The Role of Academic Veterinary Medicine in Combating Antimicrobial Resistance

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NIAA
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• Global Health Security Agenda
  • Human, animal, agricultural, food, environmental aspects – One Health approach

• WHO Global Action Plan
  • Whole-of-Society, One Health Approach

• National Action Plan
  • Strengthen national One Health surveillance efforts to combat resistance
• Agriculture and Veterinary Medical Colleges
  • U.S., Canada, Mexico

• Government
  • CDC, FDA, USDA

• Industry
  • Animal Health Institute
  • National Cattlemen’s Beef Association
  • National Chicken Council
  • Pork Producers Council
• North America’s oldest higher education association (1887)
• Represents 237 public universities
  • All 50 U.S. states
  • Canada, Mexico
• APLU member institutions annually:
  • Enroll 6.1 M undergraduate and graduate students
  • Award 1.1 M degrees
  • Employ 1.3 M faculty and staff
  • Conduct $41 B in university based research

Focused on increasing degree completion and academic success, advancing scientific research, and expanding engagement, APLU undertakes a wide array of projects and initiatives along with its members while providing a forum for public higher education leaders to work collaboratively to better meet the challenges and opportunities facing public universities.
• 49 Veterinary Medical Colleges accredited by AVMA-COE
  • 30 in the United States
  • 5 in Canada
  • 6 in Europe
  • 5 in Australia and New Zealand
  • 3 in Mexico and the Caribbean

• Key mission areas
  • Education
  • Research
  • One Health

The member institutions of the Association of American Veterinary Medical Colleges promote and protect the health and well being of people, animals and the environment by advancing the profession of veterinary medicine and preparing new generations of veterinarians to meet the evolving needs of a changing world.
Charge to the Task Force

• Propose recommendations and activities for academic institutions related to production agriculture
  • Education & Learning
  • Research & Discovery
  • Outreach & Engagement

• Advise and assist government agencies and the Interagency Task Force on Combating Antimicrobial Resistant Bacteria (CARB)
• Students at three levels
  • Novice
  • Intermediate
  • Advanced

• Competencies across six domains
  • Healthy animals
  • Global impact
  • Antimicrobial stewardship
  • Antimicrobial drugs and antimicrobial resistance
  • Roles and relationships
  • Critical analysis
<table>
<thead>
<tr>
<th>Developmental Level</th>
<th>Novice (4H/FFA/Youth)</th>
<th>Developing (animal science undergraduate or graduate)</th>
<th>Advanced (veterinary medical students)</th>
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<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Define antimicrobial drug stewardship</td>
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<td><strong>Societal resource</strong></td>
<td>Recognize that there is increasing societal concern about bacterial resistance to antimicrobials and potential reduction or loss of effectiveness</td>
<td>Recognize that there is increasing societal concern about bacterial resistance to antimicrobials and potential reduction or loss of effectiveness. Cite examples of antimicrobial stewardship that might be helpful.</td>
<td>Describe specific examples of resistance in pathogenic and non-pathogenic bacteria that are commonly found in a specific animal species and in important human pathogens</td>
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<td><strong>Common uses of antimicrobial drugs</strong></td>
<td>Identify common situations in which antimicrobials are needed to address animal health and welfare and minimize suffering</td>
<td>Recognize that there are common situations in which antimicrobials are needed to address animal health and welfare and minimize suffering and those in which antimicrobial drugs will not make a difference</td>
<td>Distinguish common or important situations in which antimicrobials are needed to address animal health and welfare and minimize suffering, and those in which antimicrobial drugs will not make a difference</td>
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<td><strong>Complexity of bacterial infections</strong></td>
<td>Recognize that infectious diseases can be caused by a variety of microorganisms, and that disease risks can vary among different animals</td>
<td>Recognize that infectious diseases can be caused by a variety of microorganisms, and describe how disease risks can vary among different animals</td>
<td>Describe the epidemiology and pathogenesis of the most common and the most significant bacterial disease challenges in major domestic species of animals; describe the organism or patient factors that may impact treatment options</td>
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<td><strong>Need for antimicrobial drugs</strong></td>
<td>Recognize that there may be a need to use antimicrobial drugs in cases of infectious disease where subsequent health and life or lives of animals are threatened</td>
<td>Recognize that there is a need to use antimicrobial drugs in cases of infectious disease where subsequent health and life or lives of animals are threatened, and understand that antimicrobial drugs may not be required</td>
<td>Explain to animal owner or manager why an antimicrobial drug is or isn’t recommended based upon the perceived need and benefit to the animal, including differentiating an infection requiring treatment and a contaminant not requiring treatment</td>
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The One Health Interprofessional Education Initiative seeks to integrate One Health concepts into the degree programs of health professions students through the case study method of instruction.

To accomplish this goal the Association of American Veterinary Medical Colleges (AAVMC) convened a Working Group in collaboration with the Association for Prevention Teaching and Research (APTR) and the Healthy People Curriculum Task Force (HPCTF). 15 case studies were selected for publication, and they are listed below.
Of Dogs and Men: Methicillin-resistant *Staphylococcus aureus*

Brian Lubbers and Carey-Ann Burnham

In 2013, the Centers for Disease Control and Prevention listed methicillin-resistant *Staphylococcus aureus* as a Serious Antibiotic Resistance Threat in the United States. Although MRSA was traditionally considered a nosocomial pathogen, community-associated infection, especially skin and soft tissue infection, is increasingly common....

Using a directed case study approach, this case will enhance student understanding of the basic microbiology and mechanisms of resistance for MRSA, potential diagnostic measures, and epidemiological challenges associated with MRSA. The interplay of this organism between companion animals and humans, and infection prevention measures will be discussed with emphasis on the interaction that is needed between human and veterinary medical professionals in resolving recurrent household MRSA infections.
These open-source teaching modules are designed for integration into existing veterinary school courses regarding: Pharmacology, Microbiology, Public Health, and Species-specific medicine.

Contributors include Michigan State University, the University of Minnesota and the Centers for Disease Control and Prevention.
Education and Outreach

Develop key messages and communication strategy

- Producers and veterinarians
  - FDA Veterinary Feed Directive and other guidance
  - Disease prevention strategies
  - Antimicrobial stewardship
- Agriculture youth groups
  - 4-H, FFA
- General public
Basic and Applied Research

- Host immune response function
- Transfer of resistance across species and in the environment
- New antibiotics and alternative products
- Metagenomic analysis of isolates
- Point-of-care diagnostic tests

Studies and Methodology

- Evaluate the impact of eliminating antibiotics for growth promotion
  - Incidence of disease, animal welfare
  - Changes in resistance patterns
- Develop models and metrics to predict attributable risk to human health
- Evaluate stewardship programs and assess best practices to reduce antibiotic usage
- Characterize incentives and motivations for antibiotic use across agricultural systems

How to change behavior
Provide global leadership to sustain and preserve the use of antimicrobials using a One Health approach

- Build a coalition
  - Academia, Industry, Government, NGOs, Producers
- Leverage existing resources from commodity groups and other stakeholders
- Engage stakeholders through meetings, symposia, outreach
- Address lack of access to veterinarians in rural areas