Methane mitigation in dairy cattle with 3-nitrooxypropanol in an on-farm trial

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Introduction

IN = non-edible fiber-rich feeds

OUT = human-edible foods, e.g. milk
Introduction

3-nitrooxypropanol

Methyl coenzyme-M reductase (MCR)

CH$_4$

Ermler et al., 1997; Duin et al., 2016
## Material and Methods

### Animals

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
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<tbody>
<tr>
<td>10 Holstein cows</td>
<td></td>
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<tr>
<td>86 ± 31 DIM</td>
<td></td>
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<tr>
<td>34 ± 6 kg milk/day</td>
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<tr>
<td>21 ± 3 kg DMI/day</td>
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### Diet (on DM basis)

<table>
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<tr>
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<th>Value</th>
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<tbody>
<tr>
<td>34% maize silage</td>
<td></td>
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<tr>
<td>27% grass silage</td>
<td></td>
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<tr>
<td>7% pressed beet pulp</td>
<td></td>
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<tr>
<td>32% concentrates</td>
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### Treatment

- 1,7 g 3-NOP/cow/day for 8 cows
- Placebo for 2 reference cows
- 3-NOP and placebo mixed with soybean meal and soybean oil
Material and Methods
Material and Methods

- **Adaptation period**
  - d0
  - Start trial

- **Control period (CP)**
  - d15
  - Start CTRL period
  - d26, d32
    - CH₄ emissions

- **Treatment period (TP)**
  - d56
  - Start TRTM period
  - d68, d74
    - CH₄ emissions
  - d98
  - End trial
Results

19% reduction

4% reduction

Treated cows

Reference cows

Control period

Treatment period
Results

<table>
<thead>
<tr>
<th></th>
<th>Treated cows</th>
<th>Reference cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control period</td>
<td>23.5 ± 2.0</td>
<td>21.0 ± 1.5</td>
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<tr>
<td>Treatment period</td>
<td>19.5 ± 1.8</td>
<td>19.0 ± 1.2</td>
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17% reduction in Treated cows
8% reduction in Reference cows
Results

- **Treated cows vs. Reference cows**

  - **Control period**
  - **Treatment period**

  - **5% reduction**
  - **5% increase**

  - Data shows a significant difference in $g \text{CH}_4/\text{kg milk}$ between treated and reference cows during both control and treatment periods.
Results

- Treated cows
- Reference cows

Milk production (kg milk/day)

- Control period
- Treatment period
Discussion

• Confirmed potential of 3-NOP to reduce methane emissions
  - Previous research:
    • 30% reduction (Hristov et al., 2015)
    • 6-10% reduction (Reynolds et al., 2014)
  - Way of administration might be important
Conclusion

• **3-NOP** has great potential to reduce methane emissions
  - Reductions between 15 and 9%
    • -15% for absolute CH$_4$ emissions
    • -10% for g CH$_4$/kg milk
    • -9% for g CH$_4$/kg DMI
Thank you