Impact of subclinical ketosis and related diseases on greenhouse gases of dairy production

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Introduction

- Subclinical ketosis (SCK) after calving
- SCK increases risk on other diseases
- Impact on milk production, reproduction and culling
- Inefficient production impact on environment

Aim of this study

Assess the impact of subclinical ketosis and related diseases in dairy cows on greenhouse gases per kg milk
Material and Methods

- Development of stochastic, dynamic, simulation model
- Integrated environmental analyses (GHGs)
Dynamics of model

Attributable risk
Additional risk of other diseases included

* Weak relation with SCK
Calculation of greenhouse gases (GHGs)

Production input
- Milk production
- Calving interval
- Culling risk

Greenhouse gases/FPCM
- Feed production, land use change
- Enteric methane
- Manure storage

Diseases

Feed intake
- Diet composition
- Energy requirement

GHGs/kg FPCM

Dairy farm

Feed production

Grass/maize

Manure storage

Enteric methane

Kg CO\textsubscript{2}e/kg FPCM

Other inputs

Concentrates

LULUC

System boundary

CO\textsubscript{2}

CH\textsubscript{4}

N\textsubscript{2}O
Input model

<table>
<thead>
<tr>
<th>Disease</th>
<th>Incidence first 30 days (%)</th>
<th>Odds Ratio SCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCK</td>
<td>29.6</td>
<td></td>
</tr>
<tr>
<td>Clinical ketosis</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Displaced abomasum</td>
<td>3.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Metritis</td>
<td>9.3</td>
<td>1.5</td>
</tr>
<tr>
<td>Mastitis</td>
<td>6.3</td>
<td>1.9</td>
</tr>
<tr>
<td>Lameness</td>
<td>3.0</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Healthy cow & cow with SCK preliminary results

- 30 days Lactation
- Kg CO2e/ kg FPCM

<table>
<thead>
<tr>
<th></th>
<th>Healthy</th>
<th>SCK(+7.3%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed production</td>
<td>.262</td>
<td>.281</td>
</tr>
<tr>
<td>Enteric</td>
<td>.314</td>
<td>.338</td>
</tr>
<tr>
<td>Land use change</td>
<td>.061</td>
<td>.066</td>
</tr>
<tr>
<td>Manure storage</td>
<td>.051</td>
<td>.054</td>
</tr>
</tbody>
</table>

* P < 0.001
System expansion for meat production

Van Middelaar et al, 2014; StatLink, 2015
Healthy cow & cow with SCK

Preliminary results

<table>
<thead>
<tr>
<th></th>
<th>Healthy</th>
<th>SCK(+7.3%)*</th>
<th>Healthy</th>
<th>SCK(+1.3%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 days</td>
<td>.689</td>
<td>.739</td>
<td>.784</td>
<td>.794</td>
</tr>
<tr>
<td>Lactation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* P <0.001
Healthy cow & cow with SCK corrected for meat products

preliminary results

<table>
<thead>
<tr>
<th></th>
<th>Healthy</th>
<th>SCK(+9.4%)*</th>
<th>Healthy</th>
<th>SCK(+1.6%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>kg CO2e/kg FPCM</strong></td>
<td>.689</td>
<td>.752</td>
<td>.755</td>
<td>.766</td>
</tr>
<tr>
<td><strong>30 days</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Lactation</strong></td>
<td></td>
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</tbody>
</table>

* P <0.001
Impact of SCK+another disease (SD) preliminary results

* P < 0.001
Conclusion

- Impact of SCK of 1.6% whole lactation or 9.4% first 30 days with current input

- Difficult to have an average result of SCK

- Reducing diseases will reduce the environmental impact of dairy production
Questions?

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