Milk Sourcing Impact on Non-Starter Lactic Acid Bacteria in Cheddar Cheese

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Our thoughts...

Cheddar cheese made from milk sourced from the Oregon Coast will have unique NSLAB compared to Cheddar cheese made from milk sourced from the Willamette Valley

- Previous work in our lab found that Cheddar cheese made from milk sourced from the Oregon Coast had unique flavor chemistry compared to Cheddar cheese made from milk sourced from the Willamette Valley, and Columbia Basin
NSLAB are group of bacterial species that are contaminate milk

NSLAB can impact flavor and texture of fermented dairy products

Sources for NSLAB
- Pasture
- Feed Lot/Farm
- Milk Truck
- Creamery/Processor
Milk Sourcing | Milk Collection and Production

- Coast
  - Oregon Coast
    - North Coast
      - NC-A
    - South Coast
      - NC-B
      - NC-C
      - SC
  - Willamette Valley
    - W-A
    - W-B

Raw Cheddar
Produced at the Arbuthnot Dairy Center
Picked select farms based on the following criteria
- Mostly Jersey cows
- On pasture
- On the Oregon Coast or in the Willamette Valley

<table>
<thead>
<tr>
<th>Farm</th>
<th>Herd Composition per milking</th>
<th>Feed in lbs</th>
<th>Time in Pasture per day</th>
<th>Major Pasture</th>
<th>Minor Pasture</th>
<th>Silage</th>
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</thead>
<tbody>
<tr>
<td>NC-A</td>
<td>100% Certified Jersey</td>
<td>5-Alfalfa</td>
<td>15 hours</td>
<td>Rye Grass</td>
<td>Clover, Native</td>
<td>None</td>
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<tr>
<td></td>
<td></td>
<td>14-Grain</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>NC-B</td>
<td>100% Certified Jersey</td>
<td>9-Alfalfa</td>
<td>14 hours</td>
<td>Orchard Grass</td>
<td>Rye Grass, Clover</td>
<td>Cannery*</td>
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<tr>
<td></td>
<td></td>
<td>19-Grain</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>NC-C</td>
<td>11% Holstein</td>
<td>20-Grain</td>
<td>16.5 hours</td>
<td>Rye Grass, Orchard Grass</td>
<td>Clover</td>
<td>Italian Rye</td>
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<tr>
<td></td>
<td>11% Aryshire</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>78% Jersey</td>
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<tr>
<td>W-A</td>
<td>10% Friesian/Jersey Mix</td>
<td>4-Grain</td>
<td>21.6 hours</td>
<td>Perennial Rye Grass, Orchard Grass</td>
<td>Plantain Herb, White, Clover</td>
<td>None</td>
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<tr>
<td></td>
<td>90% Jersey</td>
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<tr>
<td>W-B</td>
<td>32% Holsteins</td>
<td>3.5-Alfalfa</td>
<td>12 hours</td>
<td>Orchard Grass, Fescue, Rye Grass</td>
<td>Corn, Grass</td>
<td>Corn</td>
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<td>Grp 1</td>
<td>68% Jersey</td>
<td>8.5-Grain</td>
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<tr>
<td>Grp 2</td>
<td>43% Holsteins</td>
<td>7-Alfalfa</td>
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<td></td>
<td>57% Jersey</td>
<td>15-Grain</td>
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<tr>
<td>SC</td>
<td>82% Holstein</td>
<td>6.25-Alfalfa</td>
<td>19 hours</td>
<td>Rye Grass, Fescue, White, Clover</td>
<td>Velvet Grass Canary Grass</td>
<td>Grass</td>
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<tr>
<td></td>
<td>6% Brown Swiss</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>12% Jersey</td>
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</tbody>
</table>
Cheese Make | Overview

**Raw Milk**

- Standardized to .83 P/F

**Veal Rennet**

**Thermophilic and Mesophilic Starter Culture**

**Cheese Vat**

- Milled
- Salted

**Pressed Overnight**

**Cheddar aged to 6.5 months**

April 22, 2016
Microbiology | Milk Sampling

Out of press, 1, 3, and 6.5 months

Cheese Vat

Total Plate Count

Isolation

DNA Extraction

HRM-PCR

REP-PCR

Image Source: https://i.ytimg.com/vi/uXdzuz5Q-hs/maxresdefault.jpg
Milk Sourcing | Species vs. Strain

Species

Strain

Image Source: https://upload.wikimedia.org/wikipedia/commons/9/96/Walworth_Gate_010.jpg
https://www.usjersey.com/portals/0/AJCA/3_Images/ID-topslider3.png
Milk Sourcing | North Coast vs Willamette Valley

Species

Strain

Region

Farm

Replicate

9
April 22, 2016
Milk Sourcing | North Coast Species

Temperature vs. Milk Yield
Milk Sourcing | Strain Level Results

- Over 30 unique strains identified
- Total of 21 strains unique to specific farms
- Strain diversity greatest in the Northern Oregon Coast
Milk Sourcing | Summary

Milk from different farms have do contain different NSLABs

Milk from the same farm but different days contains different NSLABs

Variation in NSLAB strains were the highest in the North Coast farms

Southern Oregon Coast aged Cheddar had the most species diversity
Influences of Milk Sourcing on NSLAB in Cheddar Cheese

Photo by Lynn Ketchum