Milk Quality Improvement Program

2022 Mid-Year Report

July 25, 2022
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Three US States have over 100 Dairy Plants

- Wisconsin (196)
- New York (128)
- California (110)

New York is a Hub of Dairy Processing
The Milk Quality Improvement Program – Key Impact Areas

**On-farm Practices and Raw Milk Quality**
Investigation of sources, transmission and control of sporeforming bacteria in raw milk, troubleshooting farm related finished product quality problems

**Dairy Product Processing, Quality and Safety**
Evaluation of fluid milk, cheese, yogurt and dairy powder quality and safety through targeted, applied research

**Consumer Acceptance and Sensory Evaluation**
Assess influence of distribution and market storage conditions on dairy product sensory quality and consumer acceptance including in primary school settings

**Extension Services and Workforce Development**
Translation of research activities and dairy industry assistance with training, troubleshooting and root-cause analysis
DAIRY FARMER INVESTMENTS PAY OFF
Long-term MQIP Program Impacts

Amplifying farmer investments through leveraged funding
MQIP typically secures >$500,000 annually of non-DPO funding for dairy research, training and workforce development – with a substantial proportion originating from processors

Retaining and expanding NY processing plant capacity
MQIP staff serve as process authorities, provide research and workforce development support, and resolve food safety and other issues before they lead to plant shutdowns

Expanding the scope of dairy product manufacturing in NY
Supported powder manufacturing
Support cheese processing expansion
Assured strong cottage cheese manufacturing in NY
Supported Greek Yogurt industry from the beginning and through tough times

Serves as a resource and hub for NY dairy product innovation and enhance resilience of NY dairy processing industry

NY dairy industry insurance policy
Reduce risk of food safety issues and recalls that damage the reputation of NY processors and the overall NY dairy industry

Fluid Milk Quality Improvement
Supporting a strong fluid milk processing industry in NY through targeted testing and extension support

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MQIP

Dairy Product Quality and Safety Program

Objective 1 – Voluntary Shelf-Life Program
Objective 2 – Microbial Quality and Safety Benchmarking of Key NY Dairy Products
Objective 3 – Support NY Dairy Innovation through Product Development Infrastructure and Technology Transfer
Objective 4 – Support NY Dairy Processing Capabilities
Objective 5 – Rapid Response to NY Dairy Quality and Safety Issues

Supplemental Projects

Implementation of Listeria Control Strategies in Small Dairy Facilities
Defining Raw Milk Quality Parameters that Affect Greek Yogurt Yield and Quality
Technology scouting and evaluation for new processing technologies for NY dairy
Preparing the NY dairy industry for eCommerce distribution channels
Completed temperature profile studies of three NY eCommerce distribution pathways

Amplified dairy farmer investment through $1,600,000 in additional funding awarded

86 High-risk dairy products tested for presence of pathogens

Nearly $65,000 in fee-based income from Food Processing Development Laboratory

5 new dairy technologies identified and included in technology scouting database

Collaboratively addressing dairy manufacturing workforce shortages through programs like our high school dairy processing bootcamp

Support provided for 15 NY dairy processors with new or expanded processing capacity

8 industry workshops and trainings offered reaching 380 people

Collaboratively addressing dairy manufacturing workforce shortages through programs like our high school dairy processing bootcamp

Support provided for 15 NY dairy processors with new or expanded processing capacity

Key YTD 2022 MQIP Outcomes
The Dairy Products Competition at the State Fair is a great way to celebrate and promote NY dairy products, but behind the scenes we utilize this data to assist NY manufacturers with improving dairy product quality.
Dairy product quality, the sum of the properties of a dairy product that are acceptable to consumers, including flavor, smell, appearance, texture, nutritional content, shelf-life, etc.
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MQIP Sensory Evaluation – Providing critical feedback to the NY dairy industry
207 Milk Samples

*388 evaluations

109 Unflavored

72 Flavored

51 Chocolate

21 Non-Chocolate Flavors

26 Raw
*collected at processing facility

2022 Sensory Evaluation YTD
Raw Milk Odors and Flavors
- Oxidized
- Flat
- Feed/Weed
- Malty
- Barny/Cowy
- Foreign/Chemical

Pasteurized Milk Odors and Flavors
- Cooked
- Lacks Freshness
- Oxidized
- Fruity Fermented
- Rancid
- Coagulated
- Flat
- Acid
- Bitter
- Unclean

Pasteurized Chocolate Milk Odors and Flavors
- Lacks Freshness
- Band-aid
- Flat
- Coagulated
- Rancid
- Acid
- Unclean
- Astringent
- Bitter
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Tasting Procedure

- Open container of the lid briefly.
- Smell the sample.*
- Close the lid.
- Make note of the aroma. *If it does not get pass the nose, no need to taste
- Open container again.
- Examine the appearance of the sample. Swirl the cup and observe for signs of coagulation, film, butter particles, etc.
- Make note of the appearance.
- Taste the sample.** Take a generous sip; roll in mouth and expectorate/do not swallow
- Make note of its flavor and consistency. Breath in slowly through the mouth, out through the nose.
- Note the aftertaste and after feel.***
- **Rinse your mouth with spring water.****

*Some samples may need to be agitated before opening to get more volatiles for aroma evaluation.
**You may repeat the tasting a few times.
***We encourage to expectorate the samples rather than ingest them.
****You may use palette cleansers (e.g. unsalted saltine crackers). In case of strong aromas, we recommend you smell your inner elbow space to cleanse your “nose.”
Typical Flavor of “Good” Milk

• Pleasantly sweet & clean with no after-taste
  • Water
  • Milk Fat: “rich” mouthfeel/body
  • Protein: little flavor, mouthfeel & body
  • Milk Sugar (lactose): mild sweet taste
  • Minor mineral components: little flavor

Sample #1
Sensory Attribute: Oxidized

Sample #2

Raw

Pasteurized Unflavored

Pasteurized Chocolate

Common Descriptors
Wet cardboard, old oil, tallow, chalky, fishy, metallic, burnt protein/feathers, plastic-like, greasy mouthfeel

Causes
Exposure to metals, excessive exposure to oxygen, low antioxidant levels in raw milk, high levels of unsaturated fatty acids, light exposure
**Sensory Attribute: Foreign/Chemical**

Sample #3

- **Raw**
- **Pasteurized Unflavored**
- **Pasteurized Chocolate**

**Common Descriptors**
Odors and/or flavors that are not normally associated with milk and vary by source, but may include sanitizers, medicines, exhaust fumes, etc.

**Causes**
Cleaning and sanitation chemical residues, direct contamination with medicines (cow), poor farm ventilation
Sensory Attribute: Feed/Weed

Sample #4

Common Descriptors
Flavor/odor of hay, grass, silage, may be slightly sweet, seldom objectionable, but stronger or poor-quality feeds are more objectionable

Causes
Feed, especially corn silage, legume hay, alfalfa and brewer’s grains are often associated with absorbed feed odors and flavors. Inadequate interval between feeding and milking will intensify the presence of feed odors and flavors, with absorption peeking around 30m to 1h after consumption and tapers off after ~3h of consumption
Sensory Attribute: Rancid

Sample #5

Common Descriptors
Soapy, baby vomit, blue cheese, bitter

Causes
Disruption of milk fat globule prior to heat treatment (farm or in process), over agitation, bacterial lipase
Sensory Attribute: Malty

Sample #6

Common Descriptors
Malt-like odor or taste, similar to that of Grape-Nuts cereal or malted milk powder, may develop into acid

Causes
*Lactococcus lactis* var. *maltigenes* (formerly *Streptococcus lactis* var. *maltigenes*), or other organisms
Sensory Attribute: Cooked

Common Descriptors
May be mild (sweet/pleasant, slight sulfur odor) or intense (caramel, custard, cabbage, burnt milk)

Causes
Heat treatment

Sample #7
Sensory Attribute: Bitter

Sample #8

Common Descriptors
Flavor (no odor) of tonic water (quinine), strong coffee, grapefruit

Causes
Protein breakdown by bacterial or native milk enzymes
Sensory Attribute: Fruity Fermented

Sample #9

Common Descriptors
Pineapple, apple, or strawberry-like fruity odor, with sometimes a sauerkraut or vinegar

Causes
Growth of psychrotolerant bacteria
Sensory Attribute: Acid

Sample #10

Common Descriptors
Buttermilk odor/taste. Sour, tart, tingling sensation on tip of tongue

Causes
Growth of lactic acid bacteria

- Raw
- Pasteurized Unflavored
- Pasteurized Chocolate
Sensory Attribute: Band-aid

Sample #11

Common Descriptors
Plastic band-aid, athletic tape, smokey

Causes
Growth of psychrotolerant bacteria
Implementing change – transferring knowledge to dairy industry stakeholders

- To date in 2022, we have prepared 10 milk sensory kits for training to individual companies and through workshops
- > 150 dairy industry stakeholders have been trained
- Our group also provides sensory training and evaluation of other dairy products including cheese, yogurt, other cultured dairy products and ice cream
Implementing change – transferring knowledge to dairy industry stakeholders: A case study

• Processor with persistent oxidation attribute in fluid milk
• Two raw milk supplies, with varying traditional measures of quality
Implementing change – transferring knowledge to dairy industry stakeholders: A case study

• Initiation of raw milk sensory evaluation revealed oxidized defect in one raw milk supply
• Processor was trained to detect this defect and given support to troubleshoot the issue with the supplier

<table>
<thead>
<tr>
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<th>Chemical Analysis</th>
<th>Flavor Score*</th>
<th>Sensory Attributes</th>
</tr>
</thead>
</table>
| Raw Whole; 4 oz Vial | ** | Standard Plate Count | 6,000 | Freezing Point (°F): N/A | 8.9 | FL, LPO
| | | Psychrotrophic Count** | 49,000 | Buttermilk (N): N/A | FL, LPO, Laged Oxidized |
| | | Somatic Cell Count | < 1 E | | |
| | | Psychrotolerant Spore Count** | | | |

**Psychrotrophic bacteria count (PBC) and Psycho-tolerant spore count (PSC) takes 10 days to incubate. PBC and PSC will be reported on Final Report.

*Raw milk samples are heat treated using a laboratory pasteurization prior to flavor screening.

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| 40-1 Raw Whole; 4 oz Vial | ** | Standard Plate Count | 380,000 | Freezing Point (°F): N/A | 9 | NC
| | | Psychrotrophic Count** | 5,700,000 | Buttermilk (N): N/A | NC
| | | Somatic Cell Count | < 1 E | | NC
| | | Psychrotolerant Spore Count** | | | NC

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Thank You!