Prescribing Practices of Veterinarians in the U.S.

Paul S. Morley DVM, PhD, DACVIM
Professor of Epidemiology and Infection Control / Colorado State University
Professor of Epidemiology / Colorado School of Public Health
Director of Infection Control / James L. Voss Veterinary Teaching Hospital
How do veterinarians prescribe AMDs? What influences prescribing practices?

What do we know?
- Mostly statistics based on sales data

Limited objective information is available about:
- Reasons for treatment
- Appropriateness of treatment choices
- Factors influencing prescribing behavior
- etc.
How do veterinarians prescribe AMDs? What influences prescribing practices?

Attribution and Concern about AMR

- Use in Humans
- Use in Animals

Research Funding

- Use in Humans
- Use in Animals

My Perception
How do veterinarians prescribe AMDs? What influences prescribing practices?

- Excellent previous input applies to veterinarians
  - Examples from Sep 2017: Drs. Szymczak, Mangione-Smith, and Linder

- Sociological Factors Affecting Prescribing
  - Relationships among Clinicians
  - Risk, Fear, Anxiety, and Emotion
  - (Mis)Perception of the Problem
  - Contextual and Environmental Factors

- Client expectations (surrogate parent / economic)
- Use of diagnostics doesn’t really change sociological influences
How do U.S. veterinarians prescribe AMDs?

- 2001 Mail Survey
- AVMA veterinarians randomly selected from throughout U.S. from 7 Self-declared practice categories
  - Large animal exclusive - LGANEXC
  - Large animal predominant - LGANPRED
  - Other private practice - OTHER
  - Mixed - MIXED
  - Equine exclusive - EQUINE
  - Small Animal predominant - SMANPRED
  - Small Animal exclusive - SMANEXC
- Response = 4,652 / 12,955 (35.4%)
- Three Sections: Opinions about AMR, General AMD Prescribing Practices, and Empirical Prescribing in Specific Hypothetical Scenarios
Let’s Look at a Few Prescribing Patterns
Reasons for Antimicrobial Drug Prescriptions (past 12 mo)

Average of Percent Reported

Prophylaxis: Tx prior to potential exposure.
Metaphylaxis: Tx after potential exposure but prior to clinical disease.
Treatment: Tx of clinical disease.
Pick One Species: How Commonly Did You Treat With AMDs for Problems in These Body Systems During the Past Year?

<table>
<thead>
<tr>
<th>Average Rank</th>
<th>Bovine-Beef</th>
<th>Bovine-Dairy</th>
<th>Equine</th>
<th>Canine</th>
<th>Feline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank 1 (Most Common)</td>
<td>Respiratory Tract</td>
<td>Mammary Gland</td>
<td>Respiratory Tract</td>
<td>Integument/Skin</td>
<td>Urinary Tract</td>
</tr>
<tr>
<td>Rank 2</td>
<td>Digestive Tract</td>
<td>Respiratory Tract</td>
<td>Reproductive Tract</td>
<td>Ear and Eye</td>
<td>Respiratory Tract</td>
</tr>
<tr>
<td>Rank 3</td>
<td>Reproductive Tract</td>
<td>Reproductive Tract</td>
<td>Integument/Skin</td>
<td>Urinary Tract</td>
<td>Integument/Skin</td>
</tr>
<tr>
<td>Rank 4</td>
<td>Mammary Gland</td>
<td>Digestive Tract</td>
<td>Musculoskeletal System</td>
<td>Digestive Tract</td>
<td>Ear and Eye</td>
</tr>
<tr>
<td>Rank 5</td>
<td>Ear and Eye</td>
<td>Musculoskeletal System</td>
<td>Ear and Eye</td>
<td>Respiratory Tract</td>
<td>Digestive Tract</td>
</tr>
<tr>
<td>Rank 6</td>
<td>Musculoskeletal System</td>
<td>Urinary Tract</td>
<td>Digestive Tract</td>
<td>Musculoskeletal System</td>
<td>Musculoskeletal System</td>
</tr>
<tr>
<td>Rank 7</td>
<td>Urinary Tract</td>
<td>Ear and Eye</td>
<td>Neurological System</td>
<td>Reproductive Tract</td>
<td>Reproductive Tract</td>
</tr>
<tr>
<td>Rank 8</td>
<td>Neurological System</td>
<td>Integument/Skin</td>
<td>Urinary Tract</td>
<td>Mammary Gland</td>
<td>Neurological System</td>
</tr>
<tr>
<td>Rank 9 (Least Common)</td>
<td>Integument/Skin</td>
<td>Neurological System</td>
<td>Mammary Gland</td>
<td>Neurological System</td>
<td>Neurological System</td>
</tr>
</tbody>
</table>

Legend:
- Digestive Tract
- Mammary Gland
- Reproductive Tract
- Ear and Eye
- Musculoskeletal System
- Respiratory Tract
- Integument/Skin
- Neurological System
- Urinary Tract
Pick One Species: How Commonly Did You Treat With AMDs for Problems in These Body Systems During the Past Year?

Average Rank
- Bovine-Beef
- Bovine-Dairy
- Equine
- Canine
- Feline

Rank 1 (Most Common)
- Respiratory Tract
- Mammary Gland
- Respiratory Tract
- Integument/Skin
- Urinary Tract

Rank 2
- Digestive Tract
- Respiratory Tract
- Reproductive Tract
- Ear and Eye
- Respiratory Tract

Rank 3
- Reproductive Tract
- Reproductive Tract
- Integument/Skin
- Urinary Tract
- Integument/Skin

Rank 4
- Mammary Gland
- Digestive Tract
- Musculoskeletal System
- Digestive Tract
- Ear and Eye

Rank 5
- Ear and Eye
- Musculoskeletal System
- Ear and Eye
- Respiratory Tract
- Digestive Tract

Rank 6
- Musculoskeletal System
- Urinary Tract
- Digestive Tract
- Musculoskeletal System
- Musculoskeletal System

Rank 7
- Urinary Tract
- Ear and Eye
- Neurological System
- Reproductive Tract
- Reproductive Tract

Rank 8
- Neurological System
- Integument/Skin
- Mammary Gland
- Mammary Gland
- Neurological System

Rank 9 (Least Common)
- Integument/Skin
- Neurological System
- Mammary Gland
- Neurological System
- Neurological System

Take Home Message: Diseases / Reasons for Prescribing are Very Different for Different Species
How Often Were Samples Submitted for Bacteriology In the Previous 12 Months?

Less Use of Culture to Guide Prescribing in Mixed Practices?
Empirical Prescribing Scenarios

- Participants must have prescribed AMDs in the past year.
- Select one species as context for answering questions about empirical prescribing in hypothetical scenarios:
  - Young adult with pneumonia of primary bacterial etiology.
  - Young adult with viral upper respiratory infection without secondary infection or pulmonary involvement.
  - Juvenile with acute viral diarrhea and no fever.
  - Intestinal obstruction requiring surgery.
  - Abscess of skin, subcutis, or underlying muscle.
  - Bacterial cystitis.
- Asked to provide specific drug, route, & dosage (open ended)
If this type of case was seen in the past 12 months...
How Likely Were Vets to Treat with AMDs?

Primary Bacterial Pneumonia

- Beef: n=375
- Dairy: n=428
- Horse: n=717
- Dog: n=1338
- Cat: n=165

Uncomplicated Viral Upper Respiratory Disease

- Beef: n=292
- Dairy: n=362
- Horse: n=781
- Dog: n=1524
- Cat: n=254

Acute Viral Diarrhea Without Fever

- Beef: n=303
- Dairy: n=321
- Horse: n=457
- Dog: n=1503
- Cat: n=167
Take Home Messages:

• Background and Experience Affected Interpretation and Responses – even when these differed from instructions.

• Room for improvement in decision to treat in some patients.
What About Patterns in Drug Selection?
**Cat – Empirical Treatment Scenarios**

**Pneumonia with Primary Bacterial Etiology (n=254)**
- CEPH 1ST: 7%
- FLUORO: 23%
- Pen-Analog POTENT PEN: 67%

(93% one drug)

**Uncomplicated Viral Upper Respiratory Disease (n=186)**
- TETRACYC: 2%
- CEPH 1ST: 3%
- FLUORO: 2%
- Pen-Analog POTENT PEN: 85%

(97% one drug)

**Acute Viral Diarrhea Without Fever (n=191)**
- CEPH 1ST: 6%
- FLUORO: 3%
- OTHER: 52%
- Pen-Analog POTENT PEN: 21%
- POTENT PEN: 67%
- PEN: 5%
- SULFA: 8%
- OTHER: 52%

(95% one drug)
Dog - Empirical Treatment Scenarios

Pneumonia with Primary Bacterial Etiology (n=254)
- SULFA 8%
- CEPH 1ST 21%
- FLUORO 20%
- Pen-Analog 43%
- POTENT PEN (93% one drug)

Uncomplicated Viral Upper Respiratory Disease (n=186)
- TETRACYC 8%
- SULFA 10%
- CEPH 1ST 12%
- FLUORO 4%
- Pen-Analog 62%
- POTENT PEN (95% one drug)

Acute Viral Diarrhea Without Fever (n=191)
- OTHER 24%
- AMINO 11%
- CEPH 1ST 10%
- CEPH EXT 2%
- FLUORO 4%
- PEN 7%
- Pen-Analog 32%
- POTENT PEN (85% one drug)

- Amino
- Ceph-1
- Ceph-2
- Ceph-Ext
- Phen
- Fluor
- Linc
- Macr
- Pen
- Pen-Analog
- Sulf
- Tet
Horse – Empirical Treatment Scenarios

Pneumonia with Primary Bacterial Etiology (n=254)

- **PEN** 27%
- **AMINO** 21%
- **SULFA** 30%
- **CEPH EXT** 12%
- **OTHER** 1%
- **TETRACYC** 2%
- **POTENT PEN** 3%

(76% one drug)

Uncomplicated Viral Upper Respiratory Disease (n=186)

- **SULFA** 65%
- **TETRACYC** 5%
- **AMEX** 5%
- **CEPH EXT** 3%
- **OTHER** 14%
- **CEPH 1ST** 2%

(95% one drug)

Acute Viral Diarrhea Without Fever (n=191)

- **AMINO** 34%
- **CEPH 1ST** 2%
- **SULFA** 13%
- **OTHER** 14%
- **PHENICOL** 12%

(78% one drug)
Beef Cattle - Empirical Treatment Scenarios

**Pneumonia with Primary Bacterial Etiology (n=254)**
- TETRACYC 18%
- AMINO 2%
- CEPH EXT 8%
- PHENICOL 32%
- MACRO 27%
- FLUORO 8%
(97% one drug)

**Uncomplicated Viral Upper Respiratory Disease (n=186)**
- TETRACYC 27%
- CEPH EXT 8%
- PHENICOL 22%
- FLUORO 4%
- MACRO 23%
- PEN 8%
(95% one drug)

**Acute Viral Diarrhea Without Fever (n=191)**
- TETRACYC 5%
- AMINO 13%
- PHENICOL 18%
- SULFA 35%
- TETRACYC 5%
- CEPH EXT 19%
- FLUORO 5%
(95% one drug)
Selection of Drugs -
Additional conclusions and suppositions:

- In addition to perceived efficacy of treatment:
  - Convenience / ease of use is a critical driver of product choice.
    - Drug formulations providing multiple-day therapy from single dose.
    - Oral forms that are acceptable to companion animals in outpatient situations.
    - All else being equal, cost is a critical factor.
  - Question: What types of AMDs and formulations more likely to be developed and marketed for veterinary use?

- Differences among vets treating different species:
  - Peer-related, and Risk/Anxiety-related influences have strong impact.
Veterinarian’s Opinions About AMR
How important are these aspects of AMD use as contributors to AMR?

### Use in Humans

- Patient Compliance
- Patients Expect AMD
- Treatment of Non-Bacterial Dz

### Use in Animals

- Companion Animals
- Horses
- Food Animals

#### Percent of Responses

- Not Important
- Somewhat Important
- Important
- Very Important

#### Use Aspects

- OTC Drug Use
- Vet Prescribing
- Client Compliance
How important are these aspects of AMD use as contributors to AMR?

Is there data to support the conclusion that AMD use in Companion Animals and Horses is less problematic?
Impact of AMD Use in Animals on Public Health:

“Does AMD Prescribing by Veterinarians …”

… POSITIVELY affect public health?

… NEGATIVELY affect public health?

… for GROWTH PROMOTION in food animals NEGATIVELY affect public health?

… for DISEASE PREVENTION in food animals NEGATIVELY affect public health?
“Do Your AMD Prescribing Practices Lead to the Development of Antimicrobial Resistant Bacteria?”

~80% Said Rarely or Never
2017-2018 Study: Veterinary Prescribing of Antimicrobial Drugs in Food Producing Animals

- Dan Taylor, Jennifer Martin, Keith Belk, Paul Morley, Elaine Scallan
  - Colorado School of Public Health
  - Colorado State University
- Beef Cattle, Dairy Cattle, Growing Pigs, Turkeys
- Targeting veterinarians prescribing in populations
- Responses about Empirical Use in Standardized Scenarios
- Evaluate Prediction/Correlation With Actual Prescribing Using Electronic Diaries
Thank You

Email: Paul.Morley@ColoState.edu
Web: MEG.ColoState.edu
Office: 970-297-0374
Cell: 970-219-6089