Antibiotic Stewardship for Companion Animal Practice

Jeff Bender DVM, MS DACVPM
Hospital Epidemiologist
University of Minnesota
College of Veterinary Medicine

It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.
Outline

• Overview of antimicrobial resistance in companion animals
• Stewardship programs
• AVMA Task Force activities
• Educational and outreach
Drug Resistant Infections in Companion Animals

- Methicillin-resistant *Staphylococcus pseudintermedius* and *Schlieferi*
- Methicillin-resistant *Staphylococcus aureus*
- MDR *E. coli* and *Klebsiella*
Companion Animals and Antimicrobial Resistance

- Pets, especially cats and dogs are potential sources of spread of antimicrobial resistance due to common use of antimicrobials and their close contact with humans.

Companion Animals and Antimicrobial Use

- In 2002, companion or non-food animals accounted for 37% of the pharmaceutical products sales in the EU
- Lack of bacterial identification and antimicrobial susceptibility
- Pets often receive medically important antimicrobials (i.e. cephalosporins or fluoroquinolones)

Clinically related *Staphylococcus* sp. identified through the Dermatology Service University of Minnesota VMC, 2008-2013
Dog Park Study
Minneapolis/St. Paul (n=22)

50 (27%) of 186 samples were *E. coli* positive

- 46 (25%) of *E. coli* positive samples were AmpC positive
- 4 (2%) of *E. coli* positive samples were extended spectrum beta-lactamase (ESBL) producers
- Many of these isolates were multidrug resistant
## Veterinary Medical Center ICU Survey

<table>
<thead>
<tr>
<th>Source</th>
<th># of <em>E. coli</em> Isolates</th>
<th>Pansensitive&lt;sup&gt;1&lt;/sup&gt; n (%)</th>
<th>MDR&lt;sup&gt;2&lt;/sup&gt; n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Practice</td>
<td>102</td>
<td>70 (69%)</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>ICU</td>
<td>113</td>
<td>42 (37%)</td>
<td>42 (37%)</td>
</tr>
</tbody>
</table>

1 Sensitive to all antimicrobials on the panel
2 Multi-drug resistant   Chi-square = 37.9; p<0.0001
Selective Pressures
(The Why)

• Regardless of use (appropriate or inappropriate), the selective pressure of antibiotics underscores the importance of prudent use to slow the development of resistance

Fishman N. AJIC 2006
Inappropriately Prescribed, Why?

• Absence of bacterial infection or an indication for prophylaxis

• Violation of one of the following “D’s”
  – The right Dose
  – The right Drug
  – The best route of Delivery
  – Attention to De-escalation
  – The appropriate Duration of administration
Stewardship

• “The primary purpose of stewardship is to optimize clinical outcomes while minimizing unintended consequences of antimicrobial use, including toxicity, the selection of pathogenic organisms, and the emergence of resistance.”

Fine TM et. al. 2014 Clinic Infect Disease
Commonly Used Tactics

- Clinician education
- Formulary optimization
- Antibiotic use restrictions
- Prospective audit with intervention and feedback
- Optimization of dose administration
- Streamlining: de-escalation and elimination of redundant therapy
- Early switch from IV to oral
- Appropriate duration of antibiotic therapy
- Clinical guidelines with site specific treatment pathways
General Recommendations

• Treat infection not colonization
• Ideally, culture before Abx treatment, but provide Abx as soon as possible
• Evaluate patient daily, especially within 48-72 hours (take routine antibiotic “time out”)
Antibiotic “time out”

- Re-evaluate Abx therapy:
  - Clinical response
  - Microbiologic data
    - Organism
    - Local antibiogram
    - Isolate susceptibility
AVMA Task Force for Antimicrobial Stewardship in Companion Animal Practice

- Understand practitioner prescribing behaviors
- Understand laboratory practices
  - Support regional/hospital antibiograms
- Encourage development of practice guidelines
- Promote educational programs
  - Do’s and Don’ts recommendations
Survey of Practitioner Prescribing Practices

• Need to understand the knowledge, attitudes and beliefs of veterinarians
• In a 2011 University of Minnesota survey of companion animal veterinarians
  – 85% did not perceive antimicrobial resistance as a problem in their daily clinical practice
Survey of Influences of Choosing an Antibiotic

• The most influential reasons for choosing a specific antimicrobial were:
  – owner finances (68%)
  – antimicrobial resistance concerns (64%)
  – side effects (52%)
  – client expectations (51%).

Voss and Bender Unpublished
Veterinarian Practices

• 30% of practitioners reported routinely using antimicrobials for clean surgical procedures, such as ovariohysterectomies, castrations, or uncomplicated mass removal

• Upcoming AVMA survey

Voss and Bender Unpublished
Influences of Laboratory Standards

- Does the laboratory you use follow quality assurance standards – Clinical and Laboratory Standards Institute (CLSI)?
- AVMA sponsored survey of laboratory practices and how they report back to practitioners
## Regional Antibiogram

### Canine 2012-2013 Percent Susceptible

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Escherichia coli</th>
<th>Klebsiella pneumonia</th>
<th>Staphylococcus aureus</th>
<th>Proteus mirabilis</th>
<th>Escherichia aerogenes</th>
<th>Enterobacter cloacae</th>
<th>Proteus vulgaris</th>
<th>Citrobacter diversus</th>
<th>Citrobacter freundii</th>
<th>Enterobacter</th>
<th>Citrobacter koseri</th>
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</thead>
<tbody>
<tr>
<td><strong>Maximum # Tested</strong></td>
<td>25</td>
<td>3</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td><strong>Amoxicillin/Clavulanic Acid</strong></td>
<td>34</td>
<td>1</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td><strong>Ampicillin</strong></td>
<td>-</td>
<td>-</td>
<td>0</td>
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<tr>
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<td></td>
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<tr>
<td><strong>Cefazolin</strong></td>
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<td>0</td>
<td>0</td>
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<td><strong>Ceftazidime/Meropenem</strong></td>
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[Marshfield Labs](https://www.marshfieldlabs.com)
<table>
<thead>
<tr>
<th>Antimicrobial</th>
<th>2010-2011 Canine</th>
<th>2012 Canine</th>
<th>2013 Canine (Jan-early Dec)</th>
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<tr>
<td><strong>Staphylococcus Intermedius ear</strong></td>
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<tr>
<td>Ampicillin</td>
<td>0.07% (n=14)</td>
<td>22% (n=12)</td>
<td>17.2% (n=29)</td>
</tr>
<tr>
<td>Amoxicillin/Clavulanate</td>
<td>28.6% (n=14)</td>
<td>68.8% (n=32)</td>
<td>82.8% (n=29)</td>
</tr>
<tr>
<td>Amikacin</td>
<td>N/A</td>
<td>78.1% (n=32)</td>
<td>79.3% (n=29)</td>
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<tr>
<td>Cefazolin</td>
<td>N/A</td>
<td>68.8% (n=32)</td>
<td>86.2% (n=29)</td>
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<tr>
<td>Cefoxacin</td>
<td>N/A</td>
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<td>86.2% (n=29)</td>
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<tr>
<td>Ceftazidime</td>
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<td>68.8% (n=32)</td>
<td>86.2% (n=29)</td>
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<tr>
<td>Ceftriaxime</td>
<td>N/A</td>
<td>78.9% (n=19)</td>
<td>N/A</td>
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<td>Cefotaxim</td>
<td>22.6% (n=14)</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>0% (n=0)</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Clindamycin</td>
<td>43% (n=7)</td>
<td>78.1% (n=32)</td>
<td>75.9% (n=29)</td>
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<tr>
<td>Chloramphenicol</td>
<td>83.3% (n=6)</td>
<td>100% (n=32)</td>
<td>82.8% (n=29)</td>
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<td>Doxycycline</td>
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<td>62.5% (n=32)</td>
<td>75.9% (n=29)</td>
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<td>Enrofloxacin</td>
<td>27.3% (n=11)</td>
<td>78.1% (n=37)</td>
<td>86.2% (n=29)</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>28.6% (n=6)</td>
<td>78.1% (n=32)</td>
<td>72.4% (n=29)</td>
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<tr>
<td>Gentamicin</td>
<td>71.4% (n=14)</td>
<td>68.8% (n=32)</td>
<td>60% (n=29)</td>
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<td>Levofloxacin</td>
<td>0% (n=0)</td>
<td>N/A</td>
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<tr>
<td>Linezolid</td>
<td>100% (n=6)</td>
<td>N/A</td>
<td>N/A</td>
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<td>Marbofloxacin</td>
<td>43% (n=14)</td>
<td>78.1% (n=32)</td>
<td>93.1% (n=29)</td>
</tr>
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<td>Mupirocin</td>
<td>N/A</td>
<td>100% (n=5)</td>
<td>100% (n=5)</td>
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<td>Neomycin</td>
<td>27.3% (n=11)</td>
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<td>Orbifloxacin</td>
<td>27.3% (n=11)</td>
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<td>Oxacillin</td>
<td>79% (n=14)</td>
<td>68.8% (n=32)</td>
<td>86.2% (n=29)</td>
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<td>Penicillin</td>
<td>33.3% (n=3)</td>
<td>21.9% (n=32)</td>
<td>15.6% (n=32)</td>
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<td>Rifampin</td>
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<td>100% (n=32)</td>
<td>100% (n=29)</td>
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<td>Tetracycline</td>
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<td>N/A</td>
<td>N/A</td>
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<td>Trimethoprim/ Sulfamethoxazole</td>
<td>43% (n=4)</td>
<td>75% (n=12)</td>
<td>89.7% (n=29)</td>
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<tr>
<td>Vancomycin</td>
<td>100% (n=4)</td>
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<td>N/A</td>
</tr>
</tbody>
</table>

**VMC ANTIBIOTERM 2010-2013**

A reference guide for clinicians choosing appropriate antibiotics prior to obtaining culture and sensitivity results.

Susceptibilities were determined using isolation information from Marshfield Laboratories. This information is provided only as a guide to empiric therapy; clinical circumstances should be considered and therapy tailored accordingly.

Consult the Pharmacist, Lab, or Infection Control for questions regarding this antibiogram.

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Guidelines for the diagnosis and antimicrobial therapy of canine superficial bacterial folliculitis (Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases)

Andrew Hiller*, David H. Lloyd†, J. Scott Weese‡, Joseph M. Blondeau§, Dawn Booth‡, Edward Breitschwerdt¶, Luca Guardabassi‖, Mark G. Papich¶¶, Shelley Rankin¶¶¶, John D. Turnidge†† and Jane E. Sykes‡‡

*College of Veterinary Medicine, The Ohio State University, Columbus, OH 43210, USA
†Royal Veterinary College, University of London, North Mymms, Hertfordshire, AL7 1TB, UK
‡Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada N1G 2W1
§College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Canada S7N 5C9
¶College of Veterinary Medicine, Auburn University, Auburn, AL 36849, USA
§§College of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606, USA
‖University of Pennsylvania School of Veterinary Medicine, Philadelphia, PA 19104, USA
¶¶Animal and Children’s Hospital, North Adelaide, SA 5008, Australia
¶¶¶University of California, Davis, CA 95616, USA
††Correspondence: Andrew Hiller, 4027 Northcraft Dr, Dublin, OH 43017, USA. Email: Andrew.Hiller@osu.edu

Background – Superficial bacterial folliculitis (SBF) is usually caused by Staphylococcus pseudintermedius and routinely treated with systemic antimicrobial agents. Infection is a consequence of reduced immunity and predisposition with alterations in the skin barrier and underlying diseases that may be difficult to diagnose and resolve, thus, SBF is frequently recurrent. Therefore, repeated treatment is necessary. The emergence of multiresistant bacteria, particularly meticillin-resistant S. pseudintermedius (MRSP), has focused attention on the need for optimal management of SBF.

Objectives – Providing of an internationally available resource guiding practitioners in the diagnosis, treatment, and prevention of SBF.

Development of the guidelines – The guidelines were developed by the Antimicrobial Guidelines Working Group of the International Society for Companion Animal Infectious Diseases, with consultation and advice from the other American and European Colleges of Veterinary Dermatology. They describe optimal methods for the diagnosis and management of SBF, including isolation of the causative organism, antimicrobial susceptibility testing, selection of antimicrobial drugs, therapeutic protocols and advice on infection control. Guidance is given for both topical and systemic modalities, including approaches suitable for MRSP. Systemic drugs are classified in three tiers. Tier one drugs are used when diagnosis is clear cut and risk factors for antimicrobial drug resistance are not present. Tier two drugs are used and antimicrobial susceptibility tests are mandatory. Tier three includes drugs reserved for highly resistant infections; their use is strongly discouraged and, when necessary, they should be used in consultation with specialists.

Conclusion and clinical importance – Optimal management of SBF will improve antimicrobial use and reduce selection of MRSP and other multiresistant bacteria affecting animal and human health.

Introduction

In dogs, superficial bacterial folliculitis (SBF) is the commonest form of canine pustulosis, which in turn, is the principal reason for antimicrobial use in small animal practice.1–3 As we face the problem of increasing antimicrobial resistance in both human and veterinary medicine, there is a pressing need for prudent and more focused use of antimicrobial drugs.4–6 In the human field, adoption of guidelines for antimicrobial use at the hospital level has shown to improve prescribing practices significantly, both alone and as part of broader antimicrobial stewardship programmes.7–10 Similar guidelines for diagnosis and management of urinary tract infections were created by a Working Group of the International Society for Companion Animal Infectious Diseases. While objective data are currently limited, these guidelines provide information to assist in the diagnosis and management of lower urinary tract infections in dogs and cats.

1.1. Introduction

Urinary tract disease is commonly encountered in dogs and cats and accounts for significant use (and presumably also overuse and misuse) of antimicrobials. Improper therapy use is associated with a variety of patient health (e.g., failure to resolve infection), economic (e.g., need for repeated or prolonged treatment), public health (e.g., antimicrobial resistance) and regulatory (e.g., antimicrobial use) concerns. In human medicine, antimicrobial use guidelines such as those developed by the Infectious Diseases Society of America (IDSA) are widely respected and provide excellent guidance to physicians on management of various infectious diseases, including urinary tract infections (UTI) [1,2]. Such guidelines can be directly used or form the basis of hospital-level antimicrobial use guidelines. The impact of national or international guidelines is difficult to assess, but implementation of antimicrobial use guidelines at the
Educational Programs

- “Get Smart”
- State sponsored – Health Departments
- Web-based training modules
- Client focused
“Get Smart” Program
Centers for Disease Control and Prevention
State Sponsored Programs

Stop Antibiotic Misuse in Minnesota
Minnesota Antibiotic Resistance Collaborative (MARC)

Antibiotic Facts
- Learn about antibiotics, preventing antibiotic-resistant infections, and appropriate use of antibiotics.
- What Are Antibiotics? | Prevent Antibiotic-Resistant Infections | Appropriate Use of Antibiotics

Illnesses and Antibiotic Resistance
- Find out about viruses and bacteria, specific illnesses, and antibiotic-resistant diseases.
- Virus vs Bacteria | Will Antibiotics Help? | Staph Infections and MRSA

Prevent Illness
- Stop the spread of germs if you are sick and how you can stay healthy.
  - Stay Healthy | Cover Your Cough | Handwashing | Get Vaccinated

Print Materials
- View, download, or order educational print materials.
  - Posters | Flyers and brochures | Prescription pads | Other Items | Cover Your Cough | Educational resource order form

For Fun!
- IQ Quiz | Science Museum Exhibit

More information for...
- Health Care Professionals
- Child Care Professionals
- Long Term Care Professionals

Featured Materials:
- Cough, Child, and Flu Shopping List
- Cover Cough
- Bacteria Blaster
- Handwashing How To
- S.A.M.S. Coloring Book
- Prescription For Your Child’s Viral Infection
Overview

An introduction to the topic of antimicrobial resistance and the responsibility of veterinarians to keep antibiotics working for future generations of animals and people. Read more.

http://amrls.cvm.msu.edu/
Clinical Modules

ANTIMICROBIAL RESISTANCE LEARNING SITE

PET ANIMALS

Overview  Pharmacology  Microbiology  Public Health  Animated  Species Specific  Support

you are here: home / species specific / pet animals / canine pyoderma teaching module

1. Antibiotics Use for Canine Pyoderma

Objectives:

1. Learn how antibiotics are frequently used in treatment of canine pyoderma, and what factors need to be considered when choosing antibiotic therapy.
2. Learn the underlying causes of canine pyoderma and possible diagnostic and treatment options.
3. Learn the importance of bacterial culture and susceptibility testing, and effective communication with the client.
4. Learn how animal and human health can both be affected by antibiotic resistance.
Antimicrobial Therapy – “On Target”

General Considerations for Judicious Antimicrobial Use

• Consider and “rule-out” non-bacterial causes
• Consider other therapeutic options
• Utilize culture and sensitivity results
• Refer to published treatment guidelines
• Monitor treatment response and client compliance
• Take a “time out” before adding, switching, or changing antibiotic treatments
GASTROINTESTINAL DISEASE

- Avoid antimicrobials in healthy pets with diarrhea
- Provide supportive therapy
- Make a diagnosis before prescribing antimicrobials
- Fecal smears are not reliable for diagnosing enteropathogenic infections
Respiratory Disease

- Avoid antimicrobials for acute, uncomplicated URT disease
- Perform additional diagnostics for complicated disease or chronic respiratory disease
Urinary Tract Disease

- Avoid diagnosis based on free-catch urine samples
- Do not routinely prescribe antimicrobials for a cat <10 years of age with lower urinary tract signs
- Confirm infections with quantitative cultures
DENTAL DISEASE

- Avoid antimicrobial use for routine dental procedures in healthy patients
- Choose antimicrobials with activity against known oral pathogens
- Antimicrobials are not a substitute for appropriate dental management
DERMATOLOGIC DISEASE

- Perform cytology of lesions in all cases of suspect pyoderma
- Perform microbial culture and sensitivity as well as additional diagnostics to investigate recurrent or refractory pyoderma
- Use topical shampoos or antimicrobials when possible
Peri-Operative Use

• Adhere to best practices for infection control in the operating room
• Avoid prophylactic antimicrobials for routine surgeries
• If prophylactic antimicrobials are used, administer them IV 30 – 60 minutes before surgery and do not administer them beyond the perioperative period
Vector-Borne Disease

- Avoid antimicrobial therapy in animals that are seropositive for vector-borne pathogens; seropositivity does not imply active infection
- Recommend preventive treatments for ectoparasite control to prevent infection and spread of vector-borne pathogens
Others

- Canadian Veterinary Medical Association CVMA Antimicrobial SmartVet
  - http://www.canadianveterinarians.net/practice-economics/antimicrobial-smartvet

- Clinic antibiogram App
VMC Antimicrobial Stewardship Team

- Hospital epidemiologist
- Clinical pharmacist
- Microbiologist
- Infection control practitioner
- Clinicians (Small animal, Large Animal)
Summary

• Antimicrobial resistance is a “Grand Challenge”
• Clinicians need to be aware and encourage good antimicrobial stewardship practices
Acknowledgements

Task Force Members

Tamar F. Barlam MD, MSc., IDSA
Reilly P. Glore DVM, AAHA
Nigel Gumley DVM, Canadian Veterinary Medical Association,
Sharon E. Grayzel DVM, MPH Columbia Veterinary Center
Christine Hoang, DVM, MPH, AVMA
Mike J. Murphy DVM, PhD, Food and Drug Administration
Mark G. Papich DVM, MS North Carolina State University
Jane E. Sykes BVSc(Hons), PhD, DACVIM (SAIM). University of California, Davis
Jeffrey L. Watts PhD. Animal Health Institute. Zoetis, Anti-Infectives Research
Jean M. Whichard DVM, PhD. Centers for Disease Control and Prevention
Questions?