Measuring Antimicrobial Use
6. Stop

“Stewardship”

5. Do we still need this drug?

4. How can we prevent this disease??

3. Choose correct drug

2. Non–Antibiotic Alternative??

1. Disease Diagnosis

While asking...

Yes...

Then ask...

No...

Enter...

Yes . . .

If not...

Do we still need this drug?
Capturing Use Data

First Choice

- Coupled to cause
- Accurate
- Granular
- Current
- Easy
- Enables benchmarking

Second Choice

- Not coupled to cause
- Approximate
- Aggregate
- Historical
- Resource intensive
- Unable to benchmark
Capturing Use Data

Reality...

Coupled to cause
- Accurate
- Granular
- Current
- Easy
  Enables benchmarking

Not coupled to cause
- Approximate
- Aggregate
- Historical
- Resource intensive
  Unable to benchmark

Easy Resource intensive
Enables benchmarking
Unable to benchmark

$\text{ACD}_{kg}$ : Animal Course Dose
$\text{ADD}_{kg}$ : Animal Daily Dose
$\text{ALEA}$ : Animal Level of Exposure to Antimicrobials
$\text{ATC}$ : Anatomical Therapeutic Chemical classification system
$\text{DADD}$ : Defined animal daily dose
$\text{DAPD}$ : $\text{DADD}$ per 1,000 animals per day ; estimate of the proportion
$\text{DCD}$ : Number of DDD per 1000 physician contacts per day
$\text{DCD}_{vet}$ : Defined Course Dose for Animals
$dd$ : daily dosages
$\text{DDD}$ : Defined Daily Dose
$\text{DDD}_{vet}$ : Defined Daily Dose for Animals
Which Measurements Matter?

Numerator:
- Amount of Drug

Denominator:
- Population
- Time
**Animal Antimicrobial Use Metrics**

- **Active Substance** / 1000 animals / Year
- **Number of DC Dvet** / 1000 animals / Year
- **Number of DDDvet** / 1000 animals / Year
- **Active Substance/PCU**

- **DAPD** - Proportion animals treated with one DDDvet
- **ALEA** - % of Biomass Exposed
- **TI** = Number of DDDvet / 1000 animals

- **TI** = % of animal life expectancy treated with 1 DDDvet
### Drug Measurement Choices

<table>
<thead>
<tr>
<th>Drug (mg or mol)</th>
<th>Days Therapy (#daily doses)</th>
<th>Animals Treated (#Regimens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number At Risk</td>
<td>Live Weight</td>
<td>Number Treated</td>
</tr>
<tr>
<td></td>
<td>Meat or Milk (kg)</td>
<td></td>
</tr>
<tr>
<td>Calendar Day/Year</td>
<td></td>
<td>Production Cycles</td>
</tr>
</tbody>
</table>
Example

<table>
<thead>
<tr>
<th>Farm A</th>
<th>Farm B</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>5</td>
</tr>
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</tbody>
</table>

100 head 500 lb Calves Treated 20%

- Oxytetracycline
- Tulathromycin
Days Therapy (UDD)
**Example**

- **100 head 500 lb Calves**
- **Treated 20% with Injectable**

<table>
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</table>

- **Oxytetracycline**
  - 15 days x 10 mg/lb
- **Tulathromycin**
  - 15 days x 350 mg/head
- **Chlortetracycline**
  - 100 days x 350 mg/head
Animals Treated (UCD)

Animals Treated (DCD)

Days Therapy (UDD)

Days Therapy (DDD)
What does “Total mg” mean?
Total Use = \textit{Necessary} + \textit{Not Necessary}

\textit{Necessary}:
- Optimize Use
- Eliminate Use Without Benefit
- What WORKS?
- What does NOT work?
- Field Efficacy Studies
- Drug, Dose, Regimen, Route
- Diseased Animal PK/PD

\textit{Not Necessary}:
- Benchmarking
- Use metrics
- Sociology of Prescribing
- What does NOT work?
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