**Potential Estimation of Fatty Acid Content in Cow Milk by Mid-Infrared Spectrometry**

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**Context**

- **Chromatographic analysis:**
  - Major advantage: reliability
  - Major inconvenient:
    - Expensive reagents
    - Time consuming

- **Mid-Infrared analysis:**
  - Fast analysis (up to 500 samples / hour)
  - Used in routine milk recording

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**Objective**

- Calibration of Mid-Infrared Spectrometry to estimate the fatty acid content in bovine milk

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**Methodology**

- 2 x 600 milk samples
- Conserved at -26°C
- Analysed by Mid-Infrared Spectrometry (MilkoScan FT6000)
- Spectra were exported
- PCA based on spectral variability
- 49 milk samples

Collomb and Bühler, 2000

Capillary column with length of 50 m

The milk fat percentage ranged between 2.97 and 7.73 g / dl milk.

Represent the 6 breeds

PLS approach was used to estimate the calibration equations

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**Results and Discussion**

- Globally, CV of chromatographic data for each fatty acid were inferior to 5 %

- 41 calibration equations were estimated:
  - Fatty acid in milk (g / dl MILK)
  - Fatty acid in milk fat (g / 100 g FAT)

- Cross-validation $R^2$ was higher if the FA concentration in milk was higher.
Results and Discussion

Predicted concentrations of FA were due to a real absorbance of these FA or due only to the correlations between total fat content and FA?

If the $R_{cv}$ were not due to real absorbance specific to FA, these correlations would not be higher than the correlations FA.

Conclusions

Estimation of FA concentrations in milk by MIR Spectrometry seems feasible

For potential use, high $R^2_{CV}$ and high RPD parameters would be required
## Conclusions

**Potential uses:**
- Give some indications of FA profiles for:
  - Farmers in the routine milk recording
  - Dairy Industry to check their production
  - Future selection program to select animals which produce fat with differentiated fatty acid profile

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### Table: Fatty Acid Composition of Milk

<table>
<thead>
<tr>
<th>FA Type</th>
<th>Mean</th>
<th>SD</th>
<th>SEC</th>
<th>R²c</th>
<th>SECV</th>
<th>R²cv</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MG</strong></td>
<td>4.55</td>
<td>1.18</td>
<td>0.05</td>
<td>1.00</td>
<td>0.06</td>
<td>1.00</td>
</tr>
<tr>
<td><strong>Saturated</strong></td>
<td>2.95</td>
<td>0.78</td>
<td>0.12</td>
<td>0.98</td>
<td>0.20</td>
<td>0.94</td>
</tr>
<tr>
<td><strong>Monounsaturated</strong></td>
<td>1.44</td>
<td>0.57</td>
<td>0.29</td>
<td>0.74</td>
<td>0.34</td>
<td>0.66</td>
</tr>
<tr>
<td><strong>Polyunsaturated</strong></td>
<td>0.14</td>
<td>0.03</td>
<td>0.03</td>
<td>0.43</td>
<td>0.04</td>
<td>0.39</td>
</tr>
<tr>
<td><strong>C4:0</strong></td>
<td>0.28</td>
<td>0.11</td>
<td>0.07</td>
<td>0.59</td>
<td>0.08</td>
<td>0.51</td>
</tr>
<tr>
<td><strong>C6:0</strong></td>
<td>0.13</td>
<td>0.06</td>
<td>0.04</td>
<td>0.69</td>
<td>0.04</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>C8:0</strong></td>
<td>0.07</td>
<td>0.03</td>
<td>0.02</td>
<td>0.75</td>
<td>0.02</td>
<td>0.79</td>
</tr>
<tr>
<td><strong>C10:0</strong></td>
<td>0.14</td>
<td>0.08</td>
<td>0.03</td>
<td>0.77</td>
<td>0.04</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>C10:1</strong></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.68</td>
<td>0.01</td>
<td>0.61</td>
</tr>
<tr>
<td><strong>C12:0</strong></td>
<td>0.10</td>
<td>0.06</td>
<td>0.02</td>
<td>0.82</td>
<td>0.02</td>
<td>0.74</td>
</tr>
<tr>
<td><strong>C14:0</strong></td>
<td>0.41</td>
<td>0.12</td>
<td>0.04</td>
<td>0.90</td>
<td>0.05</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>C14:1</strong></td>
<td>0.03</td>
<td>0.01</td>
<td>0.01</td>
<td>0.12</td>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td><strong>C15:0</strong></td>
<td>0.04</td>
<td>0.01</td>
<td>0.01</td>
<td>0.58</td>
<td>0.01</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>C16:0</strong></td>
<td>1.17</td>
<td>0.39</td>
<td>0.11</td>
<td>0.91</td>
<td>0.17</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>C16:1</strong></td>
<td>0.58</td>
<td>0.24</td>
<td>0.12</td>
<td>0.73</td>
<td>0.13</td>
<td>0.69</td>
</tr>
<tr>
<td><strong>C18:1</strong></td>
<td>1.33</td>
<td>0.51</td>
<td>0.12</td>
<td>0.95</td>
<td>0.18</td>
<td>0.88</td>
</tr>
<tr>
<td><strong>C18:2</strong></td>
<td>1.19</td>
<td>0.66</td>
<td>0.15</td>
<td>0.90</td>
<td>0.13</td>
<td>0.82</td>
</tr>
<tr>
<td><strong>C18:3</strong></td>
<td>0.09</td>
<td>0.03</td>
<td>0.02</td>
<td>0.78</td>
<td>0.02</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>C18:2</strong></td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.20</td>
<td>0.01</td>
<td>0.14</td>
</tr>
<tr>
<td><strong>C18:2</strong></td>
<td>0.04</td>
<td>0.02</td>
<td>0.02</td>
<td>0.12</td>
<td>0.02</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*MG* = milk fat; **SD** = standard deviation; **SEC** = standard error of calibration; **R²c** = calibration coefficient of determination; **SECV** = standard error of cross-validation; **R²cv** = cross-validation coefficient of determination.

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Thank you for your attention