AMR AND MDROS IN COMPANION ANIMALS

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INTRODUCTION

- Current State
- Animal Health Impacts
- Economic Impacts
- Human Health Impacts
- Challenges
- Transmission
- Surveillance

CURRENT STATE

- MDROs and AMR pose a growing threat in companion animals
- Increasing cases are reported, indicating a concerning trend
- Veterinary clinics are facing challenges in treating infections effectively
- Urgent action is needed to address this escalating problem
- Companion animals are not immune to this global threat
- Understanding the factors contributing to AMR is crucial
- Collaborative efforts are needed to combat AMR

RISING THREAT OF MDROS IN COMPANION ANIMALS

- **Increased Veterinary Antibiotic Use**:
  - Misuse and overuse in companion animals heighten resistance risks, underscoring the need for judicious antibiotic application.
- **Transmission Dynamics**:
  - Close human-animal interactions facilitate bidirectional transmission of MDROs, complicating treatment landscapes for both parties.
- **Environmental Factors**:
  - High-density living conditions in shelters or kennels amplify MDRO transmission risks.
  - Global animal movements introduce resistant strains across borders, challenging containment efforts.
- **Challenges in Veterinary Practices**:
  - Compliance with treatment protocols is crucial to prevent resistance. However, lapses in veterinary infection control can perpetuate MDRO spread.
  - Advances in veterinary care increase exposure to hospital-associated infections (HAIs) through more frequent use of invasive procedures and devices.
- **Consequences of Resistance**:
  - Emerging resistance mechanisms reduce effective treatment options, potentially increasing morbidity and mortality in companion animals.

EXTENT OF THE PROBLEM

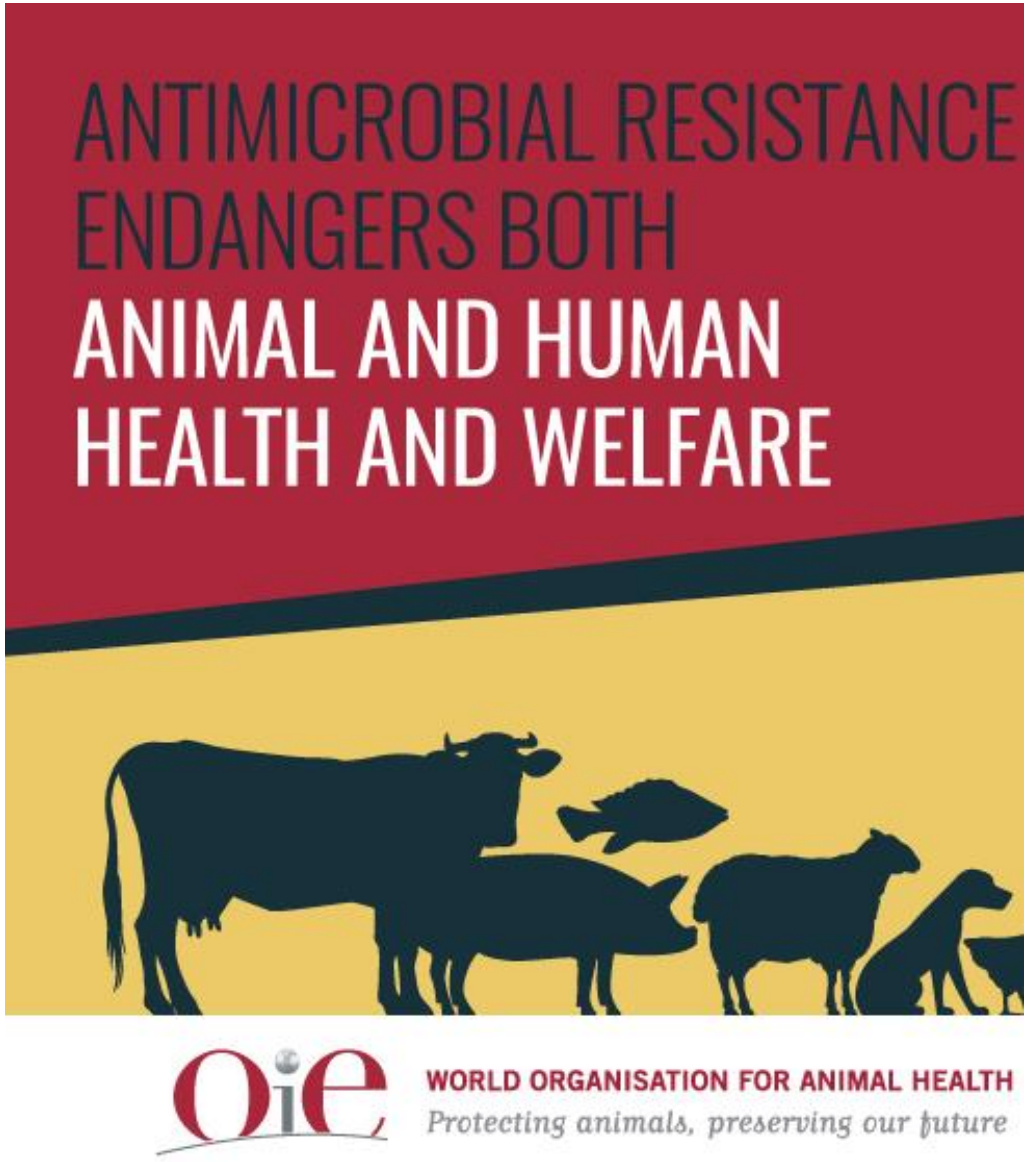
- Lack of Standardized Surveillance Systems
- Fragmented Veterinary Practices
- Differences in Diagnostic Approaches
- Geographical Variability
- Limited Data Sharing and Collaboration
- Regulatory and Privacy Challenges
- Funding and Resource Constraints
- Variable Antibiotic Use Practices
- Cross-Species Considerations

ANIMAL HEALTH IMPACTS

- Therapeutic Challenges and Health Risks
- Increased Severity and Duration of Infections
- Compromised Animal Welfare
- Pressure on Veterinary Practices
- Implications for New Therapies

ECONOMIC IMPACTS

- Increased veterinary costs
- Extended treatment duration
- Higher mortality and morbidity
- Impact on vet practices
- Liability and legal costs
- Reduced efficacy of antimicrobial drugs
- Public health impact
- Impact on related industries



HUMAN HEALTH IMPACTS

- Zoonotic Transmission Risk
- Hospital-Acquired Infections
- Environmental Contamination
- Impact on Vulnerable Population
- One Health Approach
- Global Health Implications
- Surveillance and Monitoring
- Antibiotic Stewardship

CHALLENGES

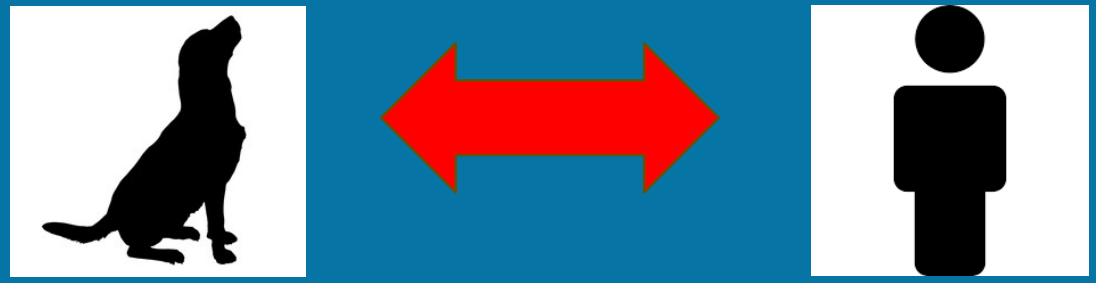
- **Treatment Challenges**:
  - Limited Antimicrobial Options
  - Infection Control
  - Diagnostic Challenges
  - Ethical and Economic Considerations

- **Prevention Challenges**:
  - Infection Control Programs
  - Screening and Surveillance
  - Veterinary Hospital-Acquired Infections
  - Antimicrobial Stewardship
  - Educational and Ethical Challenges

- **Practices Challenges**:
  - Implementation of Infection Control
  - Antimicrobial Stewardship
  - Education and compliance
  - Interdisciplinary Collaboration

TRANSMISSION

- Close Contact Between Humans and Pets
- Healthcare Settings
- Inadequate Infection Control Measures
- Use of Antibiotics in Pets
- Environmental Contamination
- Animal Shelters and Boarding Facilities
- Global Travel and Animal Transport
- Bidirectional Spread



SURVEILLANCE

- Gap In Surveillance And Control
- **NARMS** (National Antimicrobial resistance Monitoring System)
- **Vet-LIRN** (Veterinary Laboratory investigation And Response network)
- **NAHLN** (National Animal Health laboratory Network)
- **CavsNet**
- **Pennvet CREATE**- Carbapenem-Resistant Enterobacterales Animal Testing and Epidemiology

ORGANISMS AND DRUGS OF IMPORTANCE

DOGS & CATS

One of the risk factors leading to the emergence of antimicrobial-resistant bacteria is prior exposure to antimicrobial therapy. Therefore, any measures that reduce overall antimicrobial drug use in dogs and cats may help reduce antimicrobial resistance. This could include establishing infection prevention programs and developing antimicrobial stewardship plans in veterinary settings.

PATHOGEN OF CONCERN:

- *Staphylococcus* spp.
  - *S. aureus*
  - *S. pseudintermedius*
  - *S. schleiferi*
- *Enterobacteriaceae*
  - *Escherichia coli*
  - *Proteus* spp.
  - *Klebsiella* spp.
- *Acinetobacter* spp.
- *Pseudomonas aeruginosa*
- *Enterococcus* spp.
  - *Enterococcus faecalis*
  - *Enterococcus faecium*
- *Campylobacter jejuni*

Antimicrobial-resistant infections affect dogs and cats. Preventing infections is crucial to preventing resistant infections.

What you need to know

- Prevalence of resistant pathogens in dogs and cats is largely unknown. Additional information is needed to learn more about how often resistant infections occur.
- Resistant infections can be difficult to treat.
- Antimicrobial stewardship helps to prevent development of antimicrobial-resistant bacteria.
- The International Society for Companion Animal Infectious Diseases (ISCAID) has developed clinical guidelines to highlight diagnostic and treatment choices for bacterial infections of the skin, respiratory tract and urinary tract.
- The American Animal Hospital Association (AAHA) and the Ontario Animal Health Network (OAHN) have developed guidelines to control the spread of disease within hospital environments.

WHAT VETERINARIANS CAN DO:

- Use antimicrobials only when indicated.
- Use diagnostic testing to inform treatment decisions.
- Implement infection prevention and antimicrobial stewardship programs in veterinary settings (AAHA, ISCAID, and OAHN referenced above).

Campylobacter jejuni

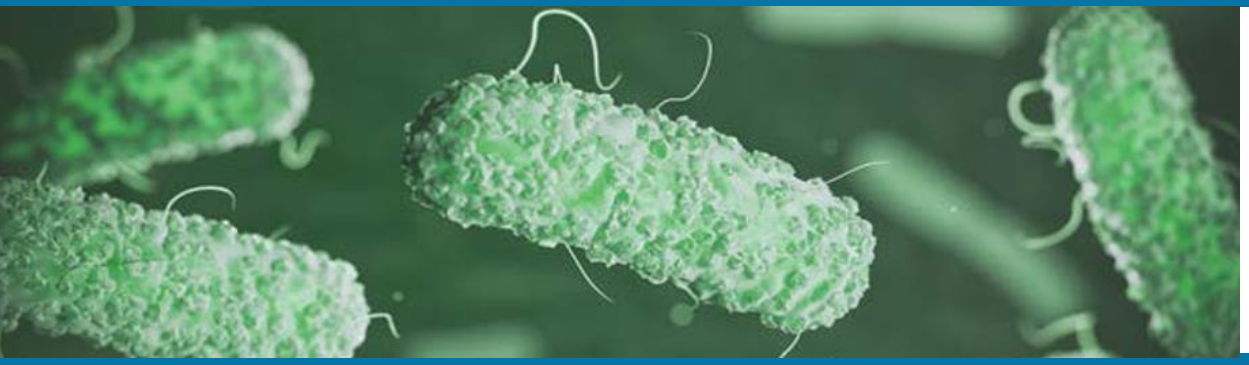
What you need to know

- Most dogs do not need antimicrobial treatment for campylobacteriosis. At this time, it is unknown whether resistant strains cause more serious problems than susceptible strains.
- Multidrug resistant *C. jejuni* can spread from pets (particularly puppies and kittens) to people and can cause human disease with symptoms that may include diarrhea (which can be bloody), fever, and abdominal cramps.
- In people, particularly those with weakened immune systems, *C. jejuni* can also spread in the blood and cause arthritis, irritable bowel syndrome, or Guillain-Barré syndrome.

- **RESISTANCE PROFILE:**
  - Aminoglycosides
  - Fluoroquinolones
  - Lincosamides
  - Macrolides
  - Tetracycline

• Multidrug resistant *C. jejuni* is an emerging concern in puppies and dogs obtained through pet stores.

• *C. jejuni* has intrinsic resistance to several antimicrobial drugs including bacitracin, novobiocin, rifampin, streptogramin B, trimethoprim, and vancomycin.



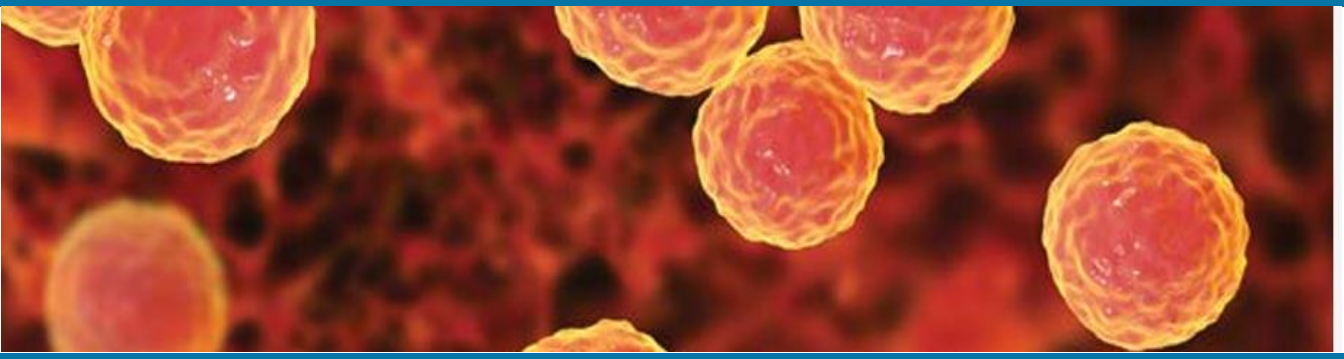
Enterobacteriaceae

What you need to know

- Extended-spectrum beta lactamase (ESBL)-producing *Escherichia coli, Proteus* spp., *Klebsiella* spp. and *Acinetobacter* spp. occur in humans, animals, and the environment. Feeding raw diets to dogs and cats has been implicated as a route of transmission to small animals; however, other modes of transmission are possible.
- There are no antimicrobial drugs approved by FDA for dogs and cats to treat ESBL-producing strains in animals. Some antimicrobials approved for animals may be active against ESBL-producing strains; however, this must be confirmed through susceptibility testing.

- **RESISTANCE PROFILE:**
  - Penicillins*
  - Cephalosporins
  - Fluoroquinolones

*Note: Some of the resistance noted for these organisms has been long established and there are available therapeutic options which may be successfully used for treatment.



Enterococcus spp.

What you need to know

- In some cases, the presence of *Enterococcus* spp. in patient samples can be interpreted as a contaminant, or non-pathogenic isolate, and no treatment is required. Clinicians should consider the patient's clinical signs and refer to existing guidelines when interpreting culture and susceptibility test results.
- Use the results of culture and susceptibility testing to determine the most appropriate antimicrobial agent to treat infections due to the broad intrinsic and acquired resistance patterns.
- When patients are co-infected with *Enterococcus* spp. and other bacteria, (e.g., in wounds, the bladder, or body cavities), treatment should be directed to the likely cause of infection.

RESISTANCE PROFILE:

- Penicillins
- Fluoroquinolones*
- Macrolides

*Note: Some of the resistance noted for these organisms has been long-established and there are available therapeutic options which may be successfully used for treatment. Enterococcus spp. are intrinsically resistant to cephalosporins, fluoroquinolones, trimethoprim-sulfonamides, clindamycin, and macrolides (erythromycin or tylosin).

Pseudomonas aeruginosa

What you need to know

- *Pseudomonas aeruginosa* is intrinsically resistant to many common antimicrobials including most penicillins, most cephalosporins, glycopeptides, macrolides, tetracyclines, trimethoprim-sulfonamides, rifampin, and chloramphenicol. Antimicrobial susceptibility testing is the only way to determine if *Pseudomonas* is resistant and to tailor antimicrobial therapy, when indicated.
- *Pseudomonas aeruginosa* transmission animal-to-animal or animal-to-human is not known to occur. This is an environmental contaminant, and infection of the ears and nasal passages and wound management are the most important treatment issues.

RESISTANCE PROFILE:

- Fluoroquinolones
- Carbapenems (rare)

Note: Some of the resistance noted for these organisms has been long-established and there are available therapeutic options which may be successfully used for treatment. Pseudomonas aeruginosa is intrinsically resistant to many common antimicrobials including most penicillins, most cephalosporins, tetracyclines, trimethoprimsulfonamides and chloramphenicol. FDA-approved antimicrobials for companion animals, including fluoroquinolones, are not active against resistant strains of Pseudomonas.

Staphylococcus spp.

What you need to know

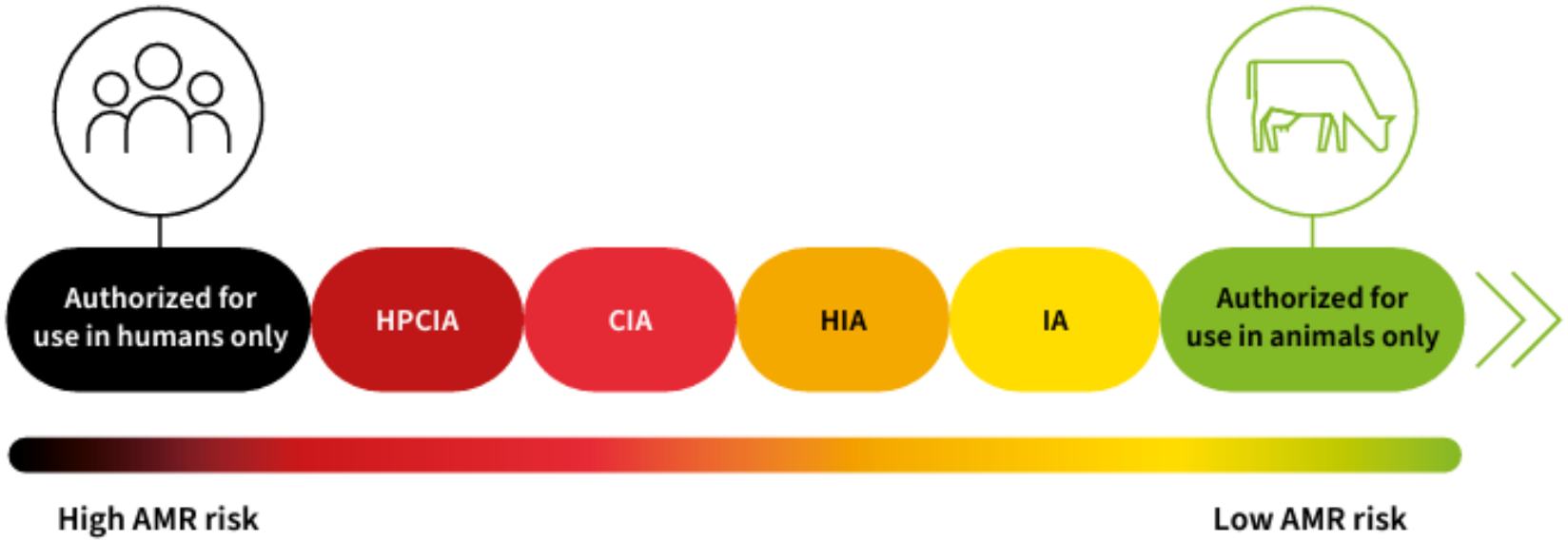
- The most common risk factors for methicillin-resistant *S. pseudintermedius* (MRSP) in animals are a) prior antimicrobial exposure, and b) visits to veterinary hospitals. However, MRSP colonization and infection can occur in dogs that do not have any known risk factors.
- There are few antimicrobials approved by FDA for dogs and cats that are active against MRSP strains of *Staphylococcus* spp.; therefore, legal extralabel use of human and animal drugs may be necessary when antimicrobial treatment is indicated.
- Methicillin-resistant *S. pseudintermedius* is a canine pathogen but is rarely the cause of illness in people.

- **RESISTANCE PROFILE:**
  - Cephalosporins
  - Fluoroquinolones
  - Lincosamides
  - Macrolides
  - Penicillins*
  - Tetracyclines*

*Note: Some of the resistance noted for these organisms has been long-established and there are available therapeutic options which may be successfully used for treatment.

WHO'S CRITICALLY IMPORTANT ANTIMICROBIAL LIST

Fig. 1. Prioritization of antimicrobial classes in the WHO MIA List



AMR: antimicrobial resistance; CIA: critically important antimicrobial; HIA: highly important antimicrobial; HPCIA: highest priority critically important antimicrobial; IA: important antimicrobial; MIA: medical important antimicrobial; WHO: World Health Organization.

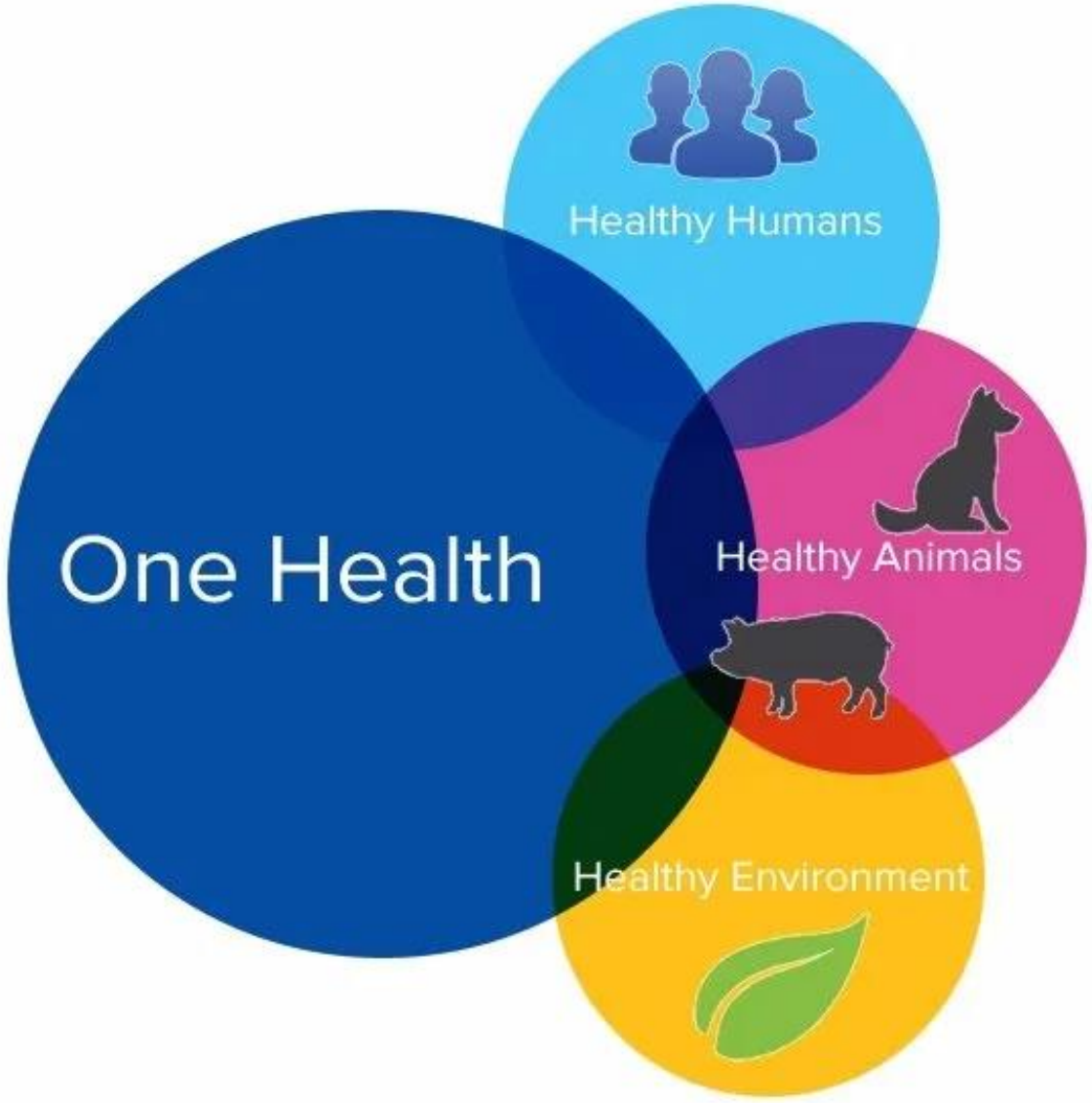
- Prioritization efforts are based on the importance of the drug in human medicine and the potential impact of AMU in animals on AMR in important human pathogens.

OTHER PRIORITIZATION SCHEMES

- **European Medicine's Agency's Categorization of Antimicrobials for Use in Animals**
  - ranks antibiotics by considering the risk that their use in animals causes to public health such as antimicrobial resistance, and the need to use them in veterinary medicines. The antibiotics are classified into four categories A-D, namely, Avoid, Restrict, Caution and Prudence.
- **OIE List Of Antimicrobial Agents Of Veterinary Importance**
  - Criterion 1. Response rate to the questionnaire regarding Veterinary Important Antimicrobial Agents
  - Criterion 2. Treatment of serious animal disease and availability of alternative antimicrobial agents
  - Veterinary Critically Important Antimicrobial Agents (VCIA): are those that meet BOTH criteria 1 AND 2 Veterinary Highly Important Antimicrobial Agents (VHIA): are those that meet criteria 1 OR 2 Veterinary Important Antimicrobial Agents (VIA): are those that meet NEITHER criteria 1 OR 2

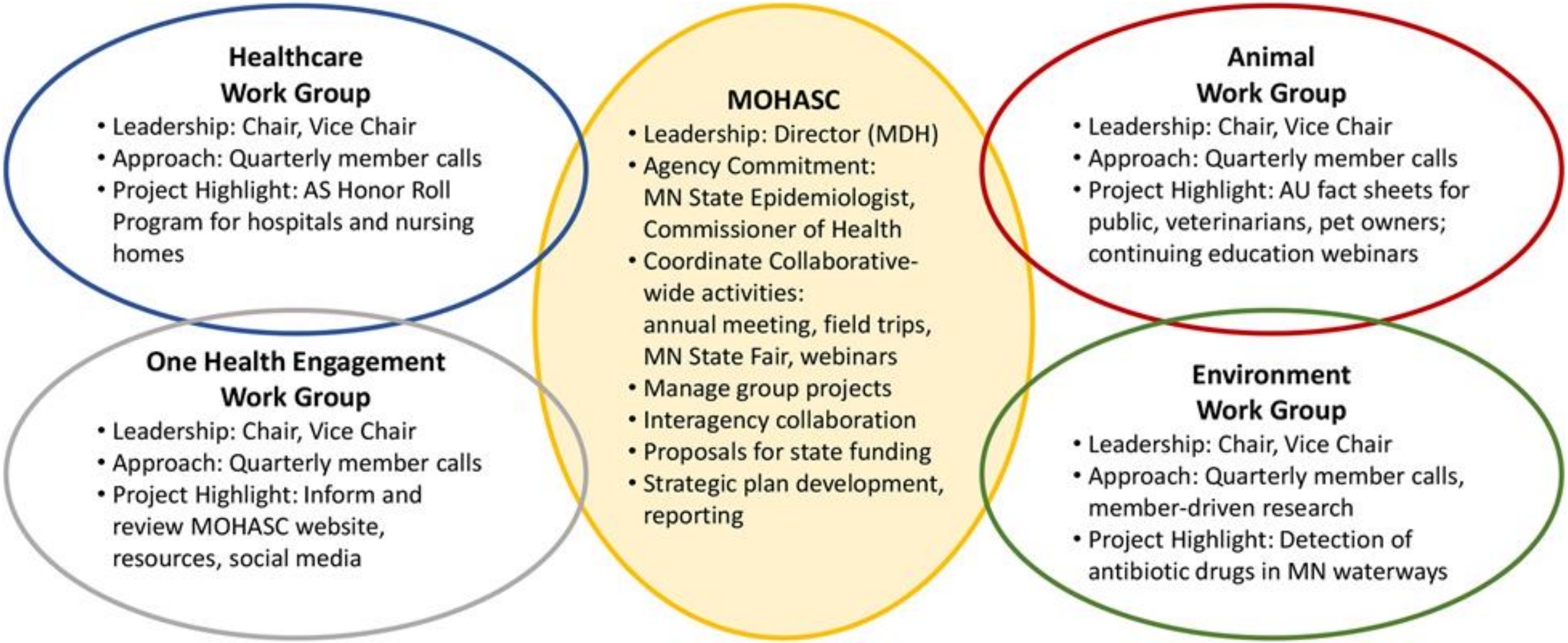
ONE HEALTH AND AMR

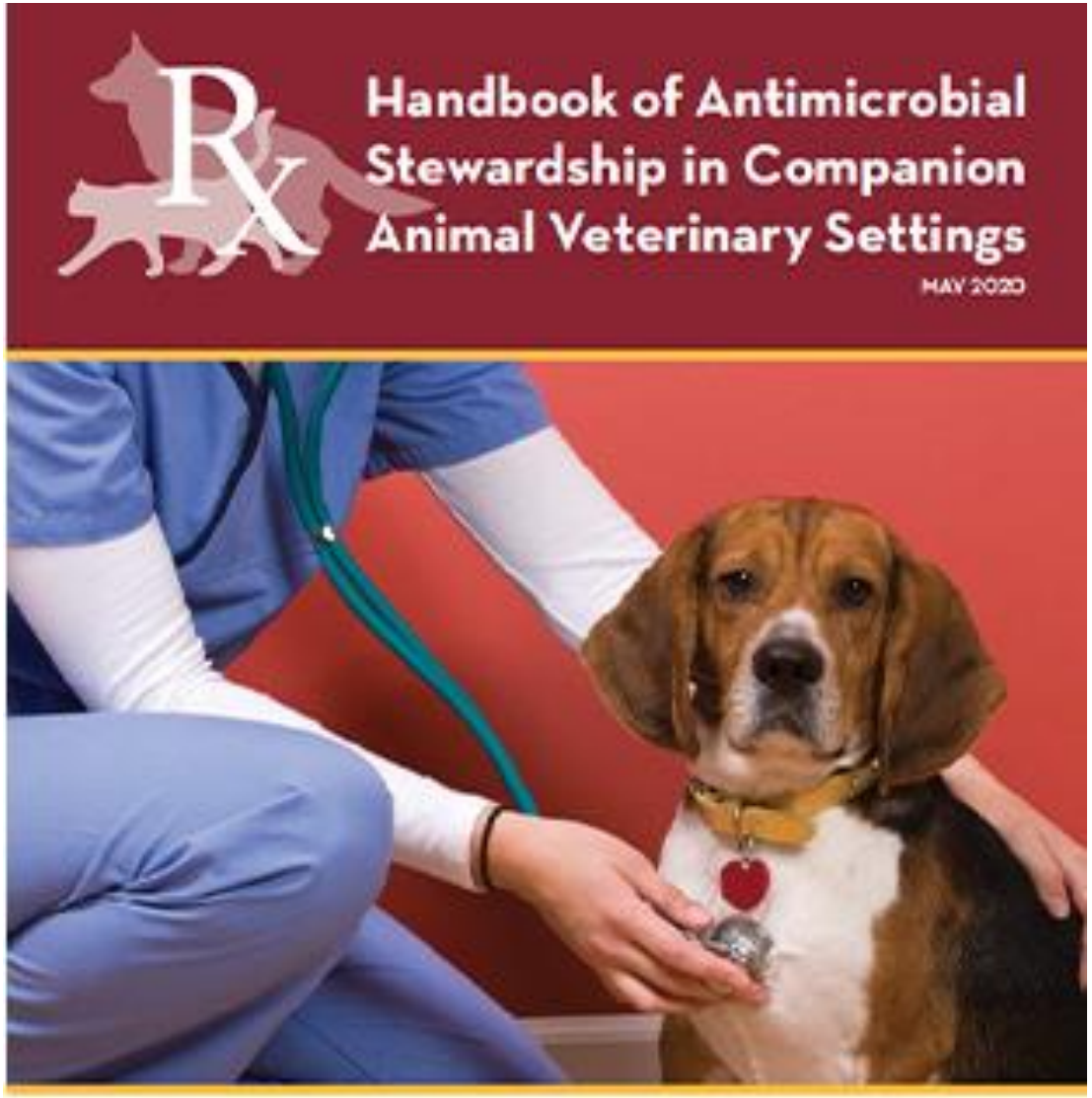
- One Health means a collaborative, multisectoral, and trans-disciplinary approach — working at the local, regional, national, and global levels — with the goal of achieving optimal health outcomes recognizing the interconnection between people, animals, plants, and their shared environment. (CDC: One Health)
- Collaboration
- Stewardship
- Surveillance



COLLABORATION

- Minnesota One Health Antibiotic Stewardship Collaborative
  - State professionals in public health, human and veterinary medicine, agriculture, and environmental protection
- PennVet CREATE- Carbapenem-Resistant Enterobacterales Animal Testing and Epidemiology


Healthcare
Work Group
• Leadership: Chair, Vice Chair
• Approach: Quarterly member calls
• Project Highlight: AS Honor Roll Program for hospitals and nursing homes
One Health Engagement
Work Group
• Leadership: Chair, Vice Chair
• Approach: Quarterly member calls
• Project Highlight: Inform and review MOHASC website, resources, social media
MOHASC
• Leadership: Director (MDH)
• Agency Commitment: MN State Epidemiologist, Commissioner of Health
• Coordinate Collaborative-wide activities: annual meeting, field trips, MN State Fair, webinars
• Manage group projects
• Interagency collaboration
• Proposals for state funding
• Strategic plan development, reporting
Animal
Work Group
• Leadership: Chair, Vice Chair
• Approach: Quarterly member calls
• Project Highlight: AU fact sheets for public, veterinarians, pet owners; continuing education webinars
Environment
Work Group
• Leadership: Chair, Vice Chair
• Approach: Quarterly member calls, member-driven research
• Project Highlight: Detection of antibiotic drugs in MN waterways



ANTIBIOTIC STEWARDSHIP

ANTIBIOTIC STEWARDSHIP

- Minnesota One Health Antibiotic Stewardship Collaborative
- Handbook of Antimicrobial Stewardship in Companion Animal Veterinary Settings
- AS is defined by AVMA as "the actions veterinarians take individually and as a profession to preserve the effectiveness and availability of antimicrobial drugs through conscientious oversight and responsible medical decision-making while safeguarding animal, public, and environmental health.
- Veterinary clinics face several challenges to implementation of the robust AS programs that have become standard in many healthcare settings. There are few clinical AU guidelines, often insufficient diagnostic testing information [e.g., bacterial culture and susceptibility (C&S)], lack of access to AU and AMR data, and often limited human and financial resources to carry out the work. Few training programs exist that focus on AS, pharmacology, data management, or quality improvement in the veterinary setting.

Basic

Requires commitment, personnel time, some access to technical expertise

- Form an ASC and define role for group and each member
- Communicate and display AS commitment to clients
- Formalize use of published prescribing guidelines in clinic (e.g., urinary tract and respiratory disease, canine pyoderma)
- Educate veterinary staff about AMR and AS, clinic protocols, guidelines (e.g., annually and at new hire)
- Emphasize patient wellness and infection prevention

Intermediate

Requires some resources, planning, dedicated staff

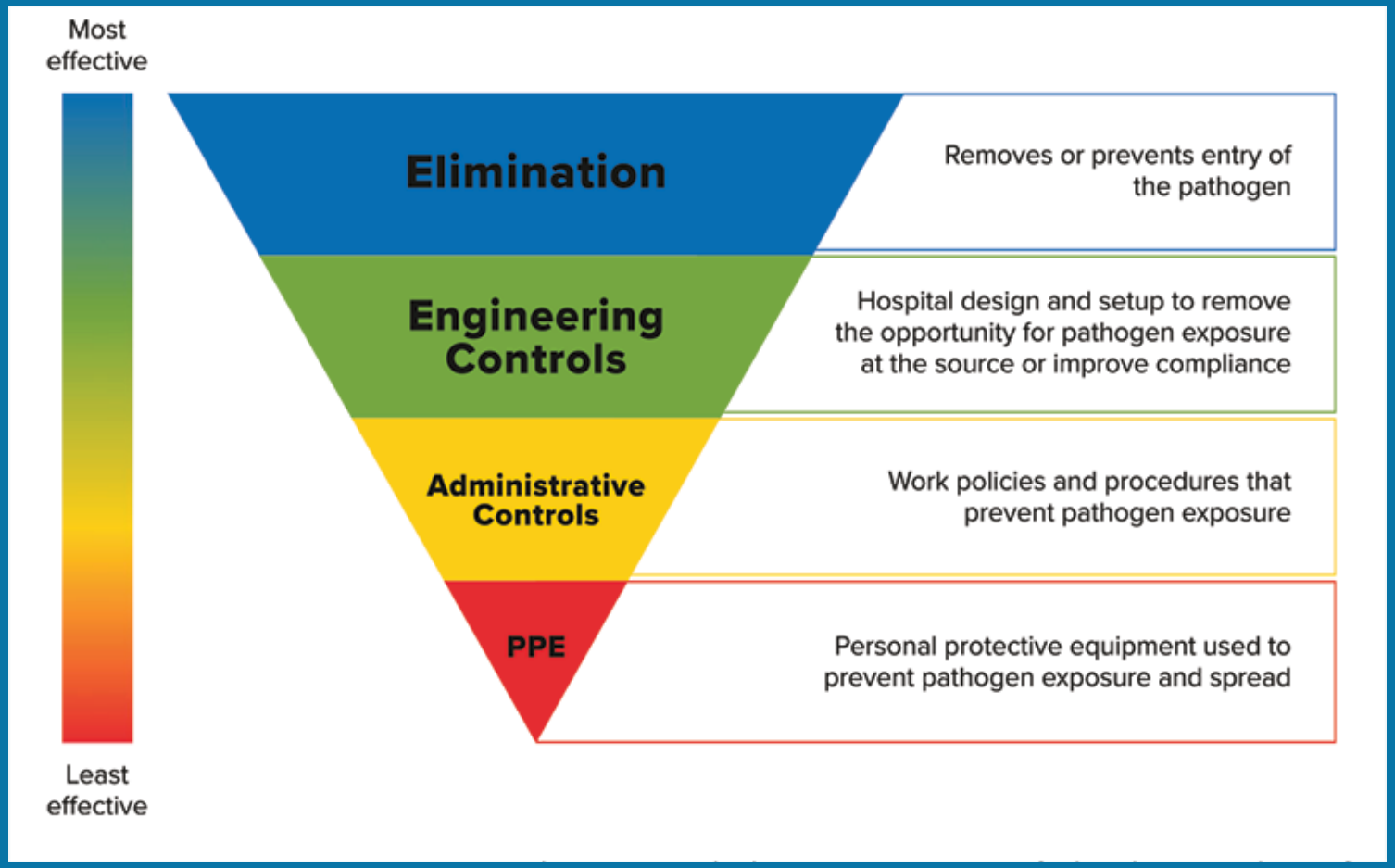
- Generate snapshot of AU through point prevalence survey or other data collection approach
- Create treatment protocols for diseases without published guidelines, considering local susceptibility, expert opinion, or guidelines from other countries
- Implement antibiotic time-out approach for hospitalized patients
- Use prior-authorization for third-line antibiotics

Advanced

Requires an established AS program with trained staff and dedicated resources

- Conduct routine AU tracking
- Measure antibiotic appropriateness for priority syndromes
- Provide rates of overall AU and appropriateness to staff and, if possible, give individual AU feedback to prescribers
- Establish system to enforce protocol use
- Track outcomes of AU (e.g., infection resolution, adverse drug reactions, development of resistant infection)
- Conduct monitoring and evaluation of AS program

INFECTION PREVENTION



- **NASPHV**
  - *Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel, 2015*
  - Model Infection Control Plan for Veterinary Practices
- **CDC**
  - Frequently Asked Questions about Carbapenem-resistant Enterobacterales (CRE) for Veterinarians

EDUCATION


COUGH.
SNORT.
SNIFFLE.
SNEEZE.
Antibiotics only when needed, please.
Learn more about antibiotic resistance and stewardship:
www.health.state.mn.us/onehealthabx


PAWS FOR A SECOND.
Are antibiotics needed in this case?
Learn more about antibiotic resistance and stewardship:
www.health.state.mn.us/onehealthabx


KEEP CALM.
Antibiotics aren't always the answer.
Learn more about antibiotic resistance and stewardship:
www.health.state.mn.us/onehealthabx

CONCLUSION- INTEGRATION OF AMR MANAGEMENT

- Strengthening Surveillance Systems
- Promoting Responsible Use of Antimicrobials
- Enhancing Infection Prevention and Control
- Encouraging Intersectoral Collaboration
- Educating Public and Professionals
- Regulating and Monitoring Antibiotic Use
- Research and Development
- Global Coordination

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