

# ONE HEALTH AMR CORE LEARNING OUTCOMES



## >>> About

Based on the discussion in the education-focused sessions at the 2021 NIAMRRE Annual Conference, a working group was formed to update the AMR Learning Outcomes developed by the Association of Public and Land Grant Universities (APLU) and the Association of American Veterinary Medical Colleges (AAVMC) AMR Core Competencies Working Group\* using a One Health framework. The One Health Learning Outcomes below serve as an outline for developing a curriculum to improve awareness and understanding of AMR across animals, humans, plants and the environment for youth, undergraduate and graduate students, as well as professional student levels.

### **Members of the NIAMRRE One Health AMR Learning Outcomes Working Group:**

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\*.AAVMC / APLU National Action Plan to Address Antibiotic Resistance Antimicrobial Resistance Core Competencies Working Group: AMR LEARNING OUTCOMES. <https://www.aplu.org/wp-content/uploads/aavmc-aplu-national-action-plan-to-address-antibiotic-resistance.pdf>

# ONE HEALTH AMR CORE LEARNING OUTCOMES



## >>> Participant Categories

Novice: 4-H/ FFA/ Youth

Developing: Undergraduate Students

Advanced: Graduate/ Professional Students

## >>> Health

### Define Healthy

**Novice:** Describe that health is different from the absence of detectable disease, including health as a holistic state of wellbeing in which humans, animals, and plants thrive within the presence of the others.

**Developing:** Explain that health is different from the absence of detectable disease, including promoting health as a holistic state of wellbeing in which humans, animals, and plants thrive within the presence of the others.

**Advanced:** Implement practices that recognize health as a holistic state of wellbeing in which humans, animals, and plants thrive within the presence of the others.

### Disease Transmission

**Novice:** Explain in general how infectious diseases can spread between humans, between animals, between plants, and within and among these groups, including via fomites and vectors.

**Developing:** Explain the spread of infectious diseases between humans, between animals, between plants, and within and among these groups, including common practices to limit this spread.

**Advanced:** Apply knowledge of infectious disease transmission and basic principles of ecology to formulate preventative and treatment programs that reduce the need for antimicrobials.

### Foodborne Hazards

**Novice:** Recognize the difference between antimicrobial drug residues in food and the presence of antimicrobial resistant bacteria in food.

**Developing:** Explain how antimicrobial drug residues are not the same as antimicrobial resistant bacteria in the food chain.

**Advanced:** Differentiate antimicrobial drug residues and antimicrobial resistant bacteria in food and provide examples of how each are mitigated.

## >>> Global Impact

### Global Reach

**Novice:** Recognize that microorganisms are resistant to antimicrobials and can move geographically, including through different environments.

**Developing:** Discuss what impacts microorganisms that are resistant to antimicrobials that can move geographically, including through different environments, may have on humans, animals, and plants.

**Advanced:** Describe the measures that will mitigate impacts from the microorganisms that are resistant to antimicrobials and can move geographically, including different environments.

### International Implications

**Novice:** List what regulations and requirements are in place for antimicrobial use depending on the country across humans, animals, and plants and how that may affect trade for animals and plants.

**Developing:** Discuss the impacts of different regulations in different countries on the use of antimicrobials in humans, animals, and plants.

**Advanced:** Recommend clinical practices, educational programs, and surveillance policies for different countries based on their regulations to identify antimicrobial resistance concerns.

## >>> Antimicrobial Stewardship

### Definition and Society

**Novice:** Define antimicrobial stewardship, including the potential reduction or loss of effectiveness of antimicrobials.

**Developing:** Explain how antimicrobial stewardship can address increasing societal concern about antimicrobial resistance.

**Advanced:** Describe specific examples of resistance in microorganisms that are commonly found in humans, animals, and/or plants, and identify stewardship steps that can be implemented.

### Use and Need

**Novice:** Identify common situations where antimicrobials are needed and not needed to address disease and that describe how risks can vary between species.

**Developing:** Describe common situations where antimicrobials are needed and not needed to address disease and that risks can vary between species.

**Advanced:** Explain the epidemiology and pathogenesis of common situations and diseases where antimicrobials are needed and not needed, and what factors of the human, animal, or plant being treated affect the need and benefit of antimicrobial use.

## Complexity of Bacterial Infections

**Novice:** Recognize that infectious diseases can be caused by a variety of microorganisms, and that disease risks can vary.

**Developing:** Explain how infectious diseases can be caused by a variety of microorganisms with risks varying among relevant hosts.

**Advanced:** Describe the epidemiology and pathogenesis of the most common and the most significant bacterial disease challenges in major relevant hosts; describe the organism or patient factors that may impact treatment options.

## Decision-Making

**Novice:** State the difference between empiric and definitive treatment based on laboratory testing, patient factors and that antimicrobial resistance can result in an adverse health outcome.

**Developing:** Describe the difference between empiric and definitive treatment based on laboratory testing, patient factors and the outcomes that can occur when antimicrobial resistance is present.

**Advanced:** Explain the rationale for antimicrobial treatment based on laboratory testing, patient factors and predict the outcomes if antimicrobial resistance is present.

## Preventing of Infection

**Novice:** Recognize that infection prevention is a key principle of antimicrobial stewardship by decreasing the need to treat infections with antimicrobials.

**Developing:** Describe the benefit that infection prevention through the use of various approaches (e.g., vaccination, hygiene, food safety, and safe-sex practices) can have on antimicrobial stewardship.

**Advanced:** Develop infection prevention recommendations (e.g., vaccination, hygiene, food safety, and safe-sex practices) for a population using knowledge of epidemiological risk for that population.

## Surveillance

**Novice:** Recognize the role of antimicrobial resistance surveillance in identifying emerging resistance pathogens.

**Developing:** Describe the benefits and mechanisms used for antimicrobial resistance surveillance.

**Advanced:** Interpret antimicrobial resistance surveillance reports through the eyes/lens of the impacts on clinical practice or additional surveillance efforts.

## >>> Antimicrobial Drugs and Antimicrobial Resistance

### Definitions

**Novice:** Define what a drug and antimicrobial drug is, explain the general concept of antimicrobial resistance and how that can vary across organisms and populations.

**Developing:** Explain what antimicrobial drugs are and why they are used. Students should be able to define antimicrobial resistance, including resistance mechanisms.

**Advanced:** Describe the different mechanisms of resistance for common classes of antimicrobials as well as pharmacodynamic and pharmacokinetic factors that affect dose and duration for effective treatment.

### General Mechanisms of Resistance

**Novice:** Describe in general the concept of antimicrobial resistance and the impact of diseases caused by bacteria.

**Developing:** Define antimicrobial resistance and the different mechanisms of resistance.

**Advanced:** Differentiate intrinsic resistance from acquired resistance with examples of each in specific types of bacteria.

### Evolution of Antibiotic Resistance

**Novice:** Explain in general how the use of antimicrobial drugs can select for resistant bacteria.

**Developing:** Explain in general how the use of antimicrobial drugs can select for resistant bacteria.

**Advanced:** Explain the difference between the general perspective that all antimicrobial drug use causes resistance in bacterial populations and the specific application of that principle to predict whether this use selects for resistance in this bacterial species.

### Discovery and Availability

**Novice:** Recognize that antimicrobial drug discovery is costly, and that the standard approaches for drug payments do not cover development costs, resulting in very few new antimicrobials being developed.

**Developing:** Describe the economic and technical challenges of discovering new antimicrobials and some potential mechanisms to overcome them.

**Advanced:** Describe the economic and technical challenges of discovering new antimicrobials and the mechanisms of pull or push incentives to increase the development pipeline.

### Communicate

**Novice:** List questions you might ask when prescribed an antimicrobial drug for yourself, an animal, or for your garden or orchard.

**Developing:** List questions you might ask when prescribed an antimicrobial drug for yourself, an animal, or for your garden or orchard.

**Advanced:** Explain the proper administration of the antimicrobial drug regimen.

## >>> Roles and Relationships

### Government Relationships

**Novice:** List the federal agencies responsible for approving and monitoring antimicrobial use.

**Developing:** Describe the roles of federal agencies in approving and monitoring antimicrobial use.

**Advanced:** Differentiate drugs approved by a federal agency (e.g., FDA) from compounded drugs, and describe the roles of federal agencies in approving and monitoring antimicrobial use.

### Personal and Legal Relationships

**Novice:** Recognize there are legal and ethical requirements for the patient/prescriber relationship including relationships between a prescriber and a client, owner, farmer, etc., and that open communication to successfully address the disease condition is needed.

**Developing:** List the characteristics included in legal and ethical definitions for the patient/prescriber relationship, including relationships between a prescriber and a client, owner, farmer, etc., and explain the role of open communication in disease diagnosis, treatment, and prevention.

**Advanced:** Explain the role of the prescriber (e.g., physician, veterinarian, etc.) in gathering complete information to address the disease, treatment, and prevention, and explain the characteristics included in legal and ethical definitions of the relationship.

### Interprofessional Team Skills

**Novice:** Recognize that improving health (e.g., healthcare) relies on teamwork among professionals with different expertise, roles, and responsibilities.

**Developing:** Discuss the importance of team work, communication, ethics, and clear roles and responsibilities in high functioning interprofessional healthcare teams.

**Advanced:** Demonstrate the importance of team work, communication, ethics, and clear roles and responsibilities in high functioning interprofessional healthcare teams.



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