

# CALIFORNIA LIVESTOCK ANTIBIOGRAMS: A USER GUIDE

California Department of Food and Agriculture Antimicrobial Use and

Antimicrobiai use ana Stewardship

**UC Davis** 

California Animal Health and Food Safety Laboratory







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## Introduction

Antibiograms represent cumulative antimicrobial susceptibility data for a particular bacterial organism and host species combination. They provide information about the proportion of bacterial isolates that are susceptible to the drugs tested. Antibiograms can be used by veterinarians as a clinical tool to target antibiotic therapy and assess trends in antibiotic resistance. Although widely used in human health systems, antibiograms are not often available in veterinary medicine, particularly for livestock species. The California Department of Food and Agriculture Antimicrobial Use and Stewardship program (CDFA AUS) and the UC Davis California Animal Health and Food Safety Laboratory (CAHFS) created this document to promote the use of antibiograms in large animal veterinary medicine.



Antibiograms are often specific to a certain region or populace, such as a human hospital. This allows for a more precise evaluation of antibiotic resistance profiles among the target population.



Antimicrobial resistance patterns can change over time and are influenced by factors such as geographic region, production type, and management practices. Therefore, antibiograms are most useful when they are up to date and specific to the population of interest.

CDFA AUS and CAHFS aim to educate veterinary clinicians on the use of antibiograms so they can be effectively used to direct empiric antibiotic selection, improve treatment outcomes, and assess antibiotic resistance prevalence and trends in California.



#### All client information is kept confidential at CAHFS.

For more information on how CAHFS analyzes antibiotic susceptibility, please see:

https://www.cdfa.ca.gov/AHFSS/aus/docs/AntibiogramDevelopment.pdf

It is vital for the creation of antibiograms that clinical samples continue to be submitted to CAHFS for susceptibility testing. Antibiograms are useful to guide initial empiric therapy but should not replace casespecific testing to determine a more definitive diagnosis for appropriate therapy. More targeted antibiograms require detailed information on submission forms that include the age of the animal, production class, location, and previous treatments. For questions regarding sample submission, please contact CAHFS at (530) 752-8700.

Veterinarian's Name			Owne	r Name			
Clinic Name				ı			
Address			Addre	ss			
City	State ip		City_		S	State Zip _	
Phone							
Email			Repo	rtto:   Clinic   Owner   Add'l Copy to:   Preferred reporting   Email notification	_		
Sample Reference	Date	sample(s) col	lected	Date	sample	e(s) shipped	
□ Cattle □ Tracey	If testing for anim	al movement p	lease			#in herd/flk	
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□ S	Current Location	of Animal(s)_				#sick	
□ Other						#died	
History (clinical signs, nutrition, housin	ng, vaccination, treatmen			se next page if more space i	s neede	d.):	
Duration of Illness: Date							d? Yes □ No □
						(continue on ne	extpage if necessary)
Treatments/Medications (type	e & when given)						
Disease(s) or condition(s) suspected: _							
	Anim	al/Specimen Ir	nforma	ation (continue on back)			
Use Animal Name/Specimen ID	Breed (F/M)	Age in Units (days, weeks, months, years)	Qty	Specimen Type		Test(s) Reque	sted



To sign up for antibiograms from CAHFS, please scan the QR code (pictured left) or use this link: http://tinyurl.com/AntibiogramSignup

# **Using Antibiograms** in Veterinary Practice

## What is an antibiogram?

An antibiogram represents a summary of cumulative antimicrobial susceptibility test data for a given drug-bug-host combination over a specified time-period (e.g. one year) and population subset (e.g. region, farm, production-type, etc.).

## How can I use an antibiogram?

**DO** use antibiograms to:



Guide empiric therapy



Assess local susceptibilities



Monitor resistance trends

**DO NOT** use antibiograms to:



Replace culture & sensitivity



Extrapolate results to other regions



Make decisions if the antibiogram is outdated

## What data is used in CAHFS antibiograms?

Unless otherwise specified, CAHFS antibiograms will:

- Contain only isolates from animals with clinical disease associated with the bacterial organism tested.
- Be based on a minimum of 30 isolates.
- Be updated annually. If fewer than 30 isolates are available, the time between updates will be extended as needed.



According to the Clinical & Laboratory Standards Institute (CLSI), estimates of percent susceptibility have less statistical validity when there are fewer than 30 isolates. If needed, CAHFS will extend the timeframe of the antibiogram until there are 30 or more isolates available for inclusion.

#### What do these terms mean?

**Clinical breakpoint** – The minimum inhibitory concentration (MIC) used to categorize an organism as susceptible (S), intermediate (I), or resistant (R). The S/I/R categorization is derived from microbiological characteristics, pharmacokinetic/pharmacodynamic (PK/PD) parameters, and/or clinical outcome data. CAHFS utilizes breakpoints established by CLSI.

Susceptible (S) – The bacterial isolate is inhibited by a concentration of drug that is usually achievable at the site of infection.

Intermediate (I) - The bacterial isolate has an MIC that falls between the breakpoints for susceptible and resistant. Clinical efficacy might be achieved in body sites where the drug concentrates (e.g. urine).

Resistant (R) - The bacterial isolate is not inhibited by the concentrations of drug that are usually achievable at the site of infection.

**Non-susceptible** – The isolate is either resistant or not completely susceptible to one or more antibiotics.

**NA** – No interpretive criteria are available.

For many veterinary species, clinical breakpoints have not been established. *In these instances*, clinical breakpoints are used from other host species (such as human) or other closely-related bacterial organisms.

## Where can I find more information?

## Clinical & Laboratory Standards Institute (CLSI) publications:

#### **CLSI M39:**

Analysis and Presentation of Cumulative Antimicrobial Susceptibility Test Data

#### **CLSI VET01/VET01S:**

Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for **Bacteria Isolated From Animals** 

#### **CLSI VET09:**

Understanding Susceptibility Test Data as a Component of Antimicrobial Stewardship in **Veterinary Settings** 

#### **CLSI VET08:**

Performance Standards for Antimicrobial Disk and Dilution Susceptibility Tests for **Bacteria Isolated From Animals** 

#### Link to MIC/Antibiogram Process Visual:

https://www.cdfa.ca.gov/AHFSS/aus/docs/AntibiogramDevelopment.pdf

# Anatomy of a Simple Antibiogram

**Antimicrobial agents tested:** this is usually determined based on the animal host and microbial organism (drug names removed for this example)

**Title:** identifies the host species, organism profile and timeframe for the antibiogram

This example displays three different microbial organisms, labeled X, Y, and Z, with the total number of microbial isolates in parentheses next to the name of each organism

	CAHFS Bovine Respiratory Pathog	gens Antibiogram July 2019 - June 2	020
	Organism X ( n=83)	Organism Y (n=90)	Organism Z (n=45)
<u>Antimicrobial<sup>a</sup></u>	% S	% S	% S
Class 1			
Drug 1a	See below <sup>b</sup>	See below <sup>b</sup>	See below <sup>b</sup>
Drug 1b	49%	94%	96%
Class 2			
Drug 2a <sup>c</sup>	99%	100%	100%
Class 3			
Drug 3a <sup>c</sup>	41%	47%	98%
Drug 3b	41%	49%	98%

S (Susceptible) based on the Clinical Laboratory Standards Institute (CLSI) cattle-specific breakpoints for each drug/bug combination.

**Important notes and disclaimers** about the data presented; may include disclaimer if breakpoints from other host species or organisms are used or notes about extra-label drug use

Percentage of total isolates susceptible to the drug

New criteria indicates this isolate is susceptible to Drug 1a (if MIC less than 0.06) which current methods cannot evaluate.

No CLSI breakpoint for Organism Z in cattle, extrapolated from Organism X CLSI breakpoints.

# Anatomy of a **Detailed Antibiogram**

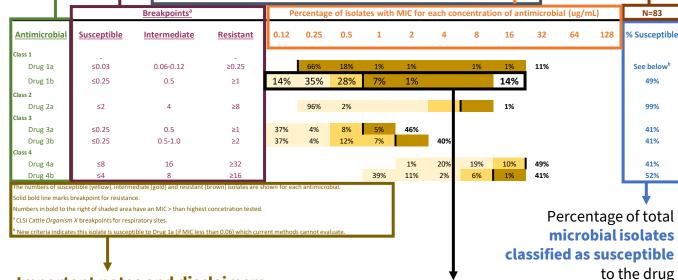
**Antimicrobial agents tested:** this is usually determined by the animal host and microbial organism tested (drug names removed for this example)

**Title:** identifies the bacterial organism, animal host and timeframe for the antibiogram (drug names removed for this example)

Number of microbial isolates included in analysis

**Breakpoints:** minimum inhibitory concentrations of the drug at which the microbial organism is classified as susceptible, intermediate, or resistant Shaded areas in table indicate the range of concentrations tested for each drug

Organism X Respiratory Sites Cattle CAHFS Clinical Isolates July 1, 2019 - June 30, 2020



## Important notes and disclaimers

about the data presented; may include disclaimer if breakpoints from a different host species or organism are used, explanation of color shading and notes about extra-label drug use

#### Key:

%

Susceptible (S)

Intermediate (I)

Resistant (R)

MIC greater than highest concentration tested (R)

# How to Read a Simple Antibiogram

	Organism X ( n=83)	Organism Y (n=90)	Organism Z (n=45)	
<u>Antimicrobial<sup>a</sup></u>	% S	% S	% S	
Class 1				
Drug 1a	See below <sup>b</sup>	See below <sup>b</sup>	See below <sup>b</sup>	
Drug 1b	49%	94%	96%	
Class 2				
Drug 2a <sup>c</sup>	99%	100%	100%	
Class 3				
Drug 3a <sup>c</sup>	41%	47%	98%	
Drug 3b	41%	49%	98%	

The higher the percentage susceptible, the greater the chance of treatment

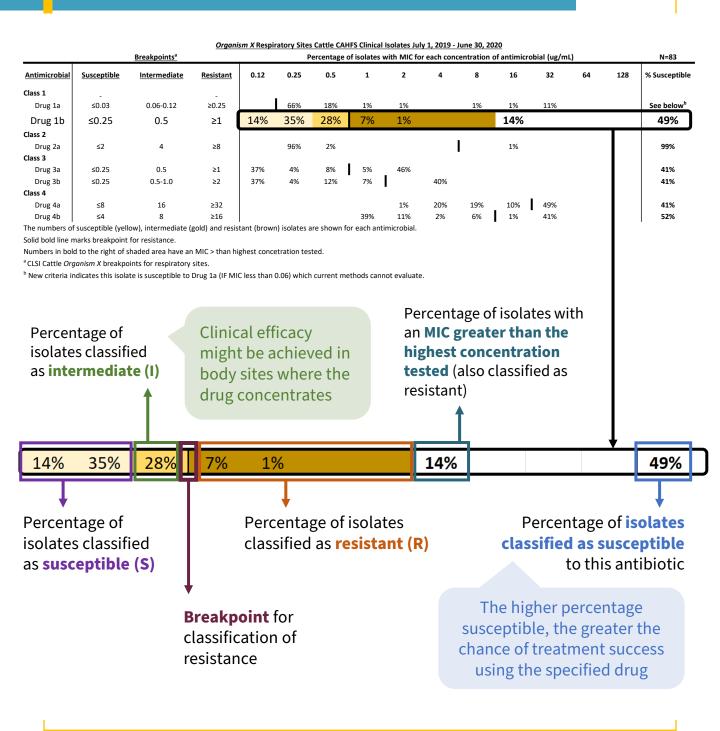
If you are unsure which organism is causing the disease, you should pick an antibiotic with a high percentage of susceptible isolates for all possible organisms. In this example, Drug 2a should be chosen over Drug 3a.

Percentage of microbial isolates tested of each organism that were susceptible to this antibiotic

<sup>&</sup>lt;sup>b</sup> New criteria indicates this isolate is susceptible to Drug 1a (if MIC less than 0.06) which current methods cannot evaluate.

<sup>&</sup>lt;sup>c</sup> No CLSI breakpoint for *Organism Z* in cattle, extrapolated from Organism X CLSI breakpoints.

# How to Read a **Detailed Antibiogram**



## **Get Involved**

## Californian veterinarians have options to expand their knowledge:

- Request additional information on antibiograms
- Plan a continuing education seminar for your local veterinary medical association or practice
- Provide feedback or request a particular species, production type or pathogen-focused antibiogram



Please continue to submit samples with complete submission forms





To sign up for antibiograms from CAHFS, please scan the QR code (pictured left) or use this link:

http://tinyurl.com/AntibiogramSignup



For requests or questions regarding California-focused livestock antibiograms, please contact CDFA AUS at: CDFA\_AUS@CDFA.CA.GOV

