Perfect your Pick: How to Use an Antibiogram

Prescribers are faced with a challenging balancing act when selecting empiric antimicrobials. On one hand, empiric antimicrobials must be broad enough to cover the likely pathogens. On the other hand, empiric antimicrobials should not be overly broad because they drive antimicrobial resistance. So when picking empiric antibiotics, how much is too much? What is too little? How do you keep up with changing epidemiology and resistance patterns? The first step is to utilize an antibiogram.

What is an antibiogram?

The antibiogram is an aggregate of antimicrobial susceptibilities for different organisms to different antimicrobials over a certain period of time, most commonly a year. Antibiograms present the total number of isolates in the period of review (e.g. past year) along with the percent of isolates that were susceptible to the corresponding antimicrobial. Antibiograms serve two major purposes: guide empiric antimicrobial therapy selection and monitor antimicrobial susceptibility trends.[1]

How do I use an antibiogram?

An antibiogram informs which antibiotics will work against an infection's most likely causative pathogen(s). For example, *E. coli* is the most common cause of urinary tract infections (UTI). Therefore, empiric antibiotics for a UTI should have adequate *E. coli* activity. See Table 1 for an example *E. coli* antibiogram. Ceftriaxone and cefepime both have high likelihood of activities against *E. coli*, but cefepime is slightly higher. Should cefepime be chosen over ceftriaxone? Not necessarily. In a survey of internal medicine and infectious diseases attendings and trainees, a minimum threshold of 80% susceptible was identified to define appropriate empiric antimicrobial selections for mild infections.[2] Therefore ceftriaxone may preferred over cefepime as both are over the 80% threshold and differences in likelihood of activity against *E. coli* are negligible. Using ceftriaxone helps to preserve the anti-pseudomonal activity of cefepime.

	Isolate #	Ampicillin	Ampicillin-sulbactam	Cefazolin	Ceftriaxone	Cefepime
E. coli	142	54%	68%	70%	87%	90%

Table 1. Example of antibiogram E. coli susceptibility

After a patient's culture and susceptibility results are available, an antibiogram is no longer pertinent. Antibiotics should be de-escalated to the most narrow-spectrum, appropriate antibiotic.

Antimicrobial stewardship programs use antibiograms to inform empiric antimicrobial recommendations for institutional guidelines. Antibiograms do NOT take into consideration individual patient characteristics like past culture data and recent antibiotic exposure. When available, these data should be considered when selecting empiric antibiotics.

Key Takeaway: Antibiograms help guide **empiric** antimicrobial selection and provide a means to guide institutional treatment guidelines. Antibiograms should not be used after culture and susceptibility data is known.

References:

1. Truong, William R et al. "The antibiogram: key considerations for its development and utilization." JAC-antimicrobial resistance vol. 3,2 dlab060. 25 May. 2021, doi:10.1093/jacamr/dlab060
2. Cressman AM, MacFadden DR, Verma AA, Razak F, Daneman N. Empiric Antibiotic Treatment Thresholds for Serious Bacterial Infections: A Scenario-based Survey Study. *Clin Infect Dis*. 2019;69(6):930-937. doi:10.1093/cid/ciy1031