

One Health in Action: Minnesota's Collaborative Approach to the AMR Challenge

May 6, 2026 | MDH Antibiotic Stewardship Conference

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What We'll Cover



- Antibiotic Resistance as a One Health Issue
- Antibiotic Stewardship and One Health
- Minnesota Antibiotic Stewardship Collaborative (MOHASC)
- Resources



Antibiotic Resistance as a One Health Issue

The One Health Concept

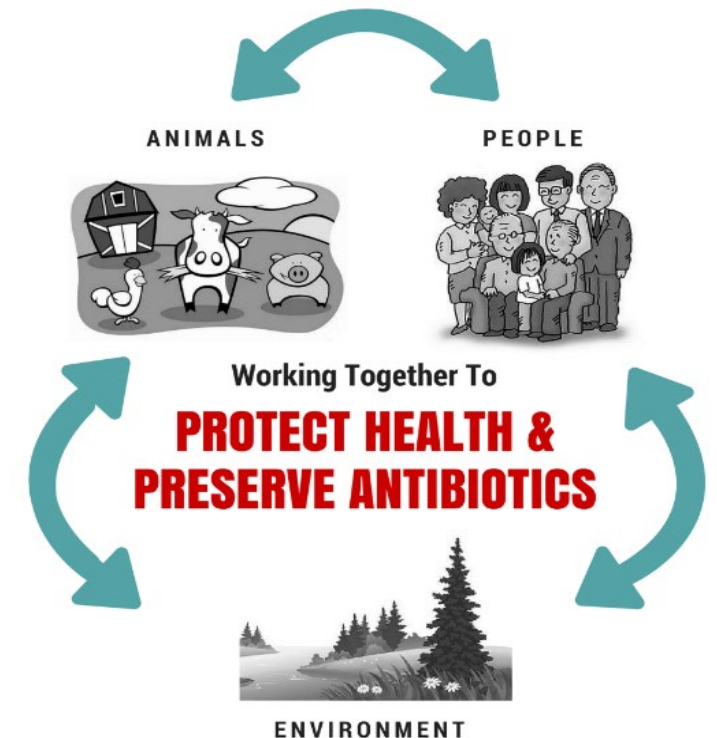
- Recognition that human, animal, and environmental health are interconnected
- Encourages collaboration of multiple disciplines to achieve optimal health for people, animals, and our environment
- Why?
 - 6 out of 10 infectious diseases in humans can be transmitted by animals
 - 3 out of 4 emerging infectious diseases in humans come from animals
 - Food safety for people relies on healthy animals and crops
 - Animals can serve as models of human health and disease
 - We rely on a healthy ecosystem, including water, air, and plants for human health

Word Cloud #1

Name one example of a disease you think is transmitted between animals and humans.

Antibiotic Resistance and Stewardship as One Health Issues

- **All users of antibiotics contribute to resistance**
 - Improvement must occur in all sectors
- **Development of resistance is very complex**
 - Direct linkage of cause and effect is difficult or impossible
- **Exposure to resistant bacteria or genes is not limited only to the sector from which they emerged**
 - Resistant bacteria or resistance genes can persist in varied settings
- **Methods of resistance prevention are similar, regardless of setting**
 - Effective tools and approaches can be shared



Who Uses Antibiotics?

- **Human healthcare**
 - Acute care, critical access hospitals
 - Long-term care facilities
 - Outpatient facilities
 - Ambulatory surgical facilities
 - Dental clinics
- **Veterinary medicine**
 - Companion animal medicine
 - Animal agriculture
 - Aquaculture
 - Honeybee production
- **Plant agriculture**
 - Fruit production
- **Industry**
 - Ethanol
 - Probiotics



Companion Animals

- **Clinically relevant resistance**
- **Bacterial culture and sensitivity often not conducted**
 - Antibiotics not always well-targeted
- **Pets often receive medically important antimicrobials**
 - (e.g., cephalosporins, fluoroquinolones)
- **Potential spread of antimicrobial resistance**
 - Direct and close contact with humans
 - Pet-to-pet transmission



Couples in households with dogs have more similar microbiomes than those living alone because of additional shared microbial sources.

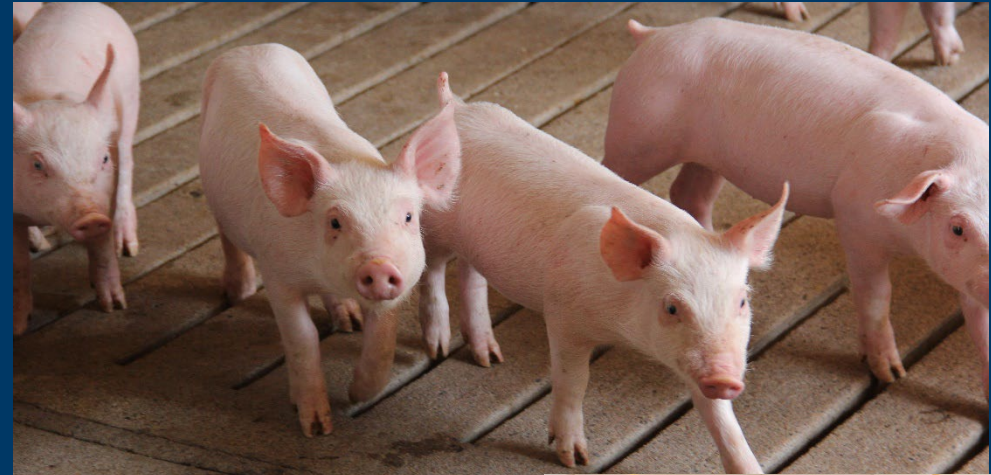


Having a dog in the household adds bacterial diversity to adult skin.

Song et al. Cohabiting family members share microbiota with one another and dogs. *eLife* 2013
Image from J. Granick

Animal Agriculture

- **Clinically relevant resistance in veterinary medicine**
 - Antibiotics are important to maintaining animal health and welfare
- **Direct contact transmission of resistant organisms from animals to people**
- **Foodborne infections of humans (e.g., *Campylobacter*, *Salmonella*)**
 - For those at risk of systemic or complicated infections, concerns with resistance are considerable



- Antibiotic residues found in groundwater, lakes, and streams
 - Macrolides: erythromycin, clarithromycin, virginiamycin, tylosin
 - Fluoroquinolones: ciprofloxacin, moxifloxacin
 - Sulfa drugs: sulfamethoxazole, sulfachloropyridazine
 - Others: carbadox, trimethoprim
- Complex mixtures of antibiotics and metabolites
- Urban, agricultural pathways to contamination
- Consideration of disposal is essential
- Outstanding questions
 - How do antibiotics in environment influence overall resistance?
 - How does antibiotic exposure impact ecology and human health?
 - How can we mitigate impact on environment?



Global Picture of Resistance

- Once easily separated ecologically and geographically
- Rapid movement of people, animals, products ensures mixing of genes across world
- Risk factors differ for resistant infections
 - In U.S., healthcare exposure is most likely source of many resistant infections, though landscape is changing
 - In other countries, more serious infections can be obtained from healthcare, community, or animal exposure
- International healthcare exposure is a particular risk for U.S. travelers to acquire colonization or infection with resistant bacteria

[Open Forum Infect Dis.](#) 2019 Oct; 6(Suppl 2): S852.

PMCID: PMC6810010

Published online 2019 Oct 23. doi: [10.1093/ofid/ofz360.2140](https://doi.org/10.1093/ofid/ofz360.2140)

2462. Public Health Response to Contain the First Outbreak of New Delhi Metallo- β -Lactamase-Producing *Klebsiella pneumoniae* in Minnesota

[Brittany VonBank](#), MPH,¹ [Sean O'Malley](#), MPH,¹ [Paula Snippes Vagnone](#), MT(ASCP),² [Mary Ellen Bennett](#), RN, MPH,¹ [Tammy Hale](#), MSN, RN, CIC,¹ [Jacy Walters](#), PhD,¹ and [Ruth Lynfield](#), MD¹

Morbidity and Mortality Weekly Report (MMWR)

*Notes from the Field: Verona Integron-Encoded Metallo- β -Lactamase-Producing Carbapenem-Resistant *Pseudomonas aeruginosa* Infections in U.S. Residents Associated with Invasive Medical Procedures in Mexico, 2015–2018*

Weekly / May 24, 2019 / 68(20):463–464

Ian Kracalik, PhD¹; Cal Ham, MD¹; Amanda R. Smith, PhD²; Maureen Vowles, MPH³; Kelly Kauber, MPH⁴; Melba Zambrano, MSN⁵; Gretchen Rodriguez, MPH⁶; Kelley Garner, MPH⁷; Kaitlyn Chorbi, MPH⁸; P. Maureen Cassidy, MPH⁹; Shannon McBee, MPH¹⁰; Rhett Stoney, MPH¹¹; Allison C. Brown, PhD¹²; Kathleen Moser, MD¹³; Margarita E. Villarino, MD¹⁴; Maroia Spalding Walters, PhD¹ ([VIEW AUTHOR AFFILIATIONS](#))



Antibiotic Stewardship and One Health

Common Wants and Fears Around Stewardship and Resistance

WANTS

- Collaboration, common goals, recognize alignment & differences
- Decisions made on unbiased data, not politics or public perception
- Community understanding and informed participation
- Minimize environmental contamination for safe food and water supply

FEARS

- Ineffective antibiotics, untreatable infections, death, adverse effects
- Reactionary decisions without sound science, incorrect assumptions
- Overregulation replacing careful medical assessment
- Negative impact on environment and ecosystem

Challenges to Stewardship in All Fields

- **Competing priorities**
 - How to consider the good of the whole rather than individual patients, animals?
- **Definition of “optimal”, “judicious”, “appropriate”**
 - How do we define this in an evidence-based way?
 - What are the “low-hanging fruit” for stewardship in each field?
- **Lack of data**
 - How can we set goals and identify progress without data?
 - How can we share data comfortably?
- **Association does not equal causation**
 - How can we design meaningful research?
- **Communication**
 - Across fields
 - With public and policy makers





What Does a One Health Approach to AMR & Stewardship Actually Look Like?


- Centered around building trust and relationships
- All sectors come to the table with a shared understanding and collaborative communication approach
- A learner mindset is key to success
- It takes time!

Open Forum Infectious Diseases

PERSPECTIVES INVITED

 **IDSA**
Infectious Diseases Society of America

 **hivma**
hiv medicine association

 **OXFORD**

Minnesota One Health Antibiotic Stewardship Collaborative: A Reproducible Approach to Facilitate Antimicrobial Stewardship Progress

Emma R. Bollig,¹ Elizabeth B. Hirsch,² Irene Bueno,³ Ruth Lynfield,⁴ Jennifer L. Granick,¹ Krista D. Gens,⁵ Ayesha Rashid,⁶ Kelly Harris,⁷ Kimberly Boeser,⁸ and Amanda L. Beaudoin⁴

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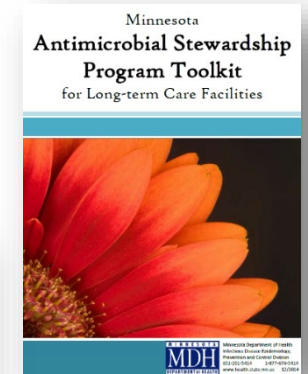
[Minnesota One Health Antibiotic Stewardship Collaborative: A Reproducible Approach to Facilitate Antimicrobial Stewardship Progress \(https://pmc.ncbi.nlm.nih.gov/articles/PMC9757673/\)](https://pmc.ncbi.nlm.nih.gov/articles/PMC9757673/)



Minnesota One Health Antibiotic Stewardship Collaborative (MOHASC)

History of Stewardship in Minnesota

- Healthcare
 - Minnesota Antibiotic Resistance Collaborative (early 2000s)
 - Antibiotic stewardship conferences held (2012-14)
 - Minnesota guidance and toolkits
- Animal health
 - Quality assurance programs
 - Producer and veterinary education programs
 - Residue prevention and legal obligations
 - Veterinary accreditation modules
 - Antibiotic use guidelines developed by veterinary groups
 - Participation in AVMA stewardship committee



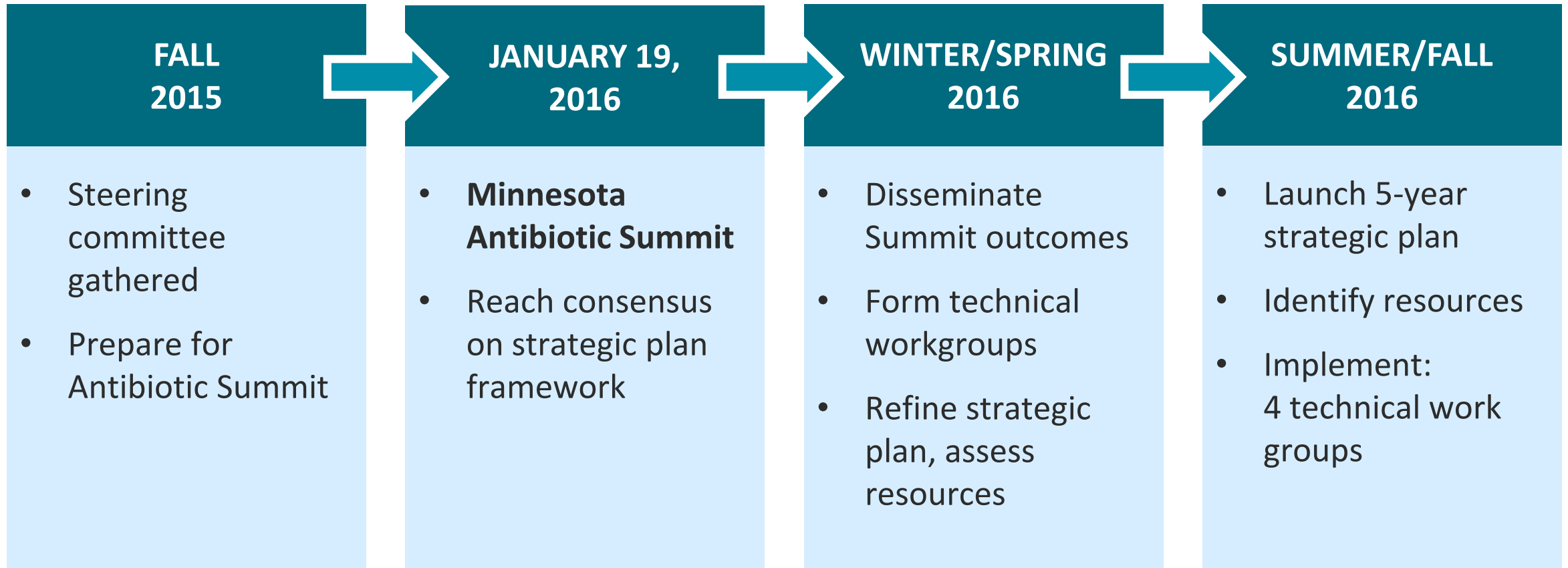
Challenges to Stewardship in MN

- Connecting facilities with tools, implementation support
- Poor understanding across human, animal, environmental health



Collaborative One Health approach

One Health Planning Process



MN One Health Antibiotic Stewardship Collaborative

- **State agency representatives**

- MN Department of Health
- MN Department of Agriculture
- MN Pollution Control Agency
- Boards of Animal Health, Vet Med, Pharmacy, Dentistry

- **Stakeholders from all fields**

- University researchers
- Human and animal health professional and industry associations
- Clinical professionals from healthcare systems, including inpatient, outpatient, long-term care
- Veterinary professionals from large and small animal clinical practice
- Human and animal pharmaceutical companies



Communicating Collaboratively

MOHASC Vision

Minnesota leaders in human, animal, and environment health will work together to raise awareness and change behaviors to preserve antibiotics and treat infections effectively.



WORKING TOGETHER TO
**PROTECT HEALTH &
PRESERVE ANTIBIOTICS**

Communication Approach:

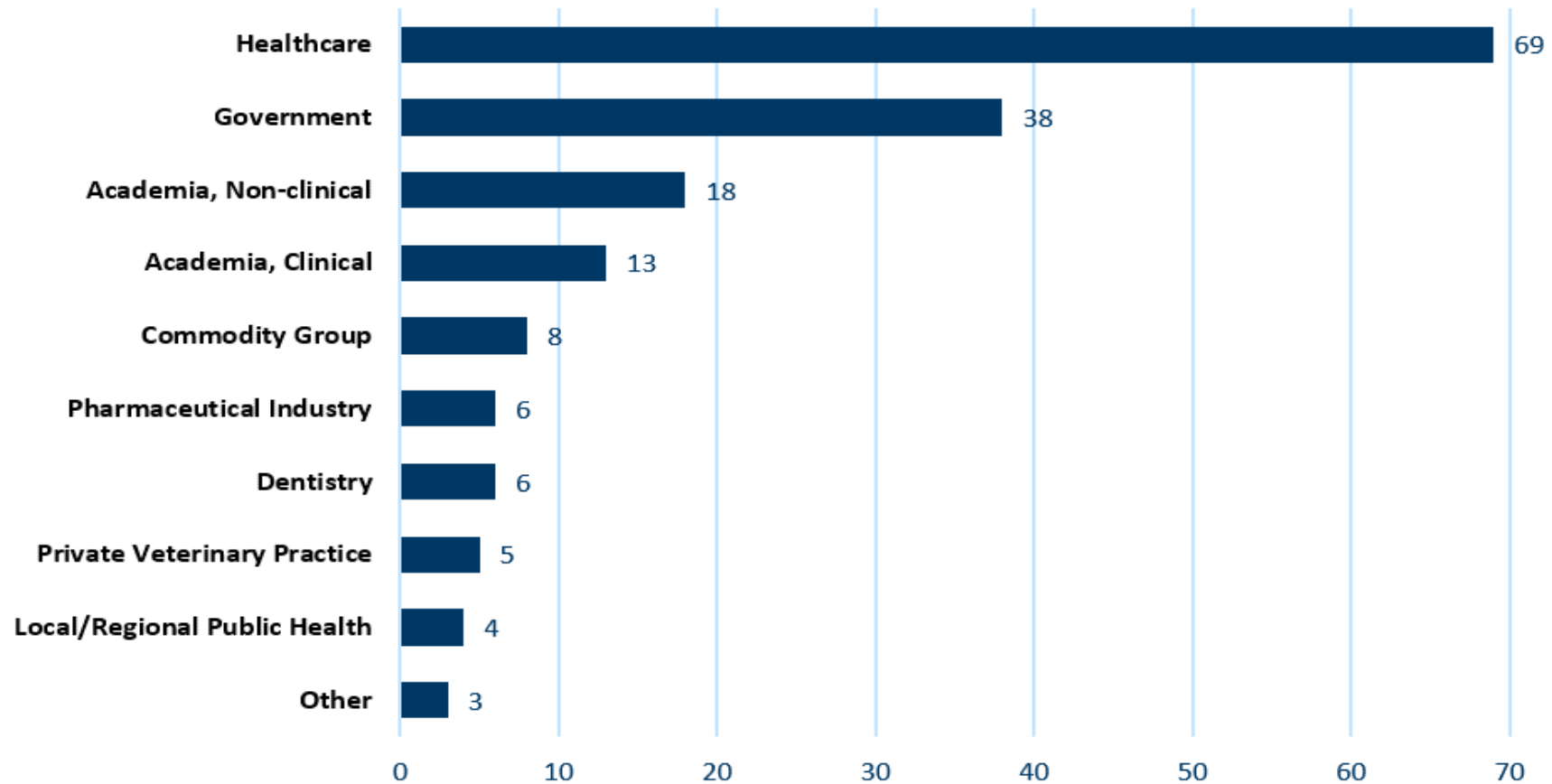
- Human, animal, and environmental health are inseparable.
- All antibiotic use can lead to resistance.
- There is some contribution to resistance from every sector using antibiotics
- Lack of “proof” of harm is not an argument for irresponsible use.
- Greater abuse in other disciplines is not an argument for injudicious use in yours.
- There are unreasonable critics.
- Behavior change is key.

MOHASC By the Numbers

- Growing membership with significant increases seen in the fields of dentistry and infectious disease pharmacists
- Currently ~170 members from >60 organizations
- One Health e-newsletter relaunched with >5,800 subscribers
- MOHASC and MDH Antimicrobial Stewardship websites and resources continually updated with over 42,000 pageviews annually
- Social media messaging on One Health, AMR, and AS reached over 71,000 people during One Health Day and USAAW

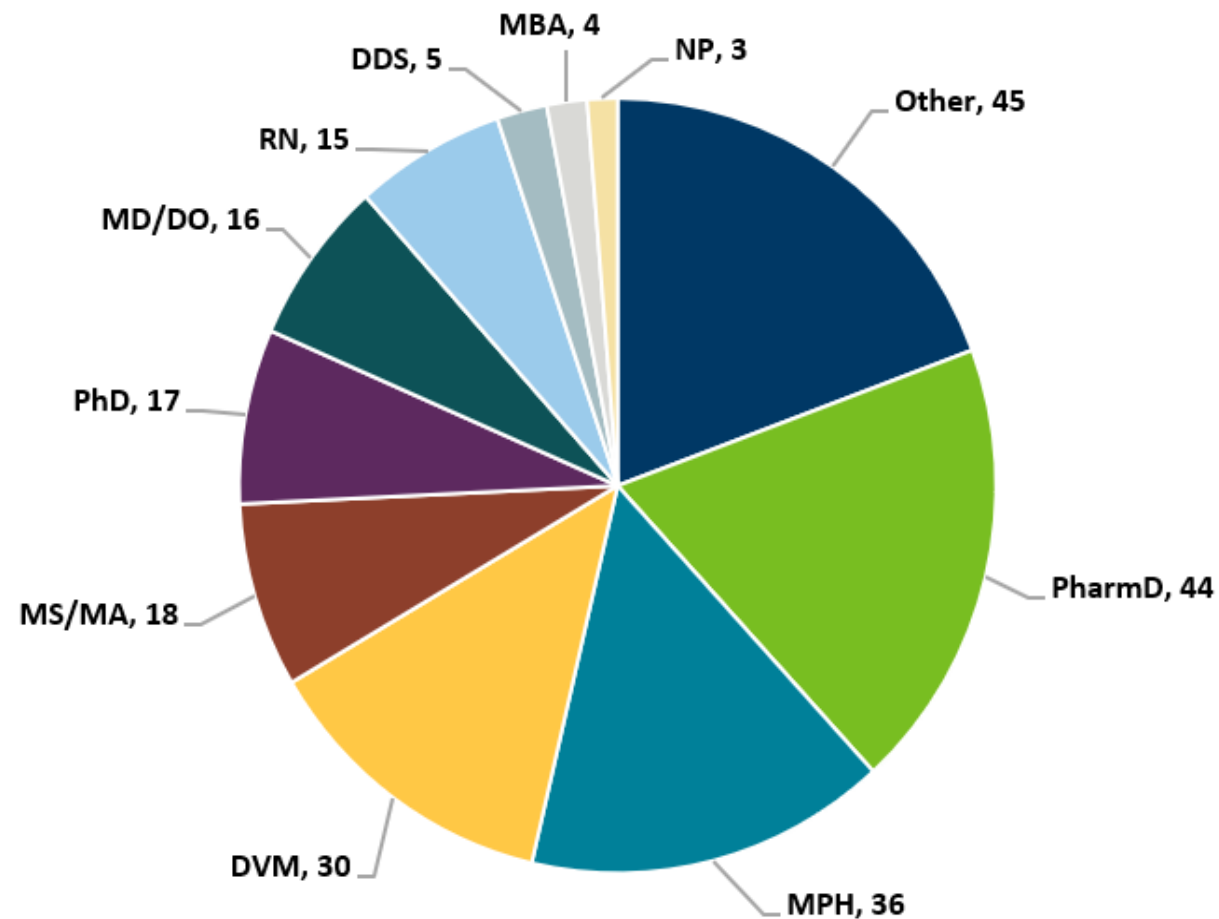
MOHASC Members

MOHASC Members by Sector, n=170



MOHASC Member Advanced Degrees & Certifications

MOHASC Member Advanced Degrees & Certifications, n=233



Sharing Stewardship Approaches Across Facilities, Settings, Disciplines

- **Antibiotic Stewardship Honor Roll Program**
 - Three levels provide incentive to improve stewardship over time
 - Acute Care, Critical Access, and Long-term Care Facilities
 - Renewable every two years
- **Antibiotic use measurement with point prevalence**
 - Healthcare antibiotic use and stewardship annual report
 - Point prevalence surveys ongoing at veterinary hospitals
- **Commitment materials and clinical resources shared among care settings**
 - Posters associated with improved prescribing behavior
 - Tools help facilities to implement antibiotic stewardship core elements/principles specific to their setting



MOHASC Member Events



Metro Wastewater Treatment Plant Tour



Honey Bee Medicine Webinar



Zollman Zoo One Health Exchange

Library Display Program

- Relaunched October 2024
- ~30 MN libraries already participating
- Promotes stewardship to diverse audiences through a low-cost method
- Expanded reach, particularly rural areas and greater MN

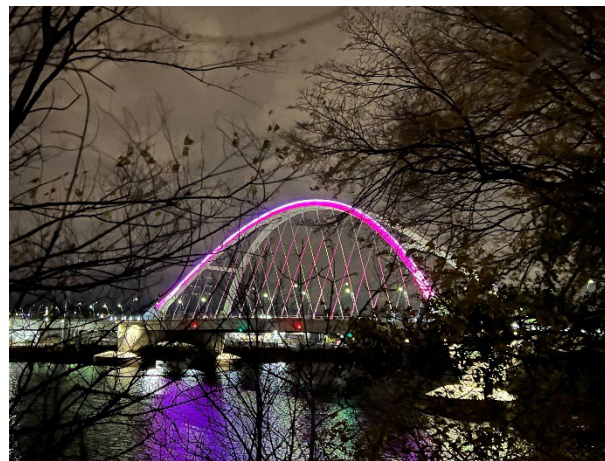


Minnesota State Fair Booth



- Interacted with >7,000 attendees!
- >350 stewardship pledges made

U.S. Antibiotic Awareness Week



2023–2027 Strategic Approach

- Summary of Goals:
 - Promote understanding of One Health antibiotic stewardship across disciplines
 - Improve human antibiotic stewardship efforts
 - Improve animal antibiotic stewardship efforts
 - Explore the role of the natural environment in antimicrobial resistance
- Current Priorities:
 - Meaningfully engage with practitioners in human, animal, environmental health
 - Continue to expand reach to Greater Minnesota
 - Translate resources into multiple languages
 - Update MOHASC website

MOHASC Website

<https://www.health.state.mn.us/onehealthabx>

mn DEPARTMENT OF HEALTH MENU I am looking for...

Home > Healthy Communities, Enviro... > Minnesota One Health Antibio...

ONE HEALTH ANTIBIOTIC STEWARDSHIP

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RELATED TOPICS

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[Antibiotics Only When Needed \(O.W.N.\)](#)
[Healthcare-Associated Infections](#)
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[Hand Hygiene](#)

WORKING TOGETHER TO PROTECT HEALTH & PRESERVE ANTIBIOTICS

Minnesota One Health Antibiotic Stewardship Collaborative

A One Health approach recognizes that the health of humans, animals, and the environment is interconnected. Here is how this is defined in the United States:

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)

Issues like antibiotic stewardship require a collaborative effort across multiple disciplines. By using One Health-oriented communication, Minnesota's public and professionals will have the awareness needed to think innovatively and responsibly about approaches to optimizing antibiotic use within each health field.

Minnesota One Health Antibiotic Stewardship ...
From a US state public health authority

Watch on YouTube

CONTACT INFO
One Health Antibiotic Stewardship health_stewardship@state.mn.us

Antibiotic Resistance and Stewardship Resources for Educators

All ages

- Michigan Antibiotic Resistance Reduction Educational Programs and Resources
- Do Bugs Need Drugs?: Educational Resources
- Oregon Health Authority: Antibiotic Resistance

Antibiotic Resistance and Stewardship Worksheet

Antibiotic Search (PDF)

Superhero (PDF)

Early Childhood

- University of Pennsylvania: Childcare Teacher's Room
- Oregon Alliance Working for Antibiotic Educators

K-12

- Minnesota Department of Agriculture

Late Elementary/Middle School

- Science Buddies: Superbugs and Antibiotics
- BrainPOP Educators: Defeating Bacteria
- Science Buddies: Stopping Superbugs

Middle/High School

NOW OPEN: Lights, Camera, Action for Antibiotic Stewardship

Stories of Antibiotic Use and Resistance

Liz from Minnesota

Minnesota Resident

What are your experiences with antibiotics?

From your perspective, what are the most challenging issues about antibiotic prescribing and use?

What are your experiences with antibiotic resistance or adverse antibiotic effects?

How has antibiotic resistance or antibiotic use affected the way you live your life?

What worries you most about antibiotic resistance?

What would you like to know more about in regard to antimicrobial resistance and/or antibiotic use?

Peter Currie, MD
Emergency Physician, Emergency Physicians Professional Association

Melissa Anacker, PhD
Research Scientist; Minnesota Department of Health – Public Health Laboratory

Minnesota Antimicrobial Stewardship Program Toolkit for Outpatient Clinics

Resources include cough and cold care guides for adults and children, sinusitis and sinusitis fact sheet, viral prescription pad, syndrome-specific antibiotic guidelines, outpatient stewardship summary reports, waiting list, and more.

Community Pharmacists: Essential Partners in Minnesota Antibiotic Stewardship

Minnesota Community Pharmacists See a Role in Stewardship

- Over 80% of Minnesota community pharmacists responding to a 2018 Minnesota Department of Health survey believe they play an important role in antibiotic stewardship.¹
- More than 60% of U.S. health care antibiotic use occurs in the outpatient setting.²
- Community pharmacists are some of the most accessible health care professionals and represent the final link in the health care chain before drugs are used in the community.
- Although community pharmacists make up 58% of the pharmacy profession, to date, antibiotic stewardship resources have been largely targeted to hospital pharmacists.³

Antibiotic Resistance

- Antibiotic resistance is one of our most serious health threats.
- CDC estimates that each year in the U.S., 2 million people develop infections from antibiotic-resistant bacteria and 23,000 die from associated causes.
- The major driver of antibiotic resistance is widespread antibiotic use.
- An estimated 30% of outpatient antibiotics are inappropriate.⁴
- Antibiotic stewardship, or the improvement of antibiotic use while effectively treating infections, is essential to combatting resistance.

Other Consequences of Antibiotic Use

- Antibiotics carry a risk of side effects, including allergies and organ damage.
- Because of increasing resistance, some of the only antibiotics available to treat infections caused by resistant bacteria come with a risk of toxic effects.
- Antibiotics have an effect on healthy gastrointestinal bacteria that can last after patients have finished a prescription. This leaves patients at risk for *Clostridium difficile* disease, a toxin-associated illness caused by the *C. difficile* bacterium which is able to thrive after antibiotic exposure.
- C. difficile* can be acquired in the community and in health care settings.

Antibiotic Stewardship

Antibiotic stewardship is the process of improving how we use antibiotics. Key elements of antibiotic stewardship include the six "D's":

Diagnosis: using an antibiotic only when clinically indicated.

Drug: choosing the right antibiotic for the infection and the patient.

Dose: giving the right amount of antibiotic.

Duration: giving the antibiotic for the right amount of time.

De-escalation: switching to an antibiotic choice that is better targeted to the infection when possible, and switching from intravenous to oral administration when possible.

Disposal: appropriate disposal keeps leftover drugs out of the hands of those for whom they were not prescribed and out of Minnesota's lakes and streams.

Minnesota One Health Antibiotic Stewardship Collaborative

Minnesotans from animal, human, and environmental health are working together to be smart about antibiotic use and preventing antibiotic resistance!

www.health.state.mn.us/onehealthabx

mn MINNESOTA

Community Pharmacists: Essential Partners in Minnesota Antibiotic Stewardship (4/30/2018) Page 1 of 2

Only When Needed: O.W.N.

- Public awareness theme for use by partners
- Graphic elements available on MDH website



Antibiotic Use and Stewardship in Minnesota Report



Antibiotic Use and Stewardship in Minnesota

2025 UPDATE ON PROGRESS AND OPPORTUNITIES

[Antibiotic Use and Stewardship in Minnesota 2025 Update on Progress and Opportunities](http://www.health.state.mn.us/diseases/antibioticresistance/augas25.pdf)
[\(www.health.state.mn.us/diseases/antibioticresistance/augas25.pdf\)](http://www.health.state.mn.us/diseases/antibioticresistance/augas25.pdf)

Interested in joining MOHASC?

- MOHASC's mission is to provide a collaborative environment to **promote judicious antibiotic use and stewardship and to reduce the impact of antibiotic-resistant pathogens** of human, animal, and environmental health importance.
- MOHASC is made up of four working groups: Animal, Healthcare, Environment, and One Health Engagement
- Benefits of Joining
 - No membership fees
 - Expand your network
 - Participate in quarterly work group meetings
 - Attend annual in-person meeting and professional exchanges
 - Share your work and/or research!
- Scan the QR code with a smartphone camera or visit bit.ly/joinmohasc to fill out the MOHASC Partner Information Form!



Word Cloud #2

What word or short phrase would you use to describe how your work contributes to antimicrobial stewardship from a One Health perspective?

Thank you!



Kristen Clark, DVM, MPH, DACVPM
MOHASC Director

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