National experience on collection and analysis of data on Antimicrobial sales and use

VetStat - the Danish experience

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EU conference
The ’Antimicrobial Threat’
Copenhagen, 1998

Recommendation:
"EU member states should implement monitoring of antimicrobial usage in addition to resistance monitoring"

Because resistance data alone do not hold the key to well targeted intervention - resistance trends are the results of forces acting together
Govermental decisions:

- 1996: Resistance monitoring - DANMAP
- 1998: Decision to establish a drug consumption database based on "end-user-data"
Data sources and detail of information

- Pharmaceutical companies (sales to wholesalers and feed mills),
  Imports
  Wholesalers

Prescription level
- Total amount by active ingredient or product
- Administration route
- Item ID: Administration route, ATCvet code, etc.
- Disease (prescription) / disease group
- Sales prices, date for prescription/sales
- National/international Defined Daily Dose

End-user level
- Applied daily dose, duration of treatment, disease, date for treatment

Farmer
Pharmacies
Feedmills
Veterinarians

National Food Institute
Data sources and detail of information - Denmark

1995-2001:
Pharmaceutical companies (sales to wholesalers and feed mills)
Collected annually by the Danish Medicines Agency

1986-1994: Retrospectively
Danish Pharmacy Association

VetStat, 2001:
Pharmacies + Feedmills + Veterinarians

National level

Prescription level

End-user level

Farmer

National Food Institute

Total amount by active ingredient or product
Species, Age group, herd ID
Item ID => Administration route, ATCvet code, etc.
Prescribed Disease/disease group
Sales prices, date for prescription/sales
National Defined Daily Dose (ADD)

Applied daily dose, duration of treatment, disease, date for treatment
Collection of veterinary usage data on prescription level - background

- All therapeutic drugs are prescription-only medicines (POM)
- (except for feed additives as coccidiostats)

- Vets and farmers can get POMs only through pharmacies (except for POM medicated feed – from the feed mills)

- Since mid-90’s pharmacies have reported individual sales to the Danish Medicines Agency (DMA)

Principles for the foundation of VetStat:
- Mandatory reporting
- "End user data" – in practice: prescription level data
- Using existing electronic data system – as far as possible!
- All therapeutic drugs
Data transfer from veterinarians

Vet practice → Invoice system company 1 → Invoice system company NN → Cattle database (industry owned) (+other species) → VETSTAT

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National Food Institute
Technical University of Denmark
VetStat – data flow

For each prescription:
- Date
- Drug ID**
- Drug quantity
- Disease category
- Prescriber ID*
- Farm ID*
- Animal species
- Age group

*relation to other databases

Danish Medicine Agency

83%(98%)

1-2%

VETSTAT - NVI
Data quality - pharmacies

- extracted automatically when the prescription is processed
- Logical validation of drug code
- Data used for billing => amounts correct

- 99.9% of sales is recorded (billing) –
- Appr 1% is missing farm ID, animal species etc. (2008) (2003: 5-7%)
  Future electronic prescriptions => extensive validation at entry

Data quality - feed mills

- Logical validation at data entry for medicated feed
- Farm-ID, Species etc. are valid for all records
- Some feedmills have been missing – historically.

Veterinarians

- Technical problem (private companies):
  - Multiplication errors in amount for individual veterinarians,
  - Data loss during transmission from vets to CDB
Trends in use of AM therapeutics for pigs, Denmark 2001-2007

Weaner pigs

Finisher pigs

Sows and piglets
Apramycin and gentamycin use and resistance in pigs (Jensen et al, JAC 2005)

<table>
<thead>
<tr>
<th>Consumption</th>
<th>OR=1.6/50 units, p&lt;0.01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (year)</td>
<td>OR=1.9/year, p&lt;0.01</td>
</tr>
</tbody>
</table>

*Note: The graph shows the consumption of Apramycin and Gentamycin, as well as the percentage of resistant isolates over time. The consumption data is presented as the number of units of antibiotic used per 1000 pigs produced, with the consumption levels increasing over time, particularly after 2001. The percentage of resistant isolates also shows an increase, peaking around 2003. The data indicates a significant association between antibiotic consumption and the prevalence of resistant isolates, with an odds ratio (OR) of 1.6 per 50 units of Apramycin, and 1.9 per year for Gentamycin, both with p-values less than 0.01.*

*Figures represent statistical significance with asterisks indicating p-values less than 0.05.*
### Prescription by disease groups in calves, 2005

<table>
<thead>
<tr>
<th>Disease Group</th>
<th>ADDkg (1000's)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Udder</td>
<td>120</td>
</tr>
<tr>
<td>Reproduction</td>
<td>30</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>150</td>
</tr>
<tr>
<td>Respiratory</td>
<td>500</td>
</tr>
<tr>
<td>Lims/CNS/skin</td>
<td>1200</td>
</tr>
<tr>
<td>Others</td>
<td>20</td>
</tr>
</tbody>
</table>

**Prescription by Disease Groups**

- **Tiamulin**
- **Penicill. /others**
- **Tetracycliner**
- **Sulf/trim**
- **Penicill, narrow**
- **Makrolider**
- **Lincosamider**
- **KombinationsA**
- **Fluorouinolon**
- **Colistin GI**
- **Cephalosporin**
- **Aminogl. GI**
- **Amfenikoler**
Association between price per "course dose" and consumption

Tetracycline consumption in pigs

- Feed medication
- Water medication
- Perenteral medication
- Antimicrobial use/pig produced
- Million pigs produced/quarter
Regional variation in consumption

ADD_{kg} per (1000 "kg-live.pig-days per region")
Conclusions

The VetStat vision:

• optimisation of drug use and prudent use guidelines.
  – surveillance, research, follow National interventions
  – guidelines, control (Danish Food Agency)

VetStat has given the potential of detailed multifactorial modelling of effect of usage on resistance
⇒ identification of consumption patterns/high risk herds.
⇒ valuable information on usage patterns and factors affecting usage

The National Defined Animal Daily Dose is superior to kg active compound – both for surveillance and research
An international DDDvet will be superior for international surveillance
Conclusions, continued

• Using existing electronic data systems
  – cheap
  – potential high data quality if correlated with billing!!!

many problems solved and lessons learnt!

THANKS FOR YOUR ATTENTION!