BIOMÉRIEUX

QUICK GUIDE

Antimicrobial Susceptibility Testing report *vs.* Cumulative antibiogram

CUMULATIVE ANTIBIOGRAM vs. AST* REPORT
WHAT IS THE DIFFERENCE?

↗ CUMULATIVE ANTIBIOGRAM

Also called antibiogram in the United States of America & Asia-Pacific region

Report that summarizes the antimicrobial susceptibility test data collected over a specific **period of time** (usually a year) to show the susceptibility patterns of clinically significant microorganisms within a given healthcare setting or location. *(CLSI Guideline M39)*

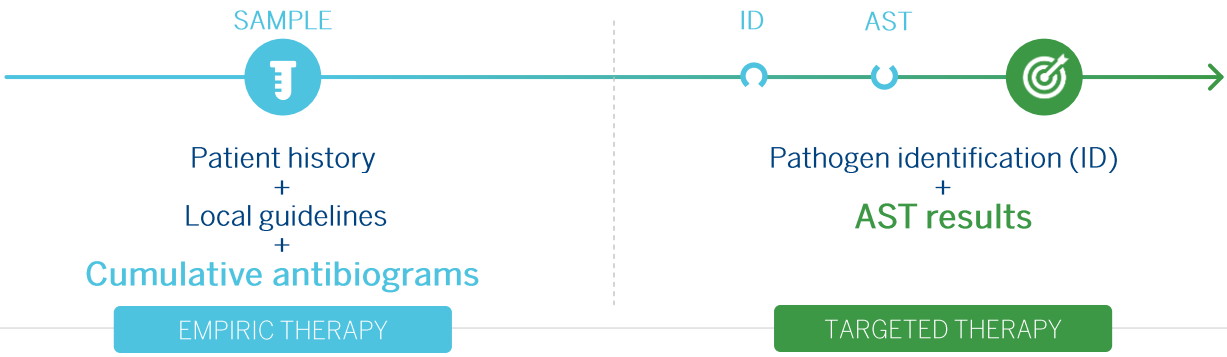
↗ AST REPORT

Also called antibiogram in Latin America & some European countries

Report that gives the Antimicrobial Susceptibility Testing (AST) results specific to individual bacterial isolates obtained from a patient sample. These results show whether the isolate is **susceptible (S), intermediate (I), or resistant (R)** to various antibiotics.

* Antimicrobial Susceptibility Testing

WHEN TO USE?



AS A CLINICIAN, YOU MAY ASK YOURSELF...

- What is the site of infection?
- What are the most common pathogens associated with this site?
- Are there risk factors for Multidrug-Resistant Organisms (MDROs)?
- What empiric therapy should I use?

- Does this organism show any resistance?
- Which antibiotics will be effective for my patient?
- Is the current empiric antibiotic treatment appropriate for this infection?
- Do I need to escalate or de-escalate?

↗ CUMULATIVE ANTIBIOGRAM

Guides empiric therapy decisions by showing local resistance patterns

Cumulative antibiograms are also used by Antimicrobial Stewardship Program (ASP) to track resistance trends, create guidelines for specific settings, update empiric therapy and aid in antibiotic stewardship and surveillance.

↗ AST REPORT

Provides information for tailoring antibiotic therapy for individual patients and helps the clinician to decide on the targeted therapy

AST reports are used by Infection Prevention and Control (IPC) teams to reduce the incidence of infections within a healthcare facility and ensure quality healthcare delivery by implementing protocols to protect patients and staff.

CUMULATIVE ANTIBIOGRAM

The cumulative antibiogram is a graphical report (usually a table) that lists the percentage of isolates of various bacteria that are susceptible to various antibiotics over a defined period of time and within a given location.

THE PRIMARY PURPOSE OF A CUMULATIVE ANTIBIOGRAM IS TO:

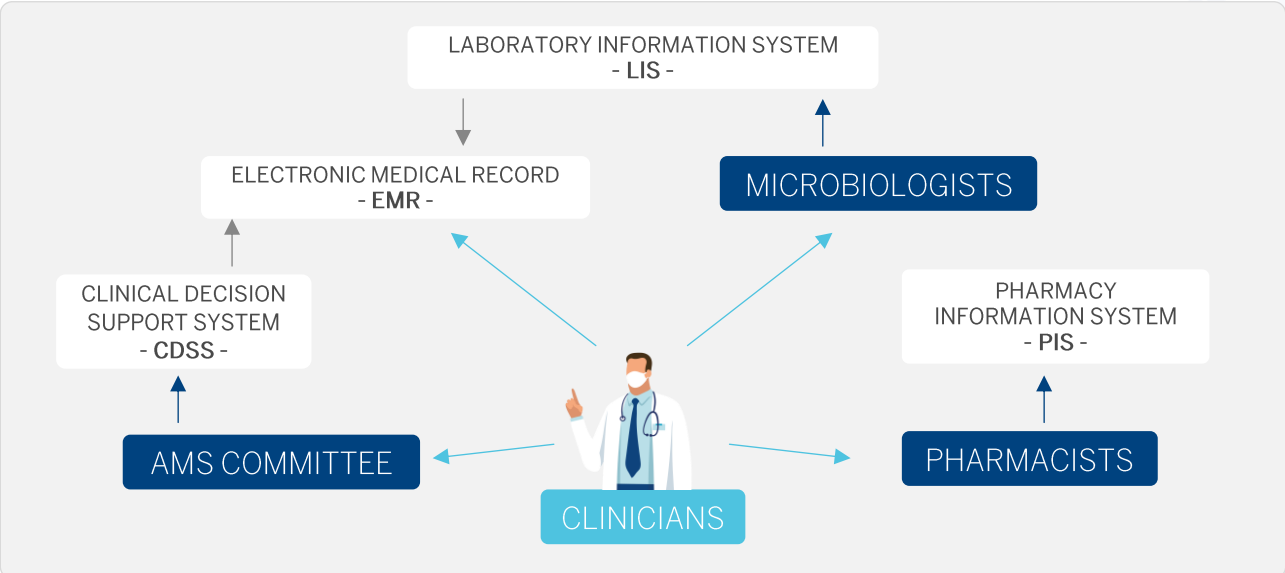
1. Guide clinicians in selecting appropriate empiric antibiotic therapy.
2. Support antimicrobial stewardship efforts by identifying resistance trends and helping to optimize antibiotic use.

HOW IS IT CREATED AND WHERE TO FIND IT?

A cumulative antibiogram is generated by compiling and analyzing antimicrobial susceptibility testing data from isolates collected at a **specific institution** over a **defined period**. It shows the percentage of **susceptible** isolates to each antimicrobial agent tested. It can be filtered according to location, specimen or patient criteria, and updated as needed. According to CLSI (the Clinical and Laboratory Standards Institute), only the first isolate per patient is analyzed, a step known as "deduplication".

Cumulative antibiograms are created by the different **software programs** used in the lab, which are connected to the lab's automated AST system (called Middleware) and manual AST tests results are also added.

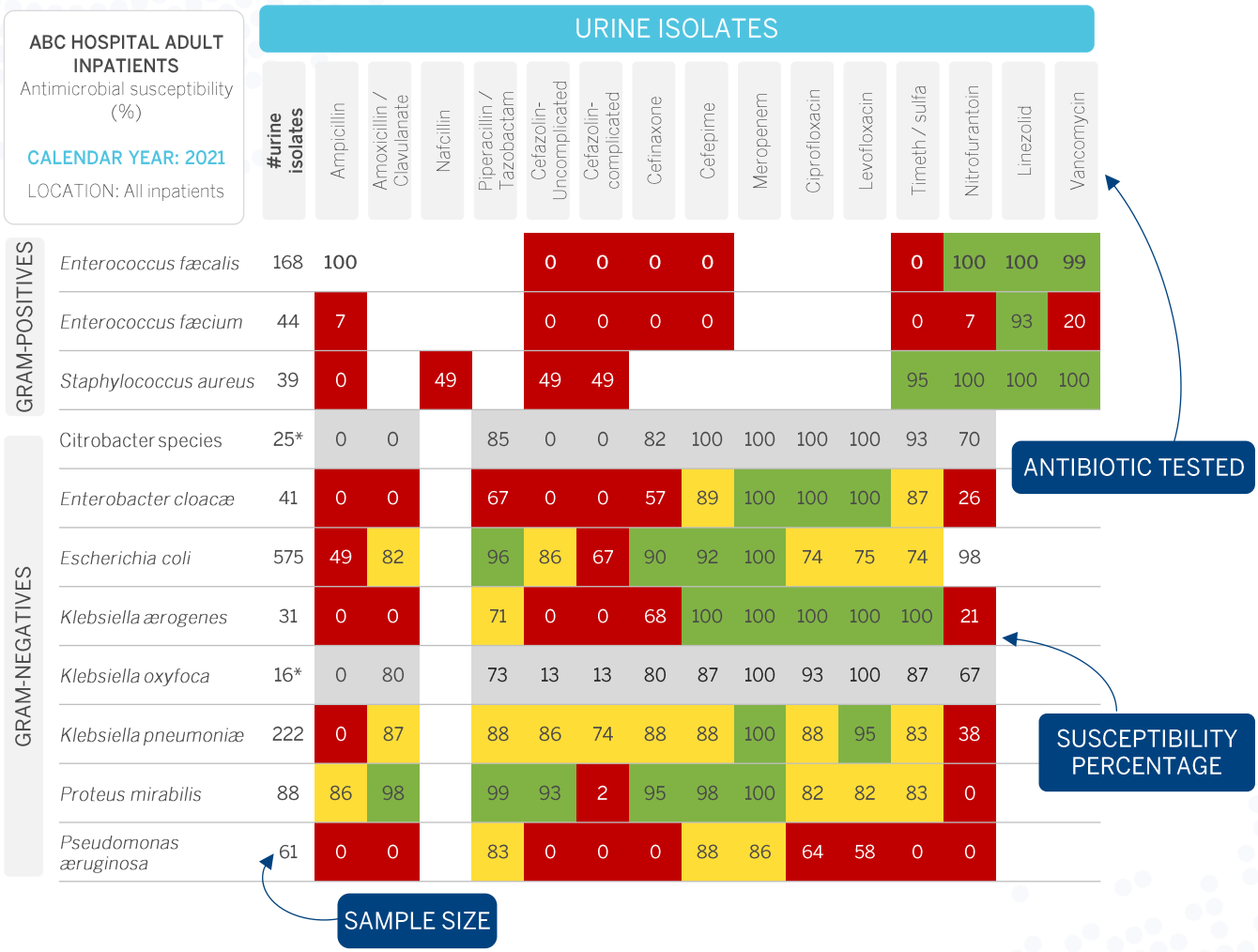
HOW TO ACCESS CUMULATIVE ANTIBIOGRAMS?



CUMULATIVE ANTIBIOGRAM

HOW TO READ A CUMULATIVE ANTIBIOGRAM?

Example of a cumulative antibiogram



0=intrinsic resistance to this drug.
*Susceptibilities were not reported for organisms with <10 isolates. Data from <30 isolates do not provide statistically significant information, and susceptibilities should be interpreted with caution.

A color-coding system allows healthcare providers to quickly assess which antibiotics are likely to be effective, facilitating more rapid and informed decision-making in clinical settings.

- ≥ 90%
- 70-90%
- ≤ 70%
- ≤ 30 isolates

In the example, **49% of the *E. coli* isolates tested are susceptible to Ampicillin,** whereas 100% of isolates are susceptible to Meropenem.

CLINICAL CONSIDERATIONS FOR INTERPRETATION
CUMULATIVE ANTIBIOGRAM

IN SUMMARY

- Check the cumulative antibiogram date
  (some cumulative antibiograms could be from the year before) ⚠
- Use the latest guidelines
- Meet with your AMS committee

ALSO, WHEN SELECTING INITIAL (OR "EMPIRIC") THERAPY, CONSIDER:

- **Patient history** (previous treatment)
  & baseline conditions (drug allergy, comorbidities, etc.)
- **Previous antibiotic use and previous microbiology results**
- **Infection type, infection site** (PK/PD)

FIGHTING ANTIMICROBIAL RESISTANCE & SELECTING APPROPRIATE TREATMENT

REQUIRES A COLLABORATIVE APPROACH!

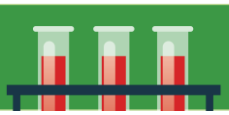
CLSI

AST REPORT

Antimicrobial susceptibility testing (AST) is the measurement of the susceptibility of bacteria and fungi to antibiotics.

DIFFERENT METHODS TO PERFORM AST

- Disk diffusion
- Gradient diffusion
- Broth microdilution
- Biosensor detection



HOW TO INTERPRET AST RESULTS?

The AST report includes data on the minimum inhibitory concentrations (MIC) for antibiotics tested against specific bacterial isolates. Results are interpreted as susceptible (S), intermediate (I), or resistant (R), based on standardized breakpoints *(CLSI M100)*.

Minimum Inhibitory Concentration (MIC) is the lowest concentration of an antimicrobial agent that prevents visible growth of a microorganism after overnight incubation. It quantifies the *in vitro* activity of an antimicrobial agent against a specific bacterial strain.

Epidemiological Cut-Off Values (ECVs) are the highest MIC values that define the "wild-type" population of a microorganism, distinguishing it from strains with acquired resistance mechanisms. ECVs are essential for monitoring the emergence and spread of resistance.

Breakpoints are threshold values that determine whether a bacterium is classified as S, I, or R to an antimicrobial agent. They are derived from a combination of MIC values, epidemiological cut-off values (ECVs), pharmacokinetic/pharmacodynamic (PK/PD) parameters and clinical data.

MIC values + ECVs + PK/PD + Clinical data

Breakpoints help translate *in vitro* MIC data into clinical practice to guide treatment decisions.

Breakpoints are established by organizations such as the **Clinical and Laboratory Standards Institute (CLSI)** and are reviewed and updated annually.

CLSI categories

S Susceptible	Isolates are inhibited by the usually achievable concentrations of antimicrobial agent when the dosage recommended to treat the site of infection is used.
I Intermediate	A buffer zone for technical uncertainty.
R Resistant	The minimum inhibitory concentration (MIC) of the antimicrobial is above a specific threshold, meaning that the organism is unlikely to be inhibited by standard doses of the drug used in therapy.
SDD Susceptible-Dose-Dependent	Isolates are not inhibited by the usually achievable concentrations of the agent with normal dosage schedules and/or that demonstrate MIC that fall in the range in which specific microbial resistance mechanisms are likely.
I^ Intermediate	Zone to highlight those antimicrobial agents that concentrate in urine and the likelihood of treatment success when the agent is prescribed for uncomplicated urinary tract infections.
NS Non-Susceptible	Isolate for which only a susceptible breakpoint is designated because of the absence or rare occurrence of resistant strains, or for which the MICs are above the value indicated for the susceptible breakpoint.

EUCAST

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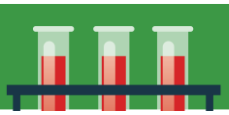

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MIC values + ECOFFs + PK/PD + Clinical data

Breakpoints help translate *in vitro* MIC data into clinical practice to guide treatment decisions.

Breakpoints are established by organizations such as the European Committee on Antimicrobial Susceptibility Testing (EUCAST) and reviewed and updated annually.

EUCAST categories

S Susceptible	High likelihood of therapeutic success using a standard dosing regimen of the agent.
I Susceptible, Increased exposure	High likelihood of therapeutic success because exposure to the agent is increased by adjusting the dosing regimen or by its concentration at the site of infection.
R Resistant	High likelihood of therapeutic failure even when there is increased exposure.
ATU Area of Technical Uncertainty	When breakpoint is in a place where reproducible interpretation cannot be achieved.

UNDERSTANDING the AST REPORT

Extract from an AST report

ANTIMICROBIAL	MIC	INTERPRETATION
Benzylpenicillin	≥ 0.5	R
Oxacillin	≥ 4	R
Gentamicin	≥ 16	R
Vancomycin	≤ 0.5	S
Moxifloxacin	≤ 0.25	S
Inducible Clindamycin Resistance	NEG	-
Erythromycin	≥ 8	R
Clindamycin	≥ 8	R
Linezolid	2	S

ANTIMICROBIAL TESTED

INTERPRETATION ACCORDING TO BREAKPOINTS

Confidence Level	Consistent	
Phenotypes flagged for review	BETA-LACTAMS	MODIFICATION OF PBP (mecA)
	MACROLIDES/LINCOSAMIDES/ STREPTOGRAMINS	MLSB+SA CONSTITUTIVE

MOST PROBABLE PHENOTYPES

The AST result is essential for guiding effective antibiotic therapy. However, interpreting AST results requires an understanding of **several caveats that can impact their accuracy and applicability.**

Inoculum effect: Varying bacterial numbers in the test sample can affect results, potentially leading to inaccurate MICs.

- Standardize inoculum sizes to prevent misinterpretation.

Phenotypic resistance: Some resistance mechanisms, such as biofilm formation, cannot be detected by standard tests but may occur in the body.

- Consider patient history and clinical context during interpretation.

Mixed cultures: Samples with multiple bacterial species complicate interpretation due to differing susceptibility profiles.

- Test each species separately whenever feasible.

Breakpoints updates: Clinical breakpoints, which define susceptibility categories, are updated annually.

- Stay informed of the latest guidelines from organizations such as CLSI or EUCAST.

Breakpoint variability by infection site: Breakpoints values can vary depending on the site of infection.

- Request a detailed AST report from the lab to align with relevant breakpoints for precise antibiotic selection tailored to the infection site.

CLINICAL CONSIDERATIONS FOR INTERPRETATION
AST REPORT

IN SUMMARY

The lowest MIC is not always the best option

- Follow your latest local guidelines
- Be aware of the difference between the wild-type value and the breakpoint value

***In vitro* AST results may not always predict clinical effectiveness**

- Refer to the bacterial phenotype given by the lab

ALSO, WHEN SELECTING APPROPRIATE (OR "TARGETED") THERAPY, CONSIDER:

- **Patient history** (previous treatment) **& baseline conditions** (drug allergy, comorbidities, etc.)
- **Infection site**
- **Other diagnostic test results** (PCR, imaging, etc.)

COMMUNICATION WITH THE MICROBIOLOGY LAB IS KEY!

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