

Importance of the Correct Susceptibility Tests Report and Identification of Genus & Species for the Correct Antibiotic Treatment Selection

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Many years of experience in the Microbiology laboratory combined with the clinical practice attending patients with infectious diseases and supporting advisory in microbiology quality, let a lot of histories to tell, many of them bittersweet because when a pitfall in the microbiological diagnosis comes to light, in many cases isn't too late to help the patient and minimize damages to its health.

The antimicrobial selection comes in two stages: the first one is the "empiric" selection, that is not really empiric, because the background of epidemiological information plus the clinical & therapeutic history, let the physician suspect the possible disease and the etiological agent involves; and with this ground of knowledge, the antimicrobial agent selection is not blind as many people suspect; the second stage is related to the arrival of the microbiological results, the identification of the agent and its antimicrobial susceptibility profile, and at this moment many physicians felt the temptation to change, rotate, escalate or de-escalate the anti-infective treatment, only based in this results, missing the whole picture that puts these results on their hands, an infected patient.

Sometimes, the simplicity of the Gram's stain reports leads the initial selection of the antimicrobial treatment in very complicated pathologies such as central nervous system infections (meningitis, i.e.), and then, the microbiologic culture and the susceptibility report determines the continuity of this treatment, of course, the main factor that drives this decision is the clinical evolution of the patient (response to the antimicrobial drugs).

An old saying says "if you are healing with water, you will continue drinking water", in other words, the weight of the favorable clinical evolution has more value than the isolated result of the antimicrobial susceptibility tests, and the most clear example of it comes to us when a patient has a great clinical improvement and the antimicrobial susceptibility test shows that the isolated microorganism exhibit resistance to the drug that the patient receives from their admission to the hospital... What should we do? Strictly follows the microbiology laboratory reports and immediately change the drug or make a detailed analysis of the patient evolution and its response to the therapy? I choose the second option (Yes, I, a Medical Microbiologist Physician! a rare species that moves among Microbiology laboratory & hospitalization wands), because the clinical evolution is more complex than the results that a Petri's dish can tell to us; and the immunological system function is very hard to evaluate in an objective way.

The need to look carefully the identification report, beyond the simplicity of the genus & species nomenclature is a good habit that we need to promote from the Microbiology laboratory, because many therapeutic decisions could be easily guided by the clear understanding of the suspected agent, a classic example is the identification of an enteric Gram-negative bacilli such as *Klebsiella* species, in a patient that receives a Penicillin drug with poor clinical evolution, as if we remember our younger years in the Medicine School, only 5% of the *Klebsiella* sp. Shows susceptibility to Ampicillin, therefore, when you facing a *Klebsiella* infection, please don't use Ampicillin, even if the Microbiology laboratory reports susceptibility to this agent because the correlation among worsening of the clinical condition is pretty high.

We need to encourage the knowledge of the relation among genus and resistance to improve the empiric & target prescription of antimicrobial drugs. One daily advice that I bring to the young physicians is to keep a little notebook in their lab coat or scrub pocket (yes, it works better than the note pad of the smartphones, and never run out of batteries), and take note of the comments in the clinical rounds and when goes to the Microbiology laboratory, more so when interconsultations are made with infectious diseases team; all these notes are the acumen of priceless knowledge. One example that I always remains from my Postgraduate formation, comes about the use of quinolones in *Pseudomonas* infections, and the need to perform a microbiological follow-up culture between 72-96 hours of the first antibiotic dose, because the expression of resistance mechanism by the bacteria, could change the first susceptibility report from the susceptible category to the intermediate or resistant one, and it is specially important in patient with torpid evolution, and can support the decision of an antimicrobial treatment rotation, instead of the addition of a second drug for example, improving the patient prognosis.

Another example of the need to put extra care in the analysis of microbiological susceptibility reports comes from the interpretation of the breakpoints, Minimal Inhibitory Concentration (MIC) and "Susceptible", "Intermediate" & "Resistant" categories. Many clinical physicians (and almost the majority of surgeons!), quickly search for the presence of the capital letters "S", "I" and "R" in the susceptibility test report, but rarely

looks the previous value of the MIC, and almost in any cases, look how close to the breakpoint of the resistance is a “susceptible” antibiotic. This lack of shrewdness hide the MIC Creep phenomenon, that in simple words is the evolutionary trend to moves closer to the resistance, but staying in the susceptible range, not above the breakpoint line, and the clinical translation of this phenomenon is the development of clinical failure in the first 72-96 hours of treatment, explained by the resistance mechanism expression under the pressure of the antibiotic agent.

So, the experience that gives gray hair can be summarized in few words: learn everything you can, go to the microbiology lab when you have any doubt (we make great coffee too!) and consider every patient that comes to you a new opportunity to help and bring joy with your knowledge.