Milk Fat to Protein Ratio and Somatic Cell Count in Bulk Milk of Dairy Farms in Upper Northeastern Region

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# Introduction

- **Milk compositions** can be used to indicate health status and imbalance of feed
- **Fat, Protein, Fat to protein ratio (FPR)**

\[
FPR = \frac{\text{Percentage of milk Fat}}{\text{Percentage of milk Protein}}
\]

- **Use to indicate**

  - Imbalance of feed
  - Risk of diseases
    - metabolic disorders (ketosis, acidosis), lameness, DA, reproductive problem and mastitis

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**Heuer et al., 1999**

**Eicher, 2004**
Introduction

• Bulk milk somatic cell count (BM SCC)  
  Monitor mastitis in dairy herd

• SCC  Excellent marker for subclinical mastitis

(Philpot, Nickerson, 1991)  
(Paape et al., 2002)  
(NMC., 2017)
Introduction

Test-day somatic cell score, fat-to-protein ratio and milk yield as indicator traits for sub-clinical mastitis in dairy cattle

J. Jamrozić & L.R. Schaeffer

Reproductive Performances of Holstein Cows with Different Milk Fat to Protein Ratio during Successive Stages of Lactation

Stoja Jotanović1, Ratko Mijatović2, Ivan Stančić3

Early lactation ratio of fat and protein percentage in milk is associated with health, milk production, and survival

F. Toni,*†† L. Vincenti,† L. Grigoletto,*, A. Ricci,† and Y. H. Schukken‡

Fat/Protein Ratio in First DHI Test Milk as Test for Displaced Abomasum in Dairy Cows

T. Geishauser, K. Leslie, T. Duffield and V. Edge

ASSOCIATIONS BETWEEN THE FAT TO PROTEIN RATION IN MILK, HEALTH STATUS AND REPRODUCTIVE PERFORMANCE IN DAIRY CATTLE

Ožbalt Podspečan1*, Janko Mrkun2, Petra Zrinšček2

Prevalence of metabolic disorders and effect on subsequent daily milk quantity and quality in Holstein cows

Vesna Gantner1, Tina Bolić2, and Klemen Potočnik3

Postpartum Body Condition Score and Results from the First Test Day Milk as Predictors of Disease, Fertility, Yield, and Culling in Commercial Dairy Herds

C. HEUER,1 Y. H. SCHUKKEN, and P. DOBBELAAR
Utrecht University, Department of Herd Health and Reproduction, Yakelaan 7, 3584 CL Utrecht, The Netherlands

Genetic associations between milk fat-to-protein ratio, milk production and fertility in the first two lactations of Thai Holsteins dairy cattle

Samosir RUSANO1,2, Monchol RUSANGA1,2, Watintra BOONKUM2, Suporn KATIAWAT1,2, Sayn BURANAN1 and Mongkol THERAPIWAT1,2
Introduction

Heuer et al., 1999
FPR uses to indicate health status

Lack of fiber
Acidosis
Mastitis

Normal

FPR

1.0
Optimal range

1.3
Higher range

NEB (lack of energy)
Ketosis
Mastitis

• Both a lower and a higher FPR increased the risk of mastitis (Windig et al., 2005)
The objectives of this study

- BM quality in Upper NE (2013-2016)
- Association between FPR and SCC
Materials and Methods

- BM data of dairy farms in Upper NE (2013-2016)
- A total of 40,272 milk records → 21/185 MCC
Materials and Methods

Milk Quality

• SCC (x10^3 cells/ml) → Fossomatic 5000 basic®

• % Fat, Protein, Lactose, SNF, and TS → MilkoScan FT6000®

(Veterinary Research and Development Center)

Cut off values

• 100x10^3 - 1,500x10^3 cells/ml → SCC¹

• 2-9% → Fat¹² and Protein¹²

• 2-10% → Lactose¹

• 2-20% → TS¹

¹Performance range test of Automatic analyzers (Combifoss, Denmark) ²Heuer, 2010
Materials and Methods

• Descriptive analysis milk quality

• FPR was classified into three groups
  • < 1.0
  • 1.0-1.3 (optimal range)
  • > 1.3

Association of FPR and SCC using Kruskal Wallis Test

(Gantner et al., 2016)
(Garciaa et al., 2015)
Table 1  Bulk milk quality of dairy farms in Upper Northeastern Region

<table>
<thead>
<tr>
<th>Milk Quality</th>
<th>2013-2016</th>
<th></th>
<th></th>
<th>2016</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n*</td>
<td>Mean</td>
<td>±SD</td>
<td>n*</td>
<td>Mean</td>
<td>±SD</td>
</tr>
<tr>
<td>SCC $\times 10^3$</td>
<td>31,584</td>
<td>332.36</td>
<td>203.46</td>
<td>10,570</td>
<td>342.39</td>
<td>209.48</td>
</tr>
<tr>
<td>Fat</td>
<td>39,200</td>
<td>3.43</td>
<td>0.43</td>
<td>13,418</td>
<td>3.54</td>
<td>0.55</td>
</tr>
<tr>
<td>Protein</td>
<td>39,718</td>
<td>3.03</td>
<td>0.22</td>
<td>13,506</td>
<td>3.10</td>
<td>0.24</td>
</tr>
<tr>
<td>Lactose</td>
<td>39,831</td>
<td>4.79</td>
<td>0.17</td>
<td>13,507</td>
<td>4.90</td>
<td>0.19</td>
</tr>
<tr>
<td>SNF</td>
<td>39,824</td>
<td>8.53</td>
<td>0.28</td>
<td>13,507</td>
<td>8.70</td>
<td>0.29</td>
</tr>
<tr>
<td>TS</td>
<td>39,601</td>
<td>11.96</td>
<td>0.60</td>
<td>13,505</td>
<td>12.23</td>
<td>0.71</td>
</tr>
<tr>
<td>FPR</td>
<td>39,057</td>
<td>1.13</td>
<td>0.13</td>
<td>13,418</td>
<td>1.15</td>
<td>0.17</td>
</tr>
</tbody>
</table>

* n= number of farms

FPR of individual cows 1.18 (Puangdee et al., 2016)
## Results and Discussion

**Strong policy on milk quality which resulted in a better milk composition**

Table 2  Percentage of bulk milk samples which milk quality were better than the targets

<table>
<thead>
<tr>
<th>Milk Quality</th>
<th>2013-2016</th>
<th>2016</th>
<th>Targets</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>SCC</td>
<td>84.6</td>
<td>32,169</td>
<td>80.4</td>
<td>8,497</td>
</tr>
<tr>
<td>Fat</td>
<td>35</td>
<td>14,102</td>
<td>43.1</td>
<td>5,787</td>
</tr>
<tr>
<td>Protein</td>
<td>55.2</td>
<td>22,248</td>
<td>62.2</td>
<td>8,936</td>
</tr>
<tr>
<td>SNF</td>
<td>54</td>
<td>21,735</td>
<td>77.8</td>
<td>10,510</td>
</tr>
<tr>
<td>TS</td>
<td>36.8</td>
<td>14,800</td>
<td>54.1</td>
<td>7,311</td>
</tr>
</tbody>
</table>

* National Bureau of Agricultural Commodity and Food Standards, TAS 6003-2010
** Ministry of Agriculture and Cooperatives, 2016
Results and Discussion

72.7% in optimal range

1.0-1.3

15.5% <1.0

11.8% >1.3

(Garcia et al., 2015)
(Gantner et al., 2016)
Results and Discussion

Table 3  Association between FPR and SCC in bulk milk of dairy farms in Upper Northeastern Region

<table>
<thead>
<tr>
<th>FPR</th>
<th>2013-2016</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>n</td>
<td>SCC (cells/ml)</td>
<td>Median</td>
<td>p-value</td>
</tr>
<tr>
<td>&lt;1.0</td>
<td>15.5</td>
<td>6,234</td>
<td>204,000a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0-1.3</td>
<td>72.7</td>
<td>29,292</td>
<td>232,000b</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;1.3</td>
<td>11.8</td>
<td>4,743</td>
<td>253,000c</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• p-value from Kruskal Wallis test.
• Supper script difference letter (a, b, c) show significant
Conclusion

- The BM SCC was significantly increased when FPR was high
Acknowledgement

• Thanks to Veterinary Research and Development Center (Upper Northeastern Region), Department of Livestock Development (DLD), Khon Kaen, Thailand for the bulk milk data


(Garcia et al., 2015) (Gantner et al., 2016)