From the farm to the fridge – the dairy community works to deliver health and wellness solutions

Through National Dairy Council, dairy farmers, dairy importers, and the broader dairy community have been committed to health and wellness for 100 years, providing one of the original, wholesome foods – milk and the milk products made from milk.
Innovation Center for U.S. Dairy combines dairy community resources precompetitively to foster innovation

The Innovation Center works to combine the collective resources of the dairy community, on a precompetitive basis, to provide nutritious dairy products and foster industry innovation for healthy people, healthy products, and a healthy planet.
Today’s agenda

► Why cheese makers are taking action to reduce sodium
► Situation assessment
► Sodium management and reduction
Disclaimer

The materials and branded products referenced in this presentation are solely for purposes of illustration. Their use in this presentation is not intended to directly or indirectly endorse, support, or advocate the claims, positions, assertions, or contentions made in the cited materials.
Why cheese makers are taking action to reduce sodium
Sodium consumption among Americans is higher than recommended

2010 Dietary Guidelines for Americans recommendation:

▶ General Population - 2300 mg/day or less
▶ Those who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease - 1500 mg/day or less
  ▪ Applies to about half of the U.S. population, including children

Current consumption:
▶ Current average intake by Americans is 3400 mg/day
The 2010 Dietary Guidelines included 3 servings of dairy foods as a core part of healthy dietary patterns

► Supply 3 of 4 “nutrients of concern”
  ▪ Calcium
  ▪ Vitamin D
  ▪ Potassium

► Associated with multiple health benefits
  ▪ Bone health
  ▪ Reduced risk of cardiovascular disease
  ▪ Reduced risk of type 2 diabetes
  ▪ Lower blood pressure in adults

► Important for children’s diets

► Important for those with lactose intolerance
  (there are dairy-friendly solutions)
Dairy foods provide important nutrients and most Americans do not meet DGA dairy recommendations

Average intake of milk, cheese, and yogurt is 1.8 servings/day

NHANES 2003-2006, 2 years and older

Milk, cheese, and yogurt contribute:
- 51% calcium
- 58% vitamin D
- 10% calories
- 14% fat

NHANES 2007-2008
Cheese contributes about 8% of sodium in the U.S. diet

*Hentges E. Sources of sodium in the food supply. Paper presented at: Institute of Medicine Committee on Strategies to Reduce Sodium Intake, Information-Gathering Workshop; 2009; Washington D.C.; Note: Data from day 1 of the NHANES 24-hour dietary recall (n=7,966). Individual food items. Individual food items in mixed dishes are included within their respective food groups (e.g., for pizza, the crust is categorized as grain, the cheese as cheese, tomato sauce as vegetables, etc.). **Dairy Research Institute™, NHANES (2003-2006). Ages 2+ years. Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey, Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, [2003-2004; 2005-2006]. [http://www.cdc.gov/nchs/nhanes.htm]
The dairy community decided to take action to address sodium in cheese

Become part of solution, not part of problem
Cheese & Sodium Best Practices Task Force was formed to collaboratively address sodium in cheese.
Collaboration is unprecedented and investment in research and key initiatives has been significant.

- **Task Force represents nearly 80% of cheese volume nationally**
- **All initiatives are pre-competitive so insights learned will benefit all**

**Collaborative effort to address sodium challenge**

- **Significant resources invested to help overcome barriers to viable solutions**
- **Working with USDA, FDA, CDC, NSRI, AHA, etc. to uncover solutions**

*No lobbying or advocacy*
Polling question #1

Is your organization actively working to reduce the amount of sodium consumed?

A. Yes, very actively
B. Yes, fairly actively
C. Somewhat, but not really actively
D. No, not a priority at this time
E. Not applicable to my line of work
Situation Assessment

► Critical role of salt in cheese making
► Approaches and challenges to sodium reduction
► Retail cheese and consumer sensory studies
Situation Assessment

► Critical role of salt in cheese making
► Approaches and challenges to sodium reduction
► Retail cheese and consumer sensory studies
Cheese making seems simple...

Natural cheese is made of four basic ingredients:

- Milk
- Salt
- Starter Culture
- Enzymes
... But is rather complex

- 72 “standard of identity” cheeses
- More than 300 types of cheese
- Cheese types have different amounts of sodium

But is rather complex
Salt plays a critical role in cheese making

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety</td>
<td>• Limits growth of pathogenic bacteria</td>
</tr>
<tr>
<td>Shelf Life &amp; Quality</td>
<td>• Significant factor in minimizing spoilage</td>
</tr>
<tr>
<td>Taste</td>
<td>• Influences flavor and flavor formation during aging/ripening</td>
</tr>
<tr>
<td>Texture</td>
<td>• Influences cheese texture and performance (i.e., meltability)</td>
</tr>
<tr>
<td>Production</td>
<td>• Salt addition to the curd draws moisture (whey) to the surface of the cheese</td>
</tr>
</tbody>
</table>
Situation Assessment

- Critical role of salt in cheese making
- Approaches and challenges to sodium reduction
- Retail cheese and consumer sensory studies
There are several approaches to reducing sodium in cheese making

- **Reduce salt addition & variability**
  - Determine lowest level of salt that can be used
  - Reduce sodium variability

- **Partial replacement of salt**
  - Determine if salt substitutes can be used to reduce sodium

- **Added flavor “enhancers”**
  - Determine flavor boosters to help compensate for reduced salt &/or speed up flavor development

Without compromising product acceptance, quality, and food safety
“Standards of Identity” have implications for reducing the sodium in cheese

72 standards of identity for cheese and cheese products in the Code of Federal Regulations

Using salt substitutes may result in a product that can no longer be called cheese (“cheese product”)

To qualify for a “reduced sodium” claim, a cheese must have 25% less sodium than the regular product
All sodium reduction approaches involve hurdles

**Product Acceptance**

- People can detect small changes in sodium in cheese
- Decreases in sodium may lead to decreased liking of the cheese; it must be done gradually and avoid going too low to avoid unintended consequences (i.e., reduced dairy consumption)

**Safety**

- Sodium is a significant factor in preventing the growth of pathogens… keep good bugs in, bad bugs out

**Cost**

- Potassium chloride costs over 10 times as much to use than sodium; it will take innovation and collaboration to find economical solutions
- Product development and production changes utilize extensive resources; it will take innovation to find efficient solutions
Reformulation is an iterative process and can take a long time, even years with cheese aging.

Rules: Must follow the rules in the Code of Federal Regulations

Minimize risk: Create desired microflora, control pathogens

Go/No-go: Liking acceptable or at parity for flavor

Must haves: Texture, cheese curd formation
Situation Assessment

- Critical role of salt in cheese making
- Approaches and challenges to sodium reduction
- Retail cheese and consumer sensory studies
Two large research studies uncovered key learnings

Retail Cheese Study
- Objective: Understand current sodium level & variability in cheese (1,665 samples)
- Learning: Substantial sodium variability exists so opportunity to improve cheese-making process controls

Consumer Sensory Study
- Objective: Understand people’s reaction and acceptance of lower sodium in cheese
- Learning: Narrow range of sodium with highest satisfaction so reduce sodium in small increments
Cheese makers have had some success with a “gradual” approach, but there are challenges

Successes include:

- **Kraft Grated Parmesan**: 10% reduction
- **Kraft Singles American Slices**: 18% reduction
- **Velveta**: 10% reduction
- **Mozzarella for Schools**: 25% reduction
- **Most Process American & Blended Cheese USDA sends to Schools**: 25% reduction

Note: Reductions not highlighted on package or in marketing initiatives (“gradual” approach)

- Recent survey results indicate a majority of major cheese companies have taken action to reduce or better control sodium

- Reducing sodium in cheese is extremely challenging without sacrificing taste, quality, or food safety
  - Simply reducing salt is unsuccessful; other factors have to be changed
  - Extensive product testing is required

- Cheese makers and the dairy community will not compromise on food safety and the public will not compromise on taste
Polling question #2

Does your organization use or recommend lower sodium cheeses?

A. Usually use/recommend lower sodium cheeses
B. Sometimes use/recommend lower sodium cheeses
C. Hardly ever use/recommend lower sodium cheeses
D. Haven’t looked into lower sodium cheeses because the people we work with have not indicated an interest in lower sodium cheeses
E. Not applicable to my line of work
Sodium management and reduction

- Rapid direct sodium measurement
- Research and development on sodium reduction
- Food safety curves development
- Education & Outreach
Cheese makers are committed to further reducing sodium; priorities were identified from research studies.
Rapid Sodium Testing initiative

Objective

- Identify a method to rapidly (<20 min.) and directly (vs chloride testing) measure sodium to enable sodium adjustments during cheese making to reduce variability

Objective: Enable sodium adjustments during cheese making to reduce variability

Results in <20 minutes

Measures sodium directly

Existing methods either:
- Don’t directly measure sodium
- Take too long to be actionable

Chloride Testing
- Results in 5-30 minutes
- Measures chloride & backs into sodium
  * Less accurate

ICP Testing
- 1 day in-house or 3-5 days sent out
- Measures sodium directly
Significant testing has been conducted

### Status

- Four sample prep methods developed for specific cheese types to measure sodium & other minerals using Oxford Instruments’ XRF technology

- One simple prep method could be used for all cheeses if instrument chamber stayed cool, but funding source not yet identified to modify instrument

- Other suppliers are developing additional options to further meet cheese makers’ needs
Objective

- Conduct sodium reduction research with overarching goals of product acceptance and food safety

Status

- Significant research conducted on:
  - Reducing salt addition
  - Assessing salt substitutes
  - Assessing flavor enhancers to compensate for reduced salt and/or speed up flavor development
Objective

• Update Food Research Institute (FRI) safety information for process-type cheese products to allow for more rapid formulation of new, lower sodium products.

Tanaka et al, 1986 JFP
Test included 80 samples; plan to publish key learnings mid 2016

<table>
<thead>
<tr>
<th>Factor</th>
<th>Test Variables</th>
<th>Low</th>
<th>Interm.</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>% fat</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>% moisture</td>
<td>50</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>pH</td>
<td>5.4</td>
<td>5.8</td>
<td>6.2</td>
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<tr>
<td>4</td>
<td>% K replacement</td>
<td>0</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>% sorbic acid</td>
<td>0</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>6</td>
<td>% NaCl</td>
<td>1.7</td>
<td>2.05</td>
<td>2.4</td>
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<tr>
<td>7</td>
<td>% DSP solids equiv</td>
<td>0.8</td>
<td>1.2</td>
<td>1.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Interm.</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>total salts</td>
<td>2.5</td>
<td>3.25</td>
<td>4</td>
</tr>
<tr>
<td>mg Na / 100g</td>
<td>928</td>
<td>1195</td>
<td>1462</td>
</tr>
<tr>
<td>mg Na if 50% repl</td>
<td>464</td>
<td>598</td>
<td>731</td>
</tr>
</tbody>
</table>

Note: Model predictions are valid for factor level combinations within these ranges only
Education & Outreach initiative

**Objective**

- Improve people’s understanding of the nutritional benefits of cheese and dispel myths and misinformation

**Status**

- Developed science-based content and utilized many different vehicles to educate health and wellness professionals, thought leaders, and the public

www.TheDairyReport.com
www.DairyGood.org
Examples used in cheese education

► Use naturally lower sodium cheeses whenever possible
  ◀ Example: Swiss cheese, fresh mozzarella

► Mix different sodium-content cheeses
  ◀ Example: Blend “aged” traditional with “young” lower-sodium cheeses

► Use whey permeate (produced as part of cheese making) as sodium replacer; also minimizes food waste
  ◀ Example: Replace some sodium in pizza crust and sauce
Summary

► Dairy foods provide important nutrients associated with multiple health benefits

► Salt plays a critical role in cheese making
  ▶ The dairy community will not compromise on food safety and the public will not compromise on taste
  ▶ Must find solutions to meet food safety, health and wellness needs, and taste preferences

► Cheese makers and the dairy community are advancing key sodium reduction initiatives
  ▶ Rapid Sodium Testing, Research & Development, Food Safety Curves, Education & Outreach
Thank you!