PRO CREAM/ DLP BLENDS: FUNCTIONALITY AND APPLICATIONS

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Pro cream and Delactosed Permeate

- Pro cream: byproduct from microfiltration of whey
  - “Reduced lactose concentrated whey”
  - “Whey protein phospholipid concentrate”

- Delactosed Permeate (DLP): permeate with 25% lactose removed
  - Co-product of lactose manufacturing
Uses of Pro Cream

Current
• Animal feed
• Fertilizer
• Processed cheese
  • Whey protein replacer

Future
• Emulsifier
• Protein
• Studies on the health benefits of dairy phospholipids
Past Research

- Protein replacement in:
  - Ice cream
  - Caramel
  - Soup
  - White Cake

- Emulsifier in ice cream
- DLP commercial variability
- Salt replacer
Project Goals

- Characterize commercial pro cream and DLP
  - Chemical composition
  - Functionality

- Incorporate dairy co products into foods
  - Potentially replace more expensive emulsifiers and proteins
## Chemical Composition

### Proximate Analysis
1. Fat
2. Moisture
3. Protein
4. Lactose
5. Ash

### Additional Analysis
1. Protein Profile
2. Phospholipid (PL) Profile
<table>
<thead>
<tr>
<th>Sample/Batch</th>
<th>Moisture</th>
<th>Fat</th>
<th>Protein</th>
<th>Lactose</th>
<th>Ash</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>2.58</td>
<td>12.48</td>
<td>69.20</td>
<td>5.08</td>
<td>4.08</td>
</tr>
<tr>
<td>A 2</td>
<td>4.53</td>
<td>13.70</td>
<td>69.97</td>
<td>2.88</td>
<td>2.07</td>
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<tr>
<td>B 1</td>
<td>4.78</td>
<td>17.71</td>
<td>63.53</td>
<td>10.28</td>
<td>3.24</td>
</tr>
<tr>
<td>B 2</td>
<td>3.57</td>
<td>15.63</td>
<td>54.67</td>
<td>3.48</td>
<td>3.50</td>
</tr>
<tr>
<td>C 1</td>
<td>4.08</td>
<td>10.85</td>
<td>69.77</td>
<td>10.72</td>
<td>2.54</td>
</tr>
<tr>
<td>C 2</td>
<td>4.33</td>
<td>15.50</td>
<td>50.26</td>
<td>3.95</td>
<td>3.61</td>
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<tr>
<td>D 1</td>
<td>2.72</td>
<td>38.11</td>
<td>52.92</td>
<td>1.06</td>
<td>1.88</td>
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<tr>
<td>D 2</td>
<td>1.90</td>
<td>32.41</td>
<td>54.35</td>
<td>1.01</td>
<td>2.10</td>
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</tbody>
</table>
Phospholipid Content

- Primarily Phosphatidylethanolamine and Phosphatidylcholine
- Much lower than expected
- Need further research
Protein Profile

University of Illinois Milk Composition & Synthesis Resource Library
DLP Composition

- Lactose: 60.00%
- Ash: 27.00%
- Protein: 0.66%
- Fat: 0.03%
- Other: 9.31%
- Moisture: 3.00%
## Functionality Testing

<table>
<thead>
<tr>
<th>Type of Pro Cream</th>
<th>DLP: PC Blend</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0:100</td>
<td>Native</td>
</tr>
<tr>
<td>B</td>
<td>30:70</td>
<td>pH 7</td>
</tr>
<tr>
<td>C</td>
<td>50:50</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Emulsifying
- Gelling

*All done with batch two of the pro cream samples*
Protein and PL and Emulsifying

- Reduce surface tension
- Form a cohesive film
- Slow the rate of water and oil separation
Gelling

- Whey proteins denature when heated

- Form a network which strengthens upon cooling

- Rheological testing will show the strength of the network
Maximum G’

G’ (Pa)

DLP: PC Blend

A 0:100
A 30:70
A 50:50
B 0:100
B 30:70
B 50:50
C 0:100
C 30:70
C 50:50
D 0:100
D 30:70
D 50:50

pH 7
Native pH
Addition of DLP:PC to Food

- Ice Cream
  - Replace 25% of Nonfat dried milk
- Caramel
  - Replace protein from milk and emulsifiers from lecithin
- Cake
  - Replace proteins and emulsifiers from eggs and lecithin
Summary

• Pro cream is highly variable between samples and brands

• Functionality is dependent on pH and amount of protein

• Potential for using co-products to reduce the cost of using whey proteins
Thank You

- Dairy Research Institute®
- Dr. Hartel
- KJ Burrington
- Hartel Lab
- All the companies that donated products