What Is Quality Milk from Pasture?

- High % fat
- High total lbs of fat
- High in CLA
- Excellent Ω 6:3 ratio
- High in β-carotene with excellent color
- Mild flavors of grass
Milk fat is made with compounds from fiber digestion.

Feed, nutrient flow from the rumen and milk components:

UIP = undegradable intake protein  DIP = degradable intake protein

Effect of Varying the Ratio Forage: Concentrate on Milk Composition

<table>
<thead>
<tr>
<th>Item</th>
<th>Ratio Forage:Concentrate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80:20</td>
</tr>
<tr>
<td>Milk, kg</td>
<td>20.80</td>
</tr>
<tr>
<td>Composition, %</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>3.11</td>
</tr>
<tr>
<td>Fat</td>
<td>3.83</td>
</tr>
<tr>
<td>Lactose</td>
<td>5.28</td>
</tr>
</tbody>
</table>

Adapted from Macleod et al.

Improving % Milk Fat on Pasture

1. Preventing “milk fat depression” by keeping the rumen healthy, grazing at the right stage, minimizing heat stress.

2. Feeding a high quality forage ration which keeps grain feeding low.
Milk fat depression is an active process

- Short pasture
- Excess protein
- Abnormal pH

T10,c12 CLA or “bad” CLA

Seasonal fluctuation in % fat.
0.2% additional drop due to grazing.
Alternative biohydrogenation pathways

Healthy rumen fermentation
CLA (c-9, t-11 C18:2)
“Rumenic acid” A desirable CLA accounting for 90% of the CLA in milk and linked to anti-cancer activity.

Linoleic Acid (C18:2)
Polyunsaturated fatty acid in pasture

Abnormal fermentation / Rumen acidosis
CLA (t-10, c-12 C18:2)
Undesirable CLA linked to milk fat depression.

Vaccinic acid (t-11 C18:1)

Stearic acid (C18:0)
Saturated fatty acid found in milk fat and used for energy by the cow.

“Bad” CLA takes 12 hours to start MFD.

...It takes 10-21 days to recover.
Short vs. Tall grass

<table>
<thead>
<tr>
<th>Quantity of fresh grass (lbs./acre and height in inches)</th>
<th>May/June</th>
<th>July/August</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,200 lbs. 16&quot;</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>1,800 lbs. 6&quot;</td>
<td>6</td>
<td>28</td>
</tr>
<tr>
<td>600 lbs. 2&quot;</td>
<td>14</td>
<td>45</td>
</tr>
</tbody>
</table>

Number of days since end of grazing

Keep five pounds of good quality DRY hay in the ration.

- During the grazing season, hay provides a steady source of effective fiber to regulate the rumen’s speed of digestion.
Yellow or dying leaves
Improving % Milk Fat on Pasture

1. Preventing “milk fat depression” by keeping the rumen healthy, grazing at the right stage, minimizing heat stress.

2. Feeding a high quality forage ration which keeps grain feeding low.
Aim for pasture and forages with fiber digestibility over 55%

- Low-quality forages provide few nutrients to the rumen microbes, reducing high-value microbial protein.
Treat pasture as an ingredient of the ration.

Pasture supplementation strategy

If goal is <50% DMI from pasture:

If goal is >50% DMI from pasture:
Corn Silage is ½ Grain : ½ Forage

MUN Range : 8 - 15
Sorting!

Reducing heat stress
Table 6. Feeding recommendations

<table>
<thead>
<tr>
<th>Buffer</th>
<th>% Grain</th>
<th>% of Total</th>
<th>lbs/day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mixture</td>
<td>Ration</td>
<td></td>
</tr>
<tr>
<td>Bicarb</td>
<td>1.0-1.5</td>
<td>.6-.8</td>
<td>.25-.5</td>
</tr>
<tr>
<td>MgO</td>
<td>.4-0.8</td>
<td>.2-.4</td>
<td>.10-.2</td>
</tr>
<tr>
<td>Bicarb + MgO (3:1)</td>
<td>1.0-1.5</td>
<td>.6-.8</td>
<td>.25-.5</td>
</tr>
<tr>
<td>Bentonite</td>
<td>3.0-5.0</td>
<td>1.5-2.5</td>
<td>1.50-2.2</td>
</tr>
<tr>
<td>Limestone</td>
<td>1.0-1.5</td>
<td>.5-.8</td>
<td>.25-.4</td>
</tr>
</tbody>
</table>
Effect of forage level and buffer addition on milk composition

<table>
<thead>
<tr>
<th>Diet</th>
<th>Rumen pH</th>
<th>Duodenal TFA, g/d</th>
<th>Milk TFA, %</th>
<th>Milk TFA, g/d</th>
<th>Milk Fat, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>60% forage, no buffer</td>
<td>6.13</td>
<td>61</td>
<td>3.1</td>
<td>33</td>
<td>4.09</td>
</tr>
<tr>
<td>60% forage, buffer</td>
<td>6.15</td>
<td>57</td>
<td>2.9</td>
<td>33</td>
<td>4.22</td>
</tr>
<tr>
<td>25% forage, no buffer</td>
<td>5.83</td>
<td>120</td>
<td>5.8</td>
<td>56</td>
<td>3.42</td>
</tr>
<tr>
<td>25% forage, buffer</td>
<td>6.02</td>
<td>66</td>
<td>2.9</td>
<td>33</td>
<td>3.91</td>
</tr>
</tbody>
</table>

Rules of Thumb in Creating Pasture Rations

- High forage ration: 80% forage/20% grain
- Minimum pasture maturity: 3 leaves/tiller
- Maximum pasture maturity: boot stage
- Conservative DMI estimate: 1.3% of body weight as NDF
- Protein: rumen degradable protein ≤ 2.2 lbs over default recommendations
- Energy: non-structural carbohydrate (NSC) ≥ 3.0 lbs under default recommendations
- Default values for pasture are often not accurate. Assume NSC = 20-25% and NDF = 45-50% for well-managed grass dominant pastures.
- Minimum quality for supplemental hay/dry baleage: NEL ≥ .68 mcal/lb, NDFD ≥ 55%
- Grass hay/dry baleage works best as pasture supplement to avoid excess protein.
- Monitor manure quality and MUN in evaluating ration and pasture.
- Force feed buffers
- Wet chemistry forage tests on all stored forages.
Genetics

- Genetic difference accounts for 50% of fat variability.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Holstein h2</th>
<th>Holstein SD1</th>
<th>Jersey h2</th>
<th>Jersey SD1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat %</td>
<td>0.58</td>
<td>0.23</td>
<td>0.55</td>
<td>0.28</td>
</tr>
<tr>
<td>Protein %</td>
<td>0.51</td>
<td>0.14</td>
<td>0.55</td>
<td>0.20</td>
</tr>
<tr>
<td>Fat, lb.</td>
<td>.30</td>
<td>52</td>
<td>0.35</td>
<td>50</td>
</tr>
<tr>
<td>Protein, lb.</td>
<td>.30</td>
<td>37</td>
<td>.35</td>
<td>36</td>
</tr>
<tr>
<td>Milk, lb.</td>
<td>.30</td>
<td>1444</td>
<td>.35</td>
<td>1204</td>
</tr>
</tbody>
</table>

Hereditability: higher for fat than for yield!
Changes to NZ bull evaluation due to fat value

2018
- BCS: 7%
- Residual Survival: 11%
- Somatic Cell Score: 1%
- Fertility: 14%
- Liveweight: 10%
- Milk Volume: 12%
- Protein: 22%
- MilkFat: 10%

2019
- BCS: 3%
- Residual Survival: 11%
- Somatic Cell Score: 5%
- Fertility: 13%
- Liveweight: 19%
- Milk Volume: 13%
- Protein: 18%
- MilkFat: 20%