Management of antibiotic use in Dairy Herds in The Netherlands

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Animal Production Systems WUR Wiebe Koops
Veterinary Practices
Data farms 2005-2012

- 40 farms; guided from 2008-2010
- 41 farms; not guided
- 13 environmental project farms; not guided

From 25 veterinary practices
Indicator for antibiotic use on herd level:

Number of daily dosages per cow per year (ADDD) indicates how many days per year an average cow in the herd under treatment of antibiotics is.

Based on veterinary invoices
Youngstock is included
Daily dosages on anual basis
8 years

Average: 5.86
Trends in guided and non guided groups in period 2005-2012

- not aware
- start political pressure
- awareness

![Graph showing trends in guided and non-guided groups from 2005 to 2012. The graph compares the number of daily dosages for guided, non-guided, and environmental groups over the years.]
Modelling adaptation
Rogers’ Diffusions of innovation theory

\[ y = \text{no daily dosages}; \ t = \text{year}; \ a = \text{start level}; \ b = \text{acceleration coeff.}; \ c = \text{level} \frac{1}{2a} \]

- **Using function** \((\text{Brown and Rothery, 1993})\):

\[ y = a \left( \frac{1}{1 + e^{-b_1(t-c_1)}} \times \frac{1}{1 + e^{-b_2(t-c_2)}} \right) \]
Split up daily dosages in health categories (avg. 8 years)

- **Mastitis**: 1.352; 23%
- **Others**: 1.599; 27%
- **Uturus**: 0.058; 1%
- **Calving**: 0.112; 2%
- **Dry-off**: 2.562; 44%
- **Calves**: 0.162; 3%
Trend in number daily dosages per cow per year

- Mastitis
- Dry cow therapy
- Other
- Total

No. daily dosages per cow per year

Year:
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
Restrictive use 3rd choice drugs fluorquinolones cephalosporines 3rd /4th gen

from 2012 on

<table>
<thead>
<tr>
<th>3rd choice drugs</th>
<th>2005-2010</th>
<th>19%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>1%</td>
</tr>
</tbody>
</table>
Do farm and farmer characteristics affect the amount of antibiotics used?

Data collected 2005-2009:

Farm and herd: 28 characteristics
- production level; health; cell count; grazing

Farmer: socio-economic factors
- relation to veterinarian
- attitude towards treatment of cow health problems
### Influence of farm technical indicators (59 farms)

<table>
<thead>
<tr>
<th>Antibiotics indicator</th>
<th>Farm factors of influence</th>
<th>Relation</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number daily dosages total</strong></td>
<td>Quota Cell count Health status</td>
<td>+</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

| Daily dosages mastitis      | Number of cows Quota Access to pasture     | –        | 0.28|
|                             |                                             | +        |     |
|                             |                                             | –        |     |

| Daily dosages dry-off       | Cellcount Calving interval Health status    | -        | -0.50|
|                             |                                             | +        |     |
|                             |                                             | -        |     |

| Daily dosages other         | Quota Milk cows Young stock/10 mk % cows removed | +        | 0.36|
|                             |                                             | -        |     |
|                             |                                             | +        |     |
|                             |                                             | -        |     |
Higher Education

Higher Antibiotic Use

Younger Farmer

Higher Health Status Herd

Higher Milk Return Per Cow

Lower Cellcount
## Increase and decrease in use

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Decreasing (20)</td>
<td></td>
<td>7,23</td>
<td>5,09</td>
<td>4,30</td>
</tr>
<tr>
<td>Increasing (20)</td>
<td></td>
<td>4,72</td>
<td>5,89</td>
<td>5,72</td>
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</tbody>
</table>
In which degree have management practices contributed to the stabilisation or reduction in use in period 2005-2012?
Likert scale 1 = no adaptation ............ 5= big adaptation done

<table>
<thead>
<tr>
<th>Herds</th>
<th>Housing</th>
<th>Hygiène</th>
<th>Milk installation</th>
<th>Selective dry cow therapy</th>
<th>Selection cows</th>
<th>Management at drying off</th>
<th>Calf rearing</th>
<th>Management in general</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreasing</td>
<td>2.50</td>
<td>2.28</td>
<td>2.11</td>
<td>2.50</td>
<td>1.94</td>
<td>2.50</td>
<td>1.94</td>
<td>2.33</td>
</tr>
<tr>
<td>Increasing</td>
<td>1.47</td>
<td>1.77</td>
<td>1.41</td>
<td>1.88</td>
<td>1.18</td>
<td>1.47</td>
<td>1.44</td>
<td>1.71</td>
</tr>
<tr>
<td>Difference</td>
<td>*</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>*</td>
<td>**</td>
<td>ns</td>
<td>*</td>
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</tbody>
</table>
Conclusions

- Daily dosages useful as tool to gain a global view of antibiotics use
- Wide variation; indicator should be based on more years to give a fair impression
- More than 65% of antibiotics to udder
- Trade off between level cell count and level antibiotics use
- Antibiotics use partly explained by farm characteristics
- Mindset of farmer and veterinarian most important
- “Better” farmers used more but were also able to adapt more quickly
Pharmaceutical Industry

Sales of pharmaceuticals in 2010 in The Netherlands

Drugs for human use total: € 6 billion
comprising 6% antibiotics (€ 360 million)

Veterinary drugs total: € 250 million
comprising 35% antibiotics (€ 87.5 million)
(>99% for food producing animals)
Total sales in some EU countries from European Medicine Authority, 2011
Trend daily dosages per cow year in veterinary practice Oosterwolde