Where will new technologies take milk recording?

Large scale screening of the Danish dairy cattle population for their fatty acid profile

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Fatty acid (FA) profiles in raw milk – possibilities and opportunities

- Brief overview – where are we now?
- Farm management possibilities
- Future perspectives in healthy milk and healthy happy cows
Fat in milk is not just fat…

The butterfat has multiple origins…

- Directly and unaltered from the feed
- From the feed after biohydrogenation in rumen
- By *de novo* synthesis in the mammary glands
- Mobilized FAs from the adipose tissue
- From the feed or adipose tissue after desaturation in the mammary glands
Alterations of FAs in raw milk

Butterfat in milk can be altered by…

• Feed
• Genetics
• Environment

FA profiles have multiple implications…

• Decreased somatic cell count (SCC)
• Reduced prevalence of ketosis
• Increased fertility
• Environmental effects
Fatty acids compositions

Fatty acids

- Carbon chain length
- Number of double bonds
  - Saturated
  - Unsaturated
    - Monounsaturated (MUFA)
    - Polyunsaturated (PUFA)
- Configuration of double bond
  - *Cis* fatty acids
  - *Trans* fatty acids

![Fatty acids diagram](image)

- Double bond
  - SFA
  - MUFA
  - PUFA
- Chain length
  - SCFA
  - MCFA
  - LCFA
- Configuration
  - *Trans* fatty acid
- Fatty acids
  - 14:0
  - 16:0
  - 18:0
  - 18:1
*De Novo* fatty acids indicate rumen health

- *De novo* FAs are created in the rumen.
  - The more *de novo* FAs, the more is the supply from the rumen
  - Better supply = good functioning rumen = healthy cow
  - Healthy cows with a healthy rumen, has a shorter dry period.
De novo at herd level

- In herds where there is a large share of cows with less than 24g de novo FAs per. 100 g fat, there is, on average, higher SCC.
De novo at herd level

- In the herds where a large part has less than 24g de novo FAs per 100 g fat, there is, on average, fewer cows who gets a second calving.
Fatty acids can be used as predictor for future reproduction opportunities
Data is provided to the farmer for action

### Fedtsyre målinger

**De novo fedtsyre målinger (g fedtsyrer / 100 g fedt) på kontroldato**

<table>
<thead>
<tr>
<th></th>
<th>19/3</th>
<th>24/4</th>
<th>31/5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gns. de novo, alle køer 120-250 dage</td>
<td>26.6 (137)</td>
<td>26.8 (137)</td>
<td>26.4 (164)</td>
</tr>
<tr>
<td>- 1. kalvs 120-250 dage</td>
<td>27.1 (49)</td>
<td>27.4 (44)</td>
<td>26.7 (60)</td>
</tr>
<tr>
<td>- 2. kalvs 120-250 dage</td>
<td>26.3 (42)</td>
<td>26.4 (37)</td>
<td>26.0 (34)</td>
</tr>
<tr>
<td>- Øvrige kalvs 120-250 dage</td>
<td>26.3 (46)</td>
<td>26.5 (56)</td>
<td>26.2 (70)</td>
</tr>
</tbody>
</table>

**Faktorer der påvirker andelen af de novo fedtsyrer**

- Reducerer: Højt fedtsyreindhold i foderrationen, frisk græs og negativ energibalance
- Øger: Højt sukkerindhold i foderrationen og en høj grovfoder andel (NDF)

### Fedtsyre målinger

**De novo fedtsyre målinger (g fedtsyrer / 100 g fedt) på kontroldato**

<table>
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<tr>
<th></th>
<th>3/4</th>
<th>7/5</th>
<th>6/6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gns. de novo, alle køer 120-250 dage</td>
<td>25.3 (50)</td>
<td>27.0 (56)</td>
<td>25.7 (61)</td>
</tr>
<tr>
<td>- 1. kalvs 120-250 dage</td>
<td>25.2 (15)</td>
<td>25.9 (16)</td>
<td>25.9 (18)</td>
</tr>
<tr>
<td>- 2. kalvs 120-250 dage</td>
<td>For få dyr*</td>
<td>26.8 (12)</td>
<td>24.3 (13)</td>
</tr>
<tr>
<td>- Øvrige kalvs 120-250 dage</td>
<td>25.5 (27)</td>
<td>27.8 (28)</td>
<td>26.2 (30)</td>
</tr>
</tbody>
</table>

* Der er for få dyr til beregningen (minimum 10 dyr)
Big differences between the different breeds in FA compositions

*Results from the Danish DHI programme, of more than 3.5 M samples*
Great seasonal differences…

MUFA

C16:0

- Conventional
- Organic

Month: Januar, Februar, Marts, April, Maj, Juni, Juli, August, September, Oktober, November, December

Value Range: 25 to 30
Cheese produced from two different Holstein herds

- Cheese 1: Milk with 31,1 % UFA
- Cheese 2: Milk with 23,4 % UFA

- Taste differences in favor of cheese 1

- Big difference in the feeding in both herds.
Future perspectives in products with altered fatty acids…

• Environmental footprint in dairy production
• Differentiated products at the dairy plants
• Increased productivity at the dairy farms
• Increased animal welfare
Thanks for listening, and all participants in this project...

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- Arne Munk, SEGES/AU
- Niels Henning Nielsen, RYK