LABORATORY TRAINING SERIES

Antimicrobial Susceptibility Testing (AST)

A Foundational Guide for Laboratorians

From how antibiotics work, to how the laboratory determines which ones will work for a specific patient.

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July 2026

Clinical & Public Health Microbiology • Introductory Level

ORIENTATION

Learning Objectives

By the end of this session, you should be able to:

1 Explain the purpose of AST

Describe why clinical laboratories test bacterial and yeast isolates against antimicrobial agents, and what the result is used for.

2 Compare the reference methods

Distinguish broth microdilution, disk and gradient diffusion, and automated AST and understand how commercial platforms relate back to them.

3 Apply testing criteria

Recognize when AST is indicated — and when it is not — based on organism, specimen, and clinical context.

4 Interpret S / I / R results

Explain what a breakpoint is, how it is set, and why interpretation is organism- and drug-specific.

WHY IT MATTERS

One Test Result, One Treatment Decision

AST results go directly into a prescribing decision — often for a patient who is already sick.

4.9M+

antimicrobial-resistant infections occur in the U.S. each year

1.27M+

deaths per year are attributed to antimicrobial-resistant infections

1 in 6

Proportion of clinical isolates are antibiotic resistant

The laboratory is the bridge between the organism and the prescription. A correct, timely AST result lets a clinician narrow therapy to the most effective, least toxic, least ecologically disruptive agent or escalate quickly when resistance is present.

WHO CLASS data, 2026

THE BASICS

What Is Antimicrobial Susceptibility Testing?

AST is a laboratory test that determines whether a specific antimicrobial agent is likely to inhibit or kill a specific organism **isolated from a patient.**

It is performed in vitro ("in glass" / in the lab) and used to predict the likely in vivo (in the patient) response.

Organisms Routinely Tested

- **Bacteria**
  The great majority of AST volume — aerobic and, less commonly, anaerobic isolates
- **Yeast**
  Candida and related species, using antifungal susceptibility methods
- **Filamentous fungi (rare)**
  Reference antifungal methods exist, but testing is largely centralized to reference labs

The Core Question AST Answers

"At concentrations this drug can safely achieve in the patient, will it stop this specific organism from growing?"

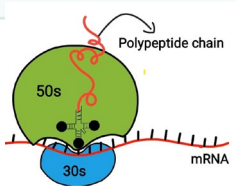
How Antibiotics Work: Targets

Every antibiotic class exploits a structural or metabolic difference between bacteria and human cells.

Cell Wall Synthesis

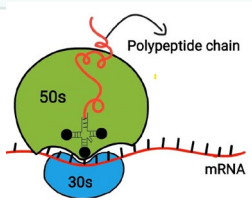
Penicillins, cephalosporins, carbapenems, monobactams, glycopeptides

Protein Synthesis (30S)



Aminoglycosides, tetracyclines

Protein Synthesis (50S)



Macrolides, lincosamides, oxazolidinones, streptogramins

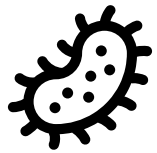
Nucleic Acid Synthesis

Fluoroquinolones (DNA), rifamycins (RNA)

Folate / Metabolic Pathway

Trimethoprim, sulfonamides

Cell Membrane Integrity



Polymyxins, lipopeptides (e.g., daptomycin)

PHARMACOLOGY REFRESHER

How Bacteria Fight Back: Resistance Mechanisms

1 Enzymatic Inactivation

The organism produces an enzyme that destroys or modifies the drug before it reaches its target.

e.g., beta-lactamases inactivating penicillins/cephalosporins

2 Target Alteration

The drug's binding site is mutated or modified so the drug can no longer bind effectively.

e.g., altered PBPs in methicillin-resistant staphylococci

3 Reduced Uptake / Efflux

The organism limits how much drug gets in (porin loss) or actively pumps it back out.

e.g., efflux pumps in many gram-negative organisms

4 Pathway Bypass

The organism develops an alternate metabolic route that avoids the blocked step entirely.

e.g., acquired alternate folate pathway enzymes

A BRIEF HISTORY

From Fleming's Petri Dish to a Standardized Test

https://www.businessinsider.com/

1928–29

Fleming observes a Penicillium mold inhibiting bacterial growth on a contaminated plate — the discovery that launches the antibiotic era.

1940s–50s

Antibiotics enter widespread clinical use. Individual laboratories develop their own, non-standardized susceptibility methods.

1950s–60s

Resistant organisms emerge almost as quickly as new drugs. Results vary lab-to-lab, making outcomes hard to compare or trust.

1960s–present

Standards organizations (CLSI in the U.S.; EUCAST internationally) formalize reproducible methods, quality control, and breakpoints.

The lesson that shaped modern AST: an antibiotic must be tested "against the very organism it is intended to treat," and the result is only useful if it is reproducible from one laboratory to the next.

Fleming A. On the antibacterial action of cultures of a penicillium. Br J Exp Pathol. 1929;10(3):226–236.

Standardizing the Test: CLSI and EUCAST

CLSI

Clinical and Laboratory Standards Institute

- Publishes the reference methods used in most U.S. laboratories (disk diffusion and broth dilution standards)
- Publishes and updates interpretive breakpoints for common bacteria annually in the M100 supplement
- Consensus process bringing together laboratorians, clinicians, industry, and regulators

EUCAST

European Committee on Antimicrobial Susceptibility Testing

- Sets the parallel standard used across much of Europe and increasingly worldwide
- Publishes its own breakpoint tables, which can differ numerically from CLSI's
- Joint CLSI–EUCAST working groups coordinate on methodology where possible

Why it matters on the bench: your instrument or panel is validated to one of these breakpoint sets. Know which one your laboratory reports — it is usually printed on your result report or SOP.

CLSI. Performance Standards for Antimicrobial Susceptibility Testing, 36th ed., M100. Clinical and Laboratory Standards Institute; 2026. EUCAST Breakpoint Tables (eucast.org).

METHODS

Two Reference Methods Underpin Everything

Every method in the lab — manual or automated — is validated against one of these two.

Broth Microdilution

Determines the Minimum Inhibitory Concentration (MIC)

- Organism is exposed to serial two-fold dilutions of antibiotic in liquid growth medium
- Lowest concentration showing no visible growth = the MIC
- Reported as a concentration, in µg/mL
- The international reference standard; used by regulators as the benchmark method

Disk Diffusion

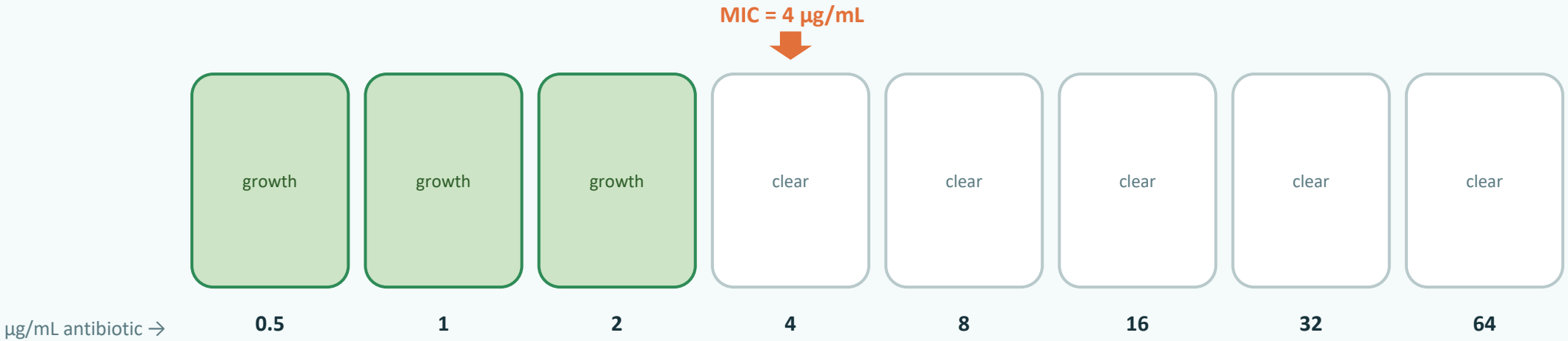
Determines a Zone of Inhibition

- A paper disk saturated with a fixed antibiotic concentration is placed on an inoculated agar plate
- Antibiotic diffuses outward in a concentration gradient as the organism grows overnight
- The diameter of the clear zone around the disk is measured, in millimeters
- Zone size correlates back to an MIC range for interpretation

CLSI M07 (dilution methods) and CLSI M02 (disk diffusion), Clinical and Laboratory Standards Institute.

The Minimum Inhibitory Concentration (MIC)

The lowest antibiotic concentration that prevents visible growth after overnight incubation.



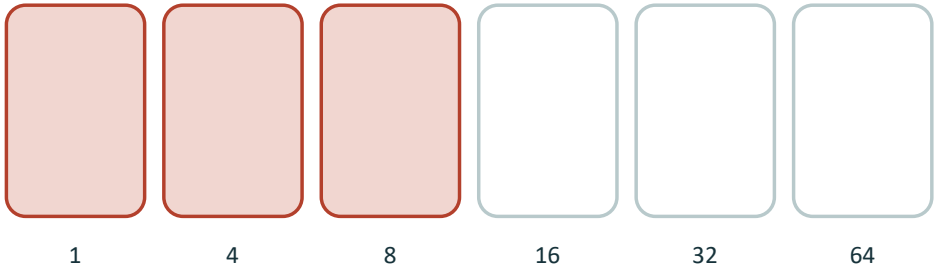
- Growth control well (no antibiotic) must show growth, confirming the organism was viable and correctly inoculated
- The first clear well in the dilution series is the MIC — here, growth stops at 4 µg/mL, so the MIC is 4 µg/mL
- Standard test variability is ± one two-fold dilution, which is expected and does not indicate an error

CLSI M07: Methods for Dilution Antimicrobial Susceptibility Tests for Bacteria That Grow Aerobically.

Reading the MIC: Two Organisms, Same Drug

Isolate #1

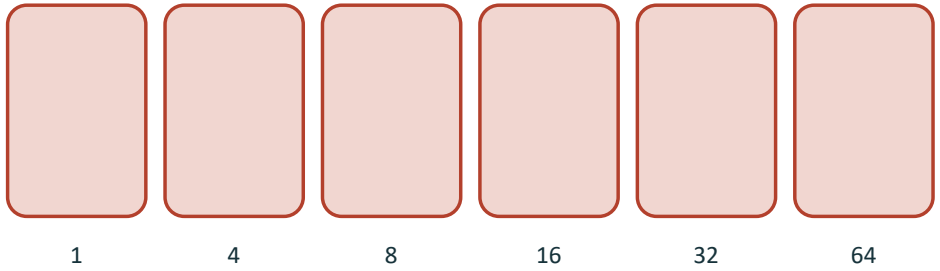
MIC = 16 µg/mL



Growth stops early — a low concentration is enough to inhibit this organism.

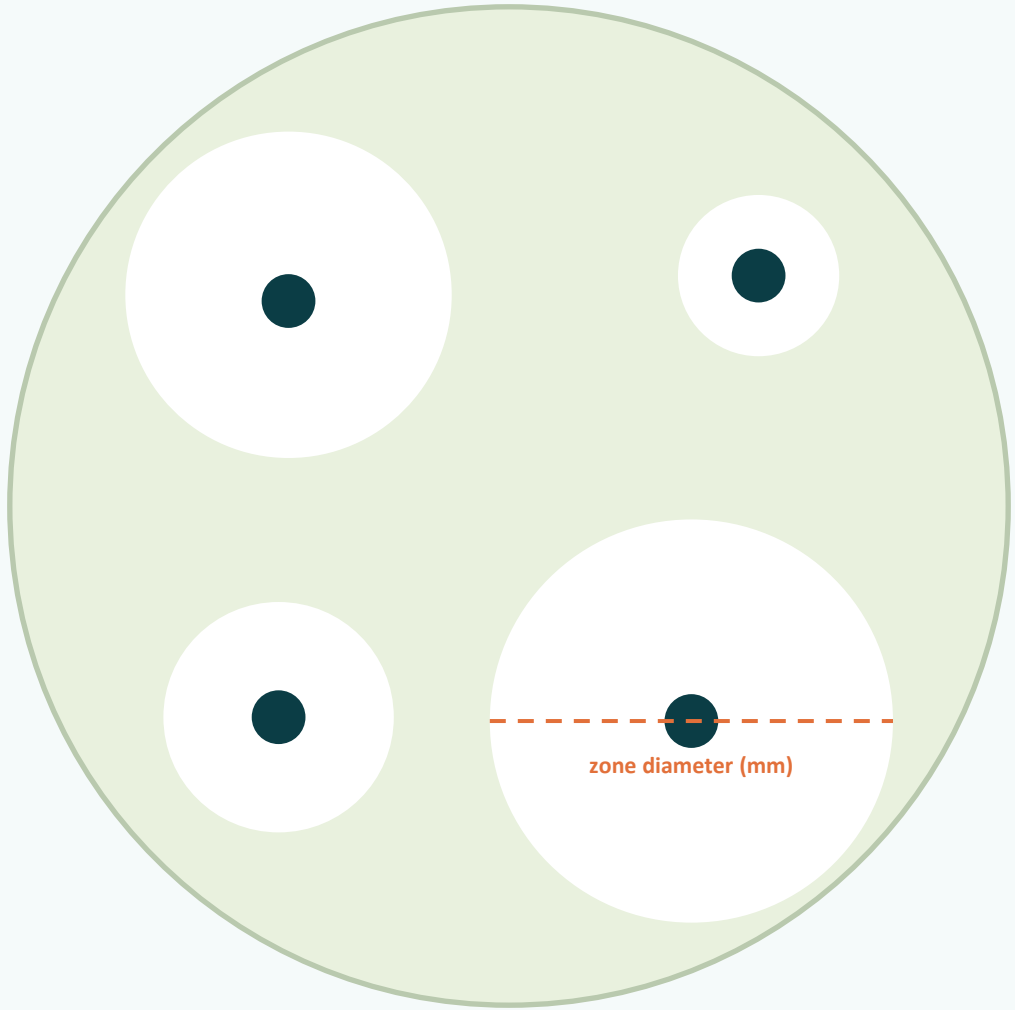
Isolate #2

MIC > 64 µg/mL



Growth continues through the entire tested range — achievable drug levels will not work.

The Disk Diffusion Test



- Agar plate is inoculated with a standardized suspension of the organism, forming a uniform lawn.
- Paper disks, each pre-loaded with a fixed concentration of one antibiotic, are placed on the surface.
- The antibiotic diffuses outward, creating a concentration gradient that decreases with distance.
- After overnight incubation, the zone of inhibition (clear area) is measured in millimeters and compared to a breakpoint table.
- Some agents cannot be reliably tested by disk diffusion — including several with poor or unpredictable agar diffusion — and require MIC-based methods instead.

CLSI M02: Performance Standards for Antimicrobial Disk Susceptibility Tests.

METHODS

MIC vs. Disk Diffusion, Side by Side

	Broth Microdilution (MIC)	Disk Diffusion
Result reported as	A concentration (µg/mL)	A distance (mm)
Format	Liquid medium in a panel/tray	Solid agar plate
Can calculate a specific dose relationship (PK/PD)?	Yes	No — correlated back to MIC ranges
Throughput on manual bench	Lower per-isolate labor with automation	Simple, inexpensive, flexible for many agents
Some agents excluded?	Rare	Yes — poor diffusers must use MIC methods

CLSI M02 and M07, Clinical and Laboratory Standards Institute.

Commercial AST Platforms: Same Principles, Different Format

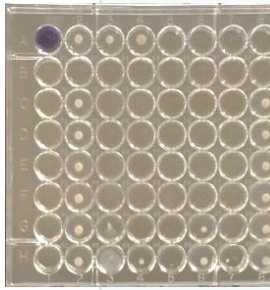
Most laboratories do not run manual reference-method testing for every isolate — they use a validated commercial system.

1 Automated broth microdilution systems

Instrument-read microdilution panels that report an MIC (and derived S/I/R) for a full antibiotic panel, often within hours.

2 Manual broth microdilution panels

Pre-made dilution trays read visually or with a simple reader; same underlying principle as automated systems.



3 Gradient diffusion strips

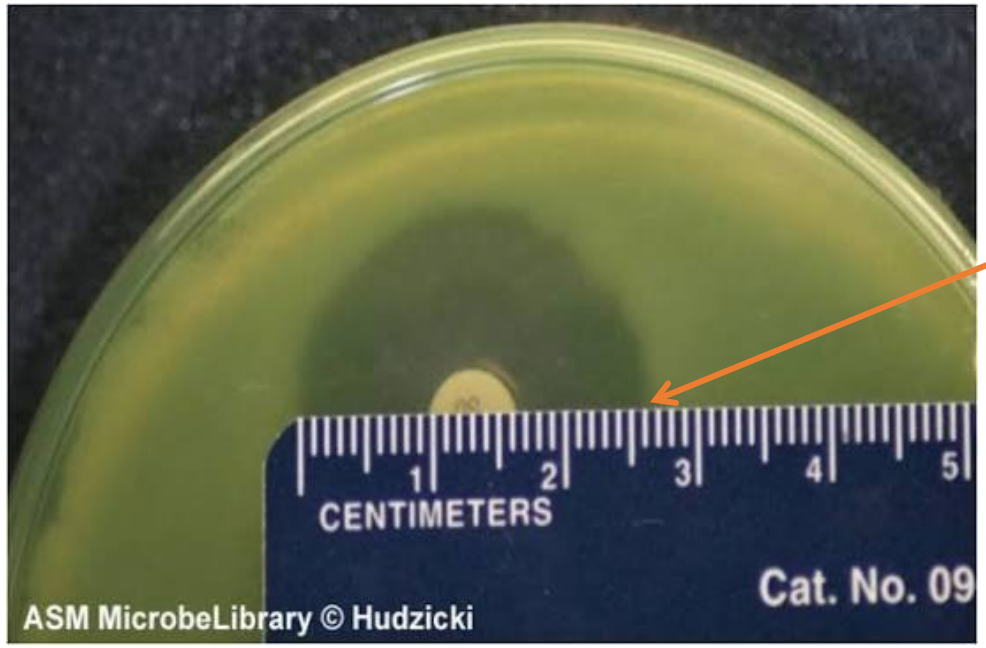
A plastic strip with a continuous antibiotic gradient replaces the disk, giving a direct MIC readout from an agar plate.

4 Disk diffusion

The original reference method, still routinely used, especially for organisms or agents not well suited to panels.

In the U.S., a commercial system must be FDA-cleared, demonstrating acceptable agreement with the CLSI reference method, before a laboratory can use it for patient results. In other countries, this is done through local regulatory agencies and demonstrated through CE-markings

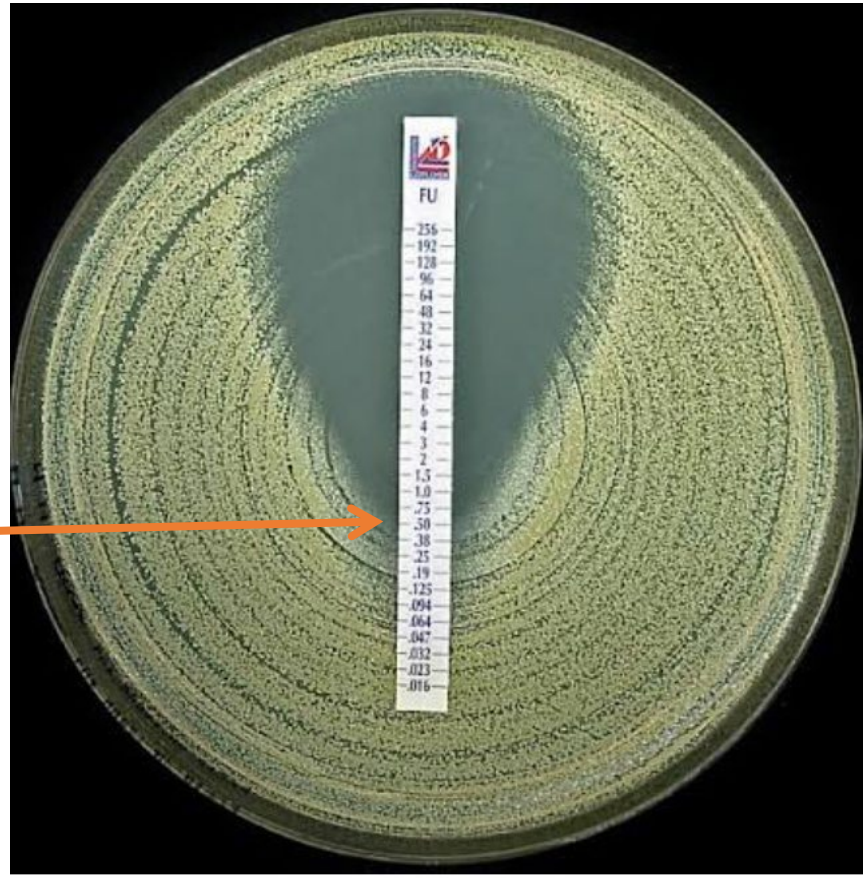
Gradient Diffusion Disc vs. Strips



Zone Diameter
26mm

Vs

MIC of 0.5



Liofilchem.com

GETTING IT RIGHT

Principles Every AST Method Depends On

The method only predicts reality if these variables are controlled — this is where technique matters most.

Pure Culture

Testing must start from a single, pure isolate — a mixed culture invalidates the result.

Growth Phase

Organisms should be in log-phase (actively dividing) growth, not an old or stressed culture.

Inoculum Density

A standardized suspension (typically referenced to a 0.5 McFarland turbidity standard) ensures a consistent starting concentration.

Incubation Time

Most panels are read at 16–20 hours; some organisms require 24 hours — reading too early or late skews results.

Temperature

Standard incubation is 35±2°C for most routine testing.

Atmosphere

Follow the manufacturer's package insert for the specific drug-organism combination as some organisms require a specific atmosphere for reliable growth or test conditions.

CLSI M02 and M07, Clinical and Laboratory Standards Institute.

CLINICAL JUDGMENT

When Should AST Be Performed?

The organism is recovered in culture	*in adequate quantity from an appropriate specimen*
It is a plausible pathogen	*for the anatomical site the specimen came from, not an expected commensal*
Susceptibility is not predictable	*the organism does not have a well-established, reliably predictable susceptibility pattern*
Your AST inoculum is a pure culture	*so the result can be attributed to a specific organism with confidence*

CLINICAL JUDGMENT

When AST Is Not Necessary — or Not Appropriate

Predictably Susceptible Organisms

- Some organisms remain reliably susceptible to standard first-line agents — testing adds cost and delay without changing management.
- Example: Group A Streptococcus remains universally susceptible to penicillin; routine AST is not necessary for this pairing.
- Reporting an unnecessary result can also tempt broader-spectrum prescribing than needed.

Likely Contaminated Specimens

- Multiple organisms at low-to-moderate colony counts, especially from a non-sterile site, often represent contamination or colonization rather than infection.
- Example: a urine culture with several organism types at modest counts, including skin/genital flora, more often reflects collection technique than a true UTI.
- Testing (and reporting) here risks treating a contaminant — a repeat, properly collected specimen is usually the better call.

Caveat: Sometime an organism requires AST results the first time it is isolated but not if it isolated from multiple specimens at the same time or within a short time frame of each other. In this case, lab reports often refer back to the isolate first tested – consult your Standard Operating Procedure!

CLINICAL JUDGMENT

Selecting the Isolate: A Urine Culture Example

Perform AST

> 100,000 CFU/mL Escherichia coli, no other organisms recovered

- Significant quantity of a well-established urinary pathogen
- No competing organisms suggesting contamination
- Result will directly guide antibiotic selection for a likely true UTI

Do Not Perform AST

Mixed growth: Corynebacterium spp., E. coli, yeast, and Lactobacillus spp., all at modest counts

- Multiple organism types, several of which are typical genital/periurethral flora
- Pattern is classic for a poorly collected (contaminated) specimen
- Recommend a freshly and properly collected specimen if a UTI is still suspected

How AST Is Reported: S, I, R

S

Susceptible

MIC falls below the susceptible breakpoint.

The antimicrobial agent is expected to inhibit the pathogen at standard dosing — predicted clinical success.

I

Intermediate / Susceptible-Dose-Dependent

MIC falls in the intermediate range, near the breakpoint.

May still work if the dose is increased, or if the infection is at a site where the drug concentrates — a conditional "maybe."

R

Resistant

MIC exceeds the resistant breakpoint.

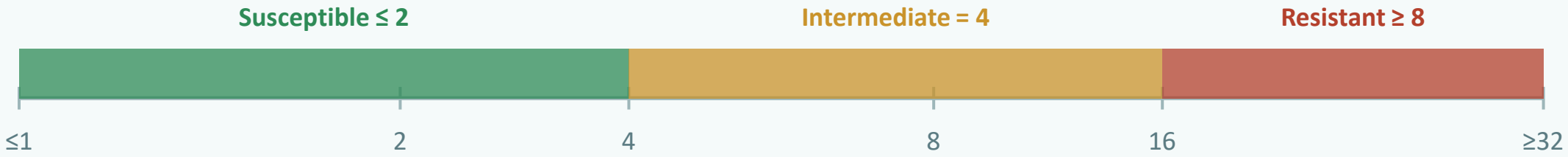
The antimicrobial agent is not expected to inhibit the pathogen at achievable levels — predicted clinical failure.

CLSI M100, 36th ed., Clinical and Laboratory Standards Institute; 2026.

What Is a Breakpoint?

A breakpoint is a specific MIC (or zone diameter) value chosen to divide results into susceptible, intermediate / SDD, and resistant categories for a given organism–drug combination.

A simplified example — not an actual published breakpoint:



Breakpoints are not fixed physical constants — they are set (and periodically revised) by expert committees, and they differ by organism, by drug, and sometimes by infection site.

CLSI M100, 36th ed., Clinical and Laboratory Standards Institute; 2026.

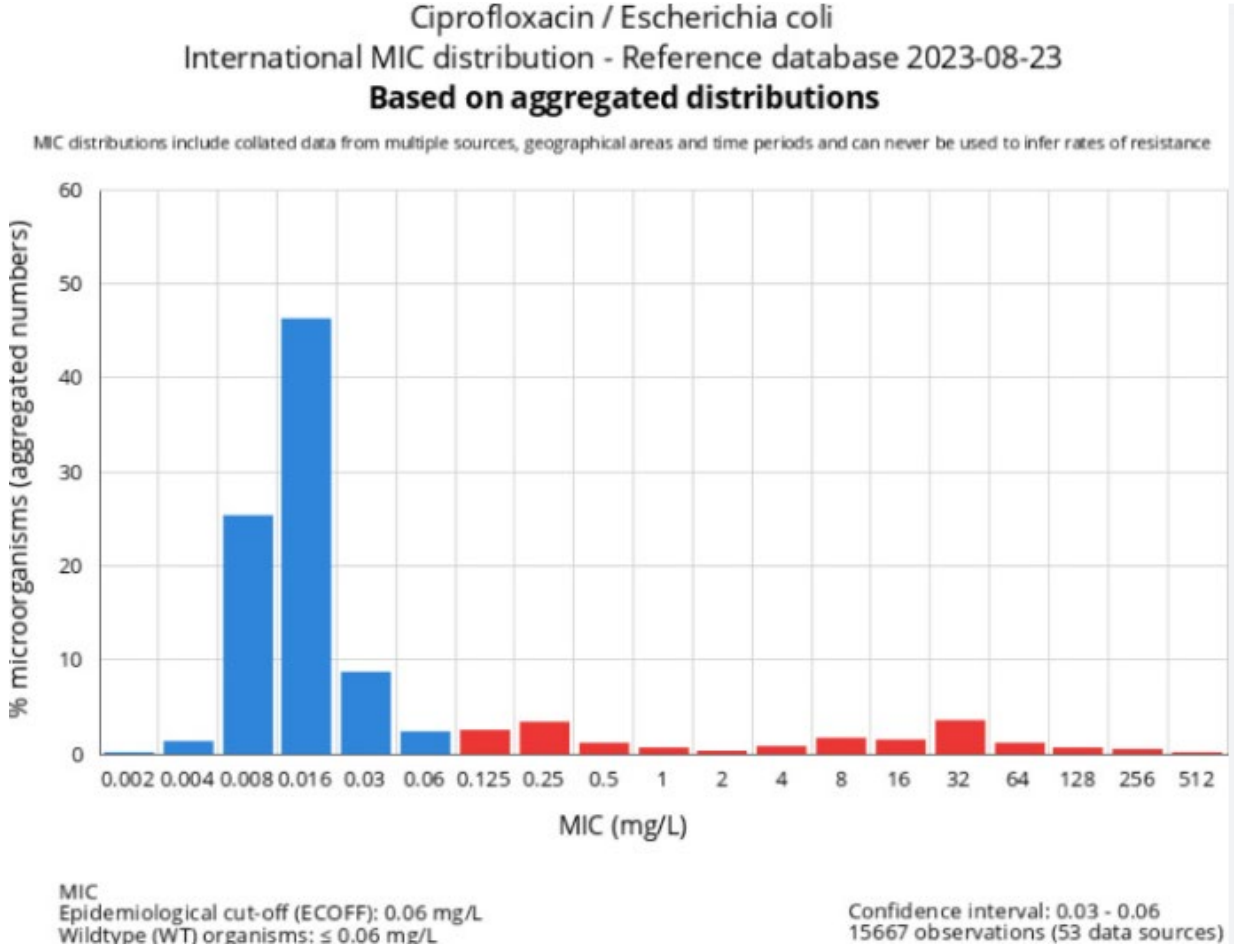
How Breakpoints Are Set: Three Pillars

Committees weigh three independent lines of evidence before setting or revising a breakpoint.

1

Microbiological Data

MIC distributions across large populations of the organism define the “wild-type” (no acquired resistance) range versus organisms with acquired resistance mechanisms.



https://pmc.ncbi.nlm.nih.gov/articles/PMC10732016/

CLSI M100, 36th ed.; Craig WA. Pharmacokinetic/pharmacodynamic parameters: rationale for antibacterial dosing of mice and men. Clin Infect Dis. 1998;26(1):1–10.

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Pharmacokinetic / Pharmacodynamic (PK/PD) Data

Modeling of how much drug reaches the infection site, and for how long, given doses that are safe and achievable in patients.

CLSI M100, 36th ed.; Craig WA. Pharmacokinetic/pharmacodynamic parameters: rationale for antibacterial dosing of mice and men. Clin Infect Dis. 1998;26(1):1–10.

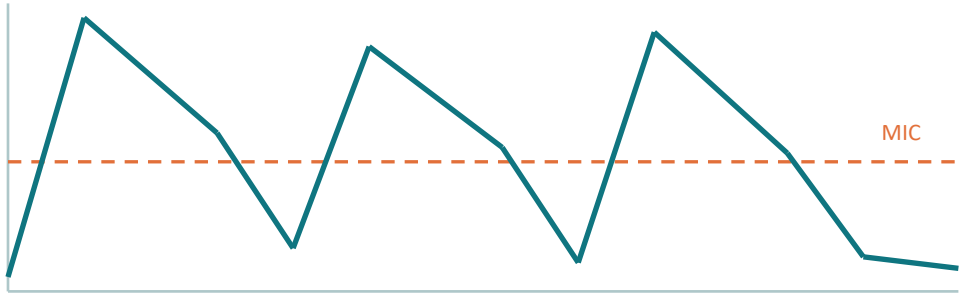
PK/PD Basics: Two Killing Patterns

Different antibiotic classes need different exposure patterns to kill bacteria effectively.

Time-Dependent Killing

e.g., beta-lactams

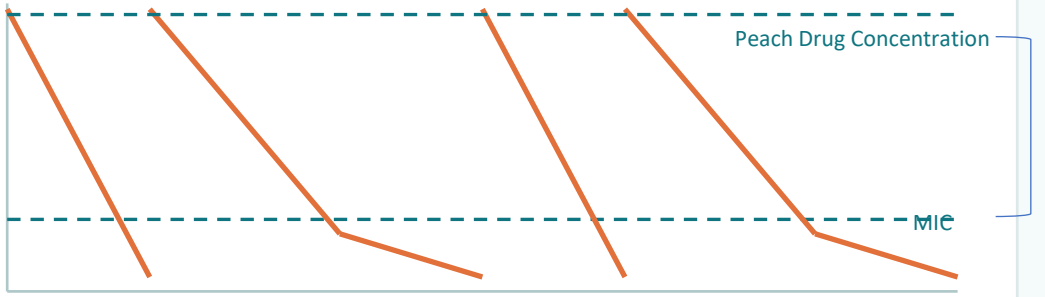
Goal: maximize the % of the dosing interval that levels stay above the MIC → favors frequent or extended dosing



Concentration-Dependent Killing

e.g., aminoglycosides, fluoroquinolones

Goal: maximize the peak concentration relative to the MIC → favors larger, less frequent doses



Adapted from Craig WA. Clin Infect Dis. 1998;26(1):1–10.

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Clinical Outcome Data

Real-world data linking MIC values to actual treatment success or failure in treated patients.

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Lancet Infect Dis. 2026 Jul;26(7):659-670. doi: 10.1016/S1473-3099(26)00020-4. Epub 2026 Mar 25.

Survival trends in patients with difficult-to-treat, antibiotic-resistant, Gram-negative infections in the era of next-generation antibiotics in the USA: a retrospective cohort study

Morgan K Walker [1], Christina Yek [2], Sadia Sarzynski [3], Sarah Warner [1], Anthony D Harris [4], Jonathan D Baghdadi [4], Katherine E Goodman [4], John H Powers 3rd [5], Michael Klompas [6], Chanu Rhee [6], Bruce Swihart [3], Sameer S Kadri [7];
NIH Antimicrobial Resistance Outcomes Research Initiative (NIH-ARORI)

Affiliations + expand

PMID: 41903557 PMCID: PMC13268009 DOI: 10.1016/S1473-3099(26)00020-4

3

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Breakpoints Are Organism- and Drug-Specific

The same MIC can mean something different depending on which organism produced it.

E	Sa	CoNS	Pa	Es
Enterobacterales	*Staphylococcus aureus*	*Coagulase-negative Staphylococcus or S.O.S.A*	*Pseudomonas aeruginosa*	*Enterococcus spp.*

Each organism group has its own interpretive tables because intrinsic biology, typical resistance mechanisms, and clinical outcome data all differ by species.

Practical rule: never apply a breakpoint from one organism group to another, even if the drug name is identical — always confirm you are reading the correct table.

CLSI M100, 36th ed., Clinical and Laboratory Standards Institute; 2026.

CASE STUDY 1

Applying S / I / R in Practice

Clinical Vignette

A 35-year-old woman is admitted with urosepsis. **Blood cultures grow Escherichia coli.**

*The laboratory reports the following **MICs** from the isolate:*

Ampicillin	**8 µg/mL**
Ceftriaxone	**0.5 µg/mL**
Ciprofloxacin	**1 µg/mL**

Question: based on these MICs, which agent(s) are predicted to be active?

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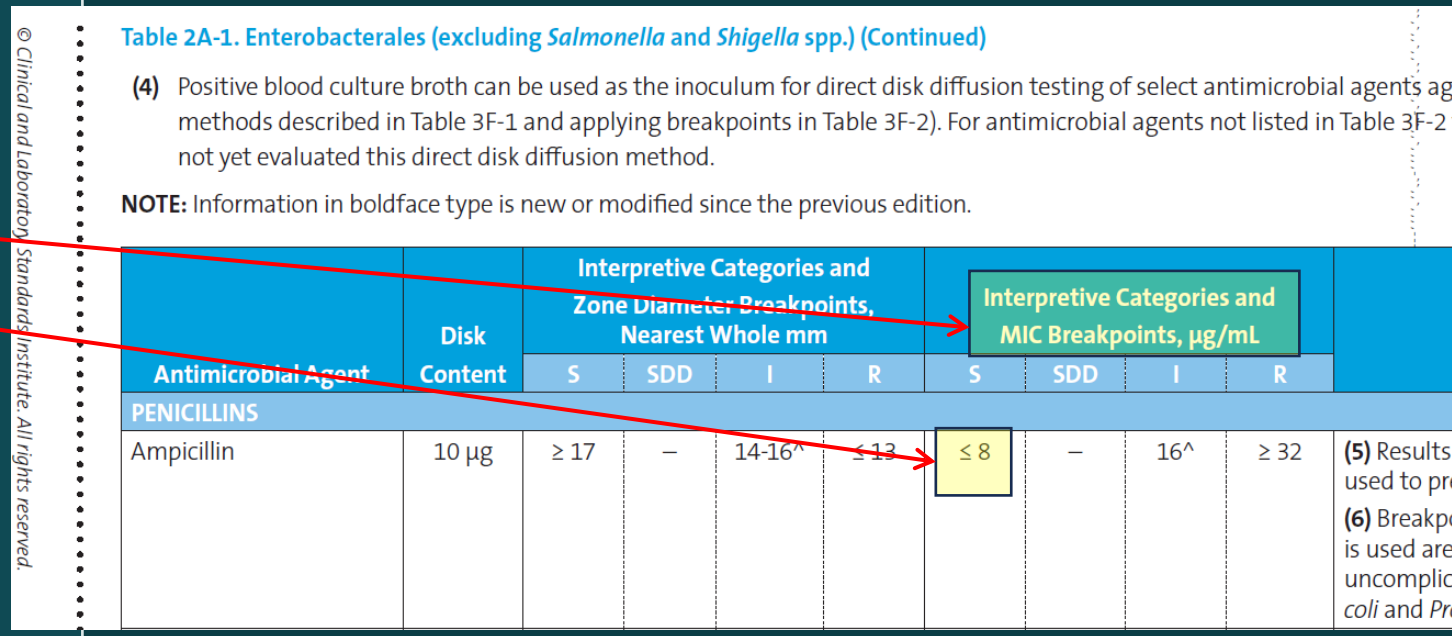

Table 2A-1. Enterobacterales (excluding *Salmonella* and *Shigella* spp.) (Continued)

(4) Positive blood culture broth can be used as the inoculum for direct disk diffusion testing of select antimicrobial agents ag methods described in Table 3F-1 and applying breakpoints in Table 3F-2). For antimicrobial agents not listed in Table 3F-2 not yet evaluated this direct disk diffusion method.

NOTE: Information in boldface type is new or modified since the previous edition.

Antimicrobial Agent	Disk Content	Interpretive Categories and Zone Diameter Breakpoints, Nearest Whole mm				Interpretive Categories and MIC Breakpoints, µg/mL				
		S	SDD	I	R	S	SDD	I	R	
PENICILLINS										
Ampicillin	10 µg	≥ 17	–	14-16^	≤ 13	≤ 8	–	16^	≥ 32	**(5)** Results used to pr **(6)** Breakp is used are uncomplic *coli* and *Pr*

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After Applying Breakpoints

Ampicillin	8 µg/mL	S
Ceftriaxone	0.5 µg/mL	S
Ciprofloxacin	1 µg/mL	S

All three agents test susceptible — so which one should be used?

- The laboratory's job ends at reporting an accurate, correctly interpreted result
- The prescriber's choice among susceptible agents depends on factors AST doesn't capture: allergy history, other medications, source control, and a preference for the narrowest effective spectrum
- This is why AST supports — but does not replace — clinical decision-making

Select Resistance Phenotypes

- A single AST result rarely is useful without knowing the larger isolate profile
- The isolate AST profile can provide insight to resistance mechanisms and potential of transferring the mechanism to another organism
- In addition to Antibiotic testing, we can also perform screening tests using antibiotics to look for certain resistance mechanisms
- Recognition of common vs. uncommon AST profiles can help
  - Determine result accuracy
  - Inform level of Infection Control Interventions
  - Understanding shifts in local epidemiology
  - Identify outbreaks

McConeghy KW, Bleasdale SC, Rodvold KA. Clin Infect Dis. 2013;57(12):1760–1765.

Staphylococcus aureus: MRSA vs. MSSA

Same species, Staphylococcus aureus — but the correct drug class depends entirely on methicillin susceptibility.

MSSA — Methicillin-Susceptible

- Beta-lactams (e.g., anti-staphylococcal penicillins, first-generation cephalosporins) are typically the most effective option
- For bloodstream infections, outcome data and potential side effects favor a beta-lactam over a higher tiered antibiotic, (e.g. vancomycin) when the isolate is susceptible

MRSA — Methicillin-Resistant

- Beta-lactams are rendered ineffective (with rare drug-specific exceptions) and must be avoided
- Alternative agents (e.g., vancomycin, ceftaroline, or other non-beta-lactam options) are required, generally with somewhat less favorable outcomes than a beta-lactam would offer for a susceptible strain

Bottom line: getting this call right, quickly, is one of the highest-stakes results a microbiology lab produces.

McConeghy KW, Bleasdale SC, Rodvold KA. Clin Infect Dis. 2013;57(12):1760–1765.

Detecting Methicillin Resistance

1	**Cefoxitin Surrogate Testing**	Cefoxitin is used as a surrogate marker because it more reliably induces detectable resistance than oxacillin itself — the result is then reported as oxacillin, not cefoxitin, since cefoxitin itself is not used therapeutically for staphylococci.
2	**Oxacillin MIC (with salt supplementation)**	Direct testing against oxacillin using a higher salt concentration to improve detection of heteroresistant populations.
3	**Molecular or Antigen Detection**	Direct detection of the *mecA* (or *mecC*) resistance gene, or the PBP2a protein it encodes, independent of phenotypic growth.

CLSI M100, 36th ed.; Swenson JM, et al. J Clin Microbiol. 2005;43(8):3818–3823.

Enterococcus: Intrinsic Resistance and Vancomycin Resistant Enterococcus (VRE)

Intrinsically Resistant To:

- Cephalosporins
- Clindamycin
- Aminoglycosides (at standard/low-level testing)
- Trimethoprim-sulfamethoxazole (in vivo activity unreliable despite in vitro results)

These results should never be reported as susceptible for Enterococcus, regardless of what an automated panel's raw MIC might suggest — intrinsic resistance overrides.

Species Differences Matter

- *E. faecalis* — usually susceptible to ampicillin/penicillin; can acquire vancomycin resistance
- *E. faecium* — usually resistant to ampicillin/penicillin; vancomycin resistance (VRE) is common in this species
- Species-level identification is therefore essential before interpreting the susceptibility profile

CLSI M100, 36th ed., Clinical and Laboratory Standards Institute; 2026.

ESBLs and Carbapenemases in Enterobacterales

Extended-Spectrum Beta-Lactamases (ESBLs)

- Enzymes that inactivate most penicillins, cephalosporins, and monobactams
- Typically remain susceptible to carbapenems, which is why carbapenems are frequently the treatment of choice for serious ESBL infections
- Detected phenotypically through characteristic resistance patterns on routine panels, often confirmed with dedicated testing

Carbapenems Producing Enterobacterales (CPE) and Carbapenem Resistance Organisms (CRO)

- CPEs have enzymes that inactivate carbapenems such as Meropenem and Imipenem
  - Among the most concerning resistance mechanisms in gram-negative organisms
- Phenotypic confirmatory methods (such as the modified/EDTA-modified carbapenem inactivation methods) distinguish true carbapenemase production (CPE) from other causes of reduced susceptibility (CRO)
- Carbapenemase production carries major infection-control implications beyond individual patient treatment since these genes can often be transferred to other organisms

CLSI M100, 36th ed.; Tamma PD, Simner PJ. J Clin Microbiol. 2018;56(11):e01140-18.

CASE STUDY 2

When Results Don't Match Expectations

A patient with a multidrug-resistant *Pseudomonas aeruginosa* bloodstream infection is being treated. **The formulary carbapenem tests resistant, but a closely related carbapenem in the same drug class tests susceptible on the panel.**

Reflex question: “They're in the same class — can we just assume the untested one works too?”

The Teaching Point

- Agents within the same class can show discordant susceptibility results, especially in organisms with efflux-pump or permeability-based resistance mechanisms
- “Class representative” or equivalent-agent testing (using one drug's result to predict another's) is on a case-by-case basis precisely because it can be misleading in exactly this way
- Each agent on the panel must be tested and reported on its own merits — never assume activity for an untested drug based on a same-class relative unless specified in your CLSI or EUCAST guidance documents

THE BIGGER PICTURE

Antimicrobial Resistance (AMR): CDC vs. WHO Priority Frameworks

Two bodies, two priority lists for the same global problem — different scope, same top threats.

CDC — Antibiotic Resistance Threats Report

United States, 2019 (updated 2021–2022)

URGENT

- Carbapenem-resistant Enterobacterales (CRE)
- Carbapenem-resistant Acinetobacter
- Clostridioides difficile
- Drug-resistant Neisseria gonorrhoeae
- Candida auris

SERIOUS

- ESBL-producing Enterobacterales
- MRSA · VRE
- Multidrug-resistant Pseudomonas aeruginosa
- Drug-resistant Candida (non-auris)

CONCERNING

- Erythromycin-R group A Strep
- Clindamycin-R group B Strep

WHO — Bacterial Priority Pathogens List

Global, 2024 (BPPL)

CRITICAL PRIORITY

- Carbapenem-resistant Acinetobacter baumannii
- Carbapenem-resistant Enterobacterales
- 3rd-gen cephalosporin-resistant Enterobacterales
- Rifampicin-resistant Mycobacterium tuberculosis

HIGH PRIORITY

- Fluoroquinolone-resistant Salmonella Typhi
- Fluoroquinolone-resistant Shigella spp.
- Drug-resistant Neisseria gonorrhoeae
- Multidrug-resistant Pseudomonas aeruginosa
- Methicillin-resistant Staphylococcus aureus (MRSA)

MEDIUM PRIORITY

- Several resistant streptococci/enterococci

Same core threats, different lens: CRE and carbapenem-resistant Acinetobacter top both lists. CDC's U.S. list also covers fungi and C. difficile; WHO's bacteria-only BPPL is built to prioritize global antibiotic R&D — which is why MRSA and *N. gonorrhoeae* rank High for WHO but Urgent/Serious for CDC.

CDC. Antibiotic Resistance Threats in the United States, 2019 (CDC, HHS). WHO Bacterial Priority Pathogens List, 2024 (Lancet Infect Dis. 2025; WHO, Geneva).

THE BIGGER PICTURE

The Antibiotic Pipeline Has Not Kept Pace

- Only about five genuinely novel antibiotic classes have reached the market since 2000 — most new approvals are variations on existing classes.
- FDA antibiotic approvals fell from roughly 19 in the early 1980s to single digits in several recent five-year windows, a trend widely described as the “antibiotic discovery void.”
- Economic factors — short treatment courses, stewardship-driven conservative use, and generic competition — make antibiotic development less commercially attractive than other therapeutic areas.

Why This Makes AST More Important, Not Less

With fewer new agents entering practice, **preserving the effectiveness of existing antibiotics through accurate susceptibility testing and antimicrobial stewardship is one of the few tools we have to keep pace with resistance.** Every correctly performed AST result helps a clinician use the right drug — and avoid using drugs that don't need to be used at all.

Innovative perspectives on the discovery of small molecule antibiotics. npj Antimicrob Resist. 2025;3:24. Current economic and regulatory challenges in developing antibiotics for Gram-negative bacteria. npj Antimicrob Resist. 2025.

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Thank You

Questions?

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