fundamental Shifts I
Why we need agility in frozen novelty packaging

Internalities

- Space external to retail
- Planogram issues
- Labor
- Restocking innovation needed
- OOS
- Cannot meet exact consumer need for size and product
- Intense shifts in value chain drivers
## Fundamental Shifts I
### Packaging Drivers in the Value Chain

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<thead>
<tr>
<th>Causes/Categories</th>
<th>Category Z</th>
<th>Category Y</th>
<th>Category X</th>
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<th>Category V</th>
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Beta design:

- Beta-packaging focuses on **agility**
- Incorporates **5th** industrial revolution
- Generative **use-focused** design
- Allows retailers and consumers to adjust package
- Packaging that senses then acts
- Aligns with inherent variability of our food system
Personalization
• Consumers in charge of formulations
• Packaging when consumers need it
• Less packaging for MSWs to handle

How and the Business Case
• Logistics stress transferred to retail and consumers
• Alter Primary packaging
  • <$$$
  • < barrier requirement
  • > recyclability
• Returnable tertiary packaging cost savings

Fundamental Shifts I
Beta Packaging - everyone gets a golden ticket
Fundamental Shifts I
We are seeing the beginning of Beta packaging
**Fundamental Shifts I**

Beta Packaging Example – packaging that changes the product

**Technology**
- Release of ingredients by the package
- 2ndary addition of ingredients – similar to salads made BOH in store now

**Consumer view**
- Formulations defined by the package
- Consistent product
- Protected ingredients

**Business Case**
- Aligns with production efficiencies
- Logistics stress transferred from production
- Adjust packaging vs product
MasterPack Expansion
- Minimal primary packaging for consumer
- Reusable high-barrier MasterPacks opened to restock shelves

Impact
- Longer shelf life from manufacturer to retailer
- Consumer packaging focused on required shelf life
- Less primary packaging for consumer and MSW
- Potentially more recyclable primary packaging
- Less food waste
Factories in the Store
Mobile factories replace ice cream trucks
Direct to consumer delivery
Self serve bins
Align with grocerants
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FUTURE OF PACKAGING FOR NOVELTY DAIRY DESSERTS
Clusters I
Role of Dairy Center Clusters

Address current industry challenges
• Increase food safety concerns with cold chain and entrepreneurs in the space
• Rapid package format conversions
• GHG and cold chain

Need windows to the future
• Enable rapid introductions with trust and shared value
• Novelty frozen dairy packaging in 2025 will not be what it is in 2035 or 2045
• No packaging on StarTrek
• Need to stay linked vs inward focused
Thank you & Next Steps

Set up a virtual coffee with Claire

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