Subacute ruminal acidosis and low rumen pH in dairy cows: A nutritional perspective including causes and consequences

WG3 Workshop
Sub-acute Ruminal Acidosis
University of Strathclyde
Glasgow
April 19th and 20th 2016

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School of Veterinary Medicine
University College Dublin
Dairy Herd Health at University College Dublin
UCD: Lyons Research Farm

200 Dairy cows, 8000 kg of milk, 1.5 tonnes of concentrate feed, calving interval 379 days (600) kg of milk fat and protein per cow per lactation, Spring and Autumn calving herds
Subacute ruminal acidosis and low rumen pH in dairy cows

• A nutritional perspective
• A. Brief review of causative factors
• B. Discussion of consequences
  – Fibre digestion
  – Production /Composition
  – Energy balance / fat mobilisation
  – Other areas (For discussion at meeting)
    • Rumen barrier dysfunction
    • Endotoxin translocation
    • Inflammation
    • Laminitis/lameness
    • Good luck with all of these!!
Subacute ruminal acidosis and low rumen pH in dairy cows

• Issues with definitions (Doherty, 2011)
  – Definition for rumenocentesis
    • Rumen pH of less than 5.5 in 25% of 12 cows typically 2-8 hours after new or large meal ingestion (Oetzel, 2003)
  – Definition for automated rumen pH monitoring equipment
    • Rumen pH of less than 5.6 for 3 or more hours (Gohzo and Plaizier, 2005)
    • Will depend also on location of pH probe
Subacute ruminal acidosis and low rumen pH in dairy cows

• SARA as: rumen pH of less than 5.5 in 25% of 12 cows typically 2-8 hours after new or large meal ingestion (Oetzel, 2003)

• Present in 20 to 40% of cows in confined high production systems (Garrett et al., 1997)

• Present in 10-15% of grazing cows in extensive systems (O’Grady, 2008; Bramley, 2008)
Subacute ruminal acidosis and low rumen pH in dairy cows

- Dietary causative factors
- Ingestion of excessive amounts of rapidly fermentable carbohydrate
  - Starches (wheat starch especially problematic)
  - Sugars
  - Pectin
Subacute ruminal acidosis and low rumen pH in dairy cows

- Dietary causative factors
- Ingestion of excessive amounts of rapidly fermentable carbohydrate
- UCD Dairy Herd Health Group working standard: 35% or more starch + sugar in a TMR type diet is a risk for SARA
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• Ingestion of excessive amounts of rapidly fermentable carbohydrate

• However to feed the high yielding dairy cow high levels of starch and sugar are required

• They are synonymous with high energy feeds
## Survey Of Diets Used For High Yielding US dairy herds

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk yield litres/yr</td>
<td>13012</td>
<td>11740</td>
<td>14167</td>
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<tr>
<td>Milk fat %</td>
<td>3.7</td>
<td>3.4</td>
<td>3.9</td>
</tr>
<tr>
<td>Milk protein %</td>
<td>3.1</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>DM intake (kg/d)</td>
<td>24.5</td>
<td>22.3</td>
<td>26.7</td>
</tr>
<tr>
<td>NE\textsubscript{lactation} (Mcal/kg DM)</td>
<td>1.75</td>
<td>1.69</td>
<td>1.80</td>
</tr>
<tr>
<td>CP (%)</td>
<td>19.1</td>
<td>18.0</td>
<td>20.0</td>
</tr>
<tr>
<td>UDP / CP (%)</td>
<td>36.8</td>
<td>34.0</td>
<td>41.0</td>
</tr>
<tr>
<td>NDF (%)</td>
<td>29.3</td>
<td>27.0</td>
<td>32.0</td>
</tr>
<tr>
<td>NDF from forage (%)</td>
<td>20.6</td>
<td>16.1</td>
<td>23.0</td>
</tr>
<tr>
<td>Fat/oil (%)</td>
<td>6.6</td>
<td>5.0</td>
<td>8.8</td>
</tr>
<tr>
<td>Starch + sugar (%)</td>
<td>36.3</td>
<td>35.0</td>
<td>39.6</td>
</tr>
</tbody>
</table>

UDP = undegradable protein

Chase, 1993.
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• Ingestion of excessive amounts of rapidly fermentable carbohydrate

• The more fermentable the diet is the greater the challenge to maintain rumen pH within a desired range
Subacute ruminal acidosis and low rumen pH in dairy cows

Whelan et al 2012: Animal Feed Science and Technology: UCD Lyons Farm
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• Ingestion of insufficient large particle size or long fibre forage

• Effective fibre promotes chewing activity
Subacute ruminal acidosis and low rumen pH in dairy cows

- Dietary causative factors

- Physically effective NDF should be 22% of ration DM (Mertens, 1997)

- Cattle require a diet that is adequate in fibre. If the quantity and quality of dietary fibre are inadequate, the anatomy and physiology of the rumen are impaired and there is increased risk of ruminal acidosis and other related disorders.

- European Food Safety Authority: Report on Dairy Cow Welfare
  The EFSA Journal 2009 1143:1-38
Subacute ruminal acidosis and low rumen pH in dairy cows

- Dietary causative factors
  - UCD Dairy Herd Health Group working standard for grass silage based or mixed ensiled forage diets (maize silage / whole crop wheat):
  - Diet should ideally contain > 21% NDF from forage
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

Table 1. Recommended minimum concentrations (% of DM) of NDF from forage and total diet NDF and recommended maximum concentrations (% of DM) of NFC for diets containing ground corn as primary starch source fed as TMR of adequate particle size (NRC, 2001).

<table>
<thead>
<tr>
<th>Minimum NDF from forage</th>
<th>Minimum NDF in Diet</th>
<th>Maximum NFC in diet¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>19%</td>
<td>25%</td>
<td>44%</td>
</tr>
<tr>
<td>18%</td>
<td>27%</td>
<td>42%</td>
</tr>
<tr>
<td>17%</td>
<td>29%</td>
<td>40%</td>
</tr>
<tr>
<td>16%</td>
<td>31%</td>
<td>38%</td>
</tr>
<tr>
<td>15%²</td>
<td>33%</td>
<td>36%</td>
</tr>
</tbody>
</table>

¹Non-fiber carbohydrate = 100 - (%NDF - NDFIP + % CP + % Fat + % Ash).
²Not recommended because of depression of milk fat test.
Subacute ruminal acidosis and low rumen pH in dairy cows
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• In my view after working with rumen fistulated dairy cattle at UCD Lyons Farm

• The rumen fibre mat can be highly variable in thickness / density between dairy cows fed the same diet
Subacute ruminal acidosis and low rumen pH in dairy cows

- Dietary causative factors

- In research at UCD Lyons Farm

- Simultaneously breaking advocated thresholds for maximum starch and sugar and minimum NDF from forage has produced SARA in dairy cows
Subacute ruminal acidosis and low rumen pH in dairy cows

Rumen pH determined with an indwelling pH probe held in the region between the dorsal and ventral caudal rumen for a diet containing 38.2% starch and sugar; 23% NDF from forage; Dry matter intake 18 kg/d; Milk production 25 litres/d (n=4)

25% of time less than pH 5.5
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• Issues with the transition period ‘Abrupt dietary change’

• pH and acidity is unlikely to be the only thing going on in there!!
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• The transition period
  – Rumen adjustment
  – Rapid increase in starch and sugar consumption
  – Low total feed intake and forage intake
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• The transition period

• SARA may be more prevalent at peak feed intake than it is during dietary transition from dry to lactating diets (Oetzel, 2005)
Subacute ruminal acidosis and low rumen pH in dairy cows

Krause and Oetzel, 2006
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors

• Transition to Pasture V Transition to TMR

• In relation to the development of metabolic and reproductive disorders, the risk assessment showed that an inadequate transition feeding is the hazard with the highest risk estimates in all indoor farming systems (Note: transition to fresh pasture with low fibre content can also cause problems). EFSA 2009
 Lyons Research Farm Experiment

Transition to perennial ryegrass pasture V Transition to TMR

- All cows grass silage and then grass silage and maize silage dry cow diet (supplemented only for minerals, trace elements, vitamins)

- Group Grazing: Grazing immediately after calving
- Abrupt turnout to pasture (allowance 20kg DM/cow/day) from day of calving + 3.5 kg of concentrate

- Group Indoor: Indoors for first 3 weeks only
- From day of calving fed balanced TMR until day 21 (grass silage, maize silage and concentrate, allowance was 23kg of DM per day of which 53% concentrate).
- Introduced to grass gradually between day 21-28 when critical first few weeks had passed
Effect of Feeding Method on Rumen pH in Fistualted Cows at days 8-10 post-partum Alibrahim et al. 2012

Grazing

TMR

Indoor

University College Dublin
Effect of abrupt turnout to pasture on rumen fermentation in grazing dairy cows days 8 – 10 in lactation

<table>
<thead>
<tr>
<th></th>
<th>NM²</th>
<th>Values</th>
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<tr>
<td></td>
<td>AP</td>
<td>GP</td>
</tr>
<tr>
<td>Hours below rumen pH5.8 ⁴</td>
<td>3.44</td>
<td>1.43</td>
</tr>
<tr>
<td>Protozoa x 10³/ml</td>
<td>193.6</td>
<td>218.0</td>
</tr>
<tr>
<td>Log₃ lactic acid⁵</td>
<td>-1.99</td>
<td>-2.61</td>
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<tr>
<td>Lactic acid g/L</td>
<td>0.166</td>
<td>0.092</td>
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<td>Total VFA, mmol/L</td>
<td>173.50</td>
<td>154.87</td>
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<table>
<thead>
<tr>
<th>Proportions of total VFA</th>
<th>Values</th>
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<tr>
<td>Acetate (A)</td>
<td>61.51</td>
</tr>
<tr>
<td>Propionate (P)</td>
<td>23.82</td>
</tr>
<tr>
<td>Butyrate</td>
<td>11.74</td>
</tr>
<tr>
<td>Valerate</td>
<td>1.59</td>
</tr>
<tr>
<td>Branched-chain FA⁶</td>
<td>1.36</td>
</tr>
<tr>
<td>A : P ratio mmol/L</td>
<td>2.64</td>
</tr>
</tbody>
</table>

AP: abrupt pasture introduction
GP: gradual pasture introduction
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors: Pasture–based diets
Subacute ruminal acidosis and low rumen pH in dairy cows

- Rumen pH samples in 12 dairy herds
- Average yield 8114kg (sd 733kg)
- Average herd size 95 (sd 38 cows)
- Average concentrate fed 3.3kg/d (sd 1.5kg/d)
- Cows sampled were 80 to 150 DIM
- Pasture NDF > 50% (sampling period mid summer)

**Results**
- 3 out of 12 herds had a significant diagnosis of SARA
- 11% of cows had a rumen pH < 5.5
- 53% of cows had a rumen pH < 5.8
Subacute ruminal acidosis and low rumen pH in dairy cows

O’Grady et al 2008: SARA and low rumen pH in grazing Irish dairy herds

<table>
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<tr>
<th></th>
<th>Affected</th>
<th>High Risk</th>
<th>Normal</th>
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<tbody>
<tr>
<td>Milk yield kg/d</td>
<td>31.54</td>
<td>29.98</td>
<td>29.28</td>
</tr>
<tr>
<td>Milk fat%</td>
<td>3.22</td>
<td>3.37</td>
<td>3.68</td>
</tr>
<tr>
<td>Milk protein%</td>
<td>3.19</td>
<td>3.05</td>
<td>3.15</td>
</tr>
<tr>
<td>Rumen pH</td>
<td>5.81⁻</td>
<td>5.82⁻</td>
<td>6.19ᵇ</td>
</tr>
<tr>
<td>Rumen acetate mmol/l</td>
<td>89.64</td>
<td>96.88</td>
<td>78.51</td>
</tr>
<tr>
<td>Rumen propionate mmol/l</td>
<td>29.85</td>
<td>26.64</td>
<td>21.34</td>
</tr>
<tr>
<td>A:P ratio</td>
<td>3.13</td>
<td>3.68</td>
<td>3.72</td>
</tr>
<tr>
<td>Iso butyrate mmol/l</td>
<td>0.95</td>
<td>1.14</td>
<td>0.59</td>
</tr>
<tr>
<td>N butyrate mmol/l</td>
<td>18.30</td>
<td>17.00</td>
<td>12.92</td>
</tr>
<tr>
<td>Iso valerate mmol/l</td>
<td>1.97</td>
<td>2.38</td>
<td>1.45</td>
</tr>
<tr>
<td>N valerate mmol/l</td>
<td>2.91</td>
<td>3.03</td>
<td>1.66</td>
</tr>
<tr>
<td>TVFA mmol/l</td>
<td>143.6</td>
<td>147.1</td>
<td>116.5</td>
</tr>
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</table>
Subacute ruminal acidosis and low rumen pH in dairy cows

• Dietary causative factors
• Pasture-based diets
• Assessments with pH recording devices likely to be located in the reticulum indicate that the reticulo-rumen of grazing cows can become quite acidic

• Duffield 2004 subtract 0.44 units from reticulum pH to compare with rumenocentesis pH
UCD Lyons Farm Data
Rafferty et al., 2013. Cow 462 15 July 2012

pH decline after feeding
Feeding line

Drinking
SARA in grazing dairy cows

- Bramley et al., 2008
- 100 dairy herds selected from 5 regions in Australia
- 10.2% of cows were considered to be acidotic
Effect of SARA on production and health
100 dairy herds
Australia Bramley et al., 2005

<table>
<thead>
<tr>
<th></th>
<th>Acidotic</th>
<th>Suboptimal</th>
<th>Non Acidotic</th>
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<tbody>
<tr>
<td>milk volume (L/d)</td>
<td>33.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>27.0&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>29.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Milk fat%</td>
<td>3.3&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.9&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>3.7&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Milk protein%</td>
<td>3.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Fat:protein ratio</td>
<td>1.1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.2&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Milk fat yield (kg/d)</td>
<td>1.1</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Milk protein yield (kg/d)</td>
<td>1.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.9&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.9&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
Subacute ruminal acidosis and low rumen pH in dairy cows

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  - Fibre digestion
  - Production
  - Energy balance / BCS loss
  - Other areas (For discussion at meeting)
    - Rumen barrier dysfunction
    - Endotoxin translocation
    - Inflammation
    - Laminitis/lameness
    - Good luck with all of these!!

Steel et al Acta Veterinaria Scandinavica 2009
Subacute ruminal acidosis and low rumen pH in dairy cows

View taken based on several review articles published 10-15 years ago

How do we feel about all of this now!!

University College Dublin
Subacute ruminal acidosis and low rumen pH in dairy cows

• What are the consequences of SARA
• Reduced fibre digestion
  – Is the reduced fibre digestion pH or substrate induced
  – Is reduced fibre digestion only an issue in starch or rapidly fermentable carbohydrate induced SARA
  – ‘The carbohydrate effect’
    Calsamiglia et al 2012; Mould and Orskov 1984
Subacute ruminal acidosis and low rumen pH in dairy cows

• Reduced fibre digestion also happens when there is no starch in the diet

• This has been proved in UCD research using a soya hulls *in-sacco* method for high NDF type diets
Subacute ruminal acidosis and low rumen pH in dairy cows

Effect of diet concentrate % on rate of digestion *in-sacco*
Diet composed only of grass silage and soya hulls

Mulligan et al., 2001
Subacute ruminal acidosis and low rumen pH in dairy cows

GED = - 0.738 + 0.216 \times (pH 6h); \ R^2 = 0.69; \ P < .001

Relationship with high rumen pH values
Diets perennial ryegrass silage and soya hulls

Mulligan et al., 2001
Subacute ruminal acidosis and low rumen pH in dairy cows

- Not everything to do with rumen pH happens at rumen pH values below 6.0
- This research published in a reputable journal and presented at ADSA
Subacute ruminal acidosis and low rumen pH in dairy cows

• In controlled experiments with diets balanced for Ca, Mg and Na concentrations in typical indoor Northern European diets

• Correcting rumen pH

• 1. Increased milk fat content
• 2. Increased milk production (fat and protein kg)

• But of course rumen pH isn’t all we change!!
Subacute ruminal acidosis and low rumen pH in dairy cows

• Controlled studies would indicate that we can alter rumen conditions in grazing cows

• This may increase milk production
• Did not increase milk fat%
Subacute ruminal acidosis and low rumen pH in dairy cows

- Low milk fat% in grazing Irish herds
- PUFA induced
- Low rumen pH (6.2 to 5.8) also a factor
Subacute ruminal acidosis and low rumen pH in dairy cows

• Energy balance and fat mobilisation

• Is it true that subacute ruminal acidosis or general rumen physiology impacts energy balance?
Subacute ruminal acidosis and low rumen pH in dairy cows

- Energy balance and fat mobilisation

- Alibrahim et al., 2013

**Effect of timing of post-partum introduction to pasture and supplementation with *Saccharomyces cerevisiae* on milk production, metabolic status, energy balance and some reproductive parameters in early lactation dairy cows**

R. M. Al Ibrahim, S. J. Whelan, K. M. Pierce, D. P. Campion, V. P. Gath and F. J. Mulligan

Summary

Dietary change, an inconsistent nutrient intake and high levels of milk production make the early post-partum period (PP) a challenging time for the lactating dairy cow. This experiment investigated the effects of two early PP nutritional management strategies (NMS): abrupt introduction to pasture (AP) or a total mixed ration (TMR) for 21 days followed by a gradual introduction to pasture over 7 days (GP), with (T) or without (C) live yeast (YS) on milk production, energy balance (EB) and selected metabolic and reproductive variables. Four multiparous dairy cows were assigned to one of four dietary treatments in a two (AP vs. GP) by two (T vs. C) factorial, randomized block design. The experiment was conducted from days 1 to 70 PP. Blood samples were taken on day 1, day 3 and every 10 days until day 45 to determine metabolites, whilst intake (DMI), and EB were determined during week 6 PP. Milk was sampled weekly for fat, protein and lactose. Transectal scanning for reproductive variables commenced on day 16 PP. Animals in the GP group had a higher DMI (p = 0.01), higher fat yield (p = 0.05) and fewer days to first oestrus (p = 0.09) vs. those in the AP group. EB (~3.5 ± 0.67 units of energy for milk production) and body condition score loss (0.70 ± 0.09) were not affected by NMS. However, non-esterified fatty acids (NEFA) (p < 0.01) were higher, and glucose (p = 0.02) was lower in the AP vs. the GP group. Supplementary YS tended to improve EB (p = 0.09) and reduced NEFA (p < 0.01) in non-supplemented animals. These data suggest that offering animals a nutritionally balanced TMR during the first 3 weeks PP followed by a gradual introduction to pasture can improve DMI vs. pasture-based diets. Additionally, the blood metabolic profile suggests a more favourable energy status in the GP group where YS was supplemented during the early PP period.

Keywords: early lactation, nutrition, dairy cows, supplementation, energy balance.

Correspondence: S. Whelan, School of Agriculture and Food Science, University College Dublin, Belfield, Dublin 4, Ireland. Tel: 00353 1 7162160, Fax: 00353 017162421; Email: stephen.c.whelan@ucd.ie

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Subacute ruminal acidosis and low rumen pH in dairy cows

- Energy balance and BCS loss

- Supplementation of early lactation dairy cows with *Saccharomyces cerevisiae* \(^{1026}\)
- Fed at 2.5 X \(10^9\) CFU per cow per day
- Typical milk yield ca 30 kg per day
- TMR grass silage, maize silage, straw and concentrate and also pasture-based diets
Influence of *saccharomyces cerevisiae* supplementation on rumen pH days 22-24 postpartum

Alibrahim et al., 2013

Supplementation (2.5 × 10⁹ cfu of *S. cerevisiae*; C = control, n = 4; Y = supplemented, n = 4; d 10 PP and (b) d 22 to 24 post-partum in fistulated dairy cows. Feed offered twice daily at 07 for bars correspond to the SEM (**P<0.01, ***P>0.01 <0.05).
Influence of *saccharomyces cerevisiae* supplementation on rumen fermentation days 22-24 postpartum

Alibrahim et al., 2013

<table>
<thead>
<tr>
<th></th>
<th>YC¹</th>
<th></th>
<th>NM²</th>
<th></th>
<th>SED³</th>
<th></th>
<th>P-Values</th>
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<tbody>
<tr>
<td></td>
<td>C</td>
<td>Y</td>
<td>AP</td>
<td>GP</td>
<td>YC</td>
<td>NM</td>
<td></td>
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<tr>
<td>H. rumen pH&lt;5.8⁴</td>
<td>3.50</td>
<td>2.29</td>
<td>3.54</td>
<td>2.24</td>
<td>0.46</td>
<td></td>
<td>0.01</td>
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<tr>
<td>NH₃-N mg/L</td>
<td>106.2</td>
<td>102.8</td>
<td>107.6</td>
<td>101.4</td>
<td>3.18</td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>Protozoa×10⁹/ml</td>
<td>220.3</td>
<td>232.6</td>
<td>220.9</td>
<td>231.9</td>
<td>8.83</td>
<td></td>
<td>0.17</td>
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<tr>
<td>Logₑ lactic acid⁵</td>
<td>-1.67</td>
<td>-2.41</td>
<td>-1.82</td>
<td>-2.26</td>
<td>&lt;0.01</td>
<td></td>
<td>&lt;0.01</td>
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<tr>
<td>Lactic acid g/L</td>
<td>0.211</td>
<td>0.101</td>
<td>0.186</td>
<td>0.126</td>
<td>0.029</td>
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<tr>
<td>Total VFA, mmol/L</td>
<td>139.92</td>
<td>168.66</td>
<td>158.60</td>
<td>149.98</td>
<td>13.06</td>
<td></td>
<td>0.03</td>
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<tr>
<td>Proportions of total VFA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acetate (A)</td>
<td>61.33</td>
<td>64.51</td>
<td>62.45</td>
<td>63.39</td>
<td>1.22</td>
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<td>0.01</td>
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<tr>
<td>Propionate (P)</td>
<td>23.36</td>
<td>21.72</td>
<td>23.14</td>
<td>21.94</td>
<td>1.13</td>
<td></td>
<td>0.16</td>
</tr>
<tr>
<td>Butyrate</td>
<td>11.93</td>
<td>11.00</td>
<td>11.43</td>
<td>11.50</td>
<td>0.67</td>
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<td>Branched-chain FA⁶</td>
<td>1.49</td>
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<tr>
<td>A:P</td>
<td>2.65</td>
<td>2.99</td>
<td>2.71</td>
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Influence of *saccharomyces cerevisiae* supplementation on NEFA concentrations in peripheral blood days 1 to 45 postpartum

Alibrahim et al., 2013

![Graph showing influence of *saccharomyces cerevisiae* supplementation on NEFA concentrations in peripheral blood days 1 to 45 postpartum. The graph compares NEFA concentrations over time for control and yeast groups.](image-url)
Subacute ruminal acidosis and low rumen pH in dairy cows

• Energy balance and BCS loss

• Supplementation of early lactation dairy cows with *Saccharomyces cerevisiae* $^{1026}$

• Cows supplemented with *Saccharomyces cerevisiae* had better energy balance at 6 weeks after calving ($P = 0.09$)
Subacute ruminal acidosis and low rumen pH in dairy cows

- Altered rumen fermentation (not only rumen pH) may improve energy balance and metabolic status in early lactation cows
Subacute ruminal acidosis and low rumen pH in dairy cows

- SARA and low rumen pH
- Highly fermentable diets
- Insufficient particle size
- Transition /dietary change
- Pasture based diets
  - Low DM%, low fibre, high sugar, short sward length
Subacute ruminal acidosis and low rumen pH in dairy cows

• Reduced fibre digestion is not just about feeding too much starch

• Changing rumen pH (and everything else that goes along with that) using indoor type diets in Northern Europe may influence production but effects are inconsistent: consistent effect on milk fat%

• Increasing rumen pH (etc, etc) in pasture based diets can increase production but effects on milk fat% inconsistent
Subacute ruminal acidosis and low rumen pH in dairy cows

• Changing rumen fermentation may alter energy metabolism and reduce circulating NEFA in early lactation dairy cows
Thank you for listening

Any Questions?