MIC Basics

What is an MIC?
- Minimum inhibitory concentrations (MICs) are defined as the lowest concentration of an antimicrobial that will inhibit the visible growth of a microorganism after overnight incubation (Andrews JM. J Antimicrob Chemother 2001;48(suppl 1):5-16.)
- Each year, the Clinical and Laboratory Standards Institute (CLSI) publishes new antimicrobial susceptibility testing standards

Laboratory Reporting
- “R” is resistant, “I” is intermediate, “S” is susceptible. Some labs will additionally report the actual MIC.
- The farther the MIC is BELOW the breakpoint, the better the ODDS of efficacy become (Lower MIC ≠ Increased Efficacy (ie, don’t just pick the drug with the lowest MIC from the list)
- The MIC does not reflect pharmacodynamics or patient-specific factors such as renal function, site of infection, volume of distribution, etc.

Antimicrobial Dosing
- If an MIC is reported as “I” (intermediate resistance), the following antibiotics may still be ok:
  - UTI - anything that concentrates well in the urine: beta-lactams, FQs, AMGs (normal doses)
  - Other sites of infection: beta-lactams @ increased frequency or extended/continuous infusion, concentration dept drugs (AMGs, dapto, FQs) - higher doses (e.g. dapto 10-12 mg/kg, AMGs target higher peaks)
- The actual bug doesn’t matter so much as what the MIC is and what concentrations of drug are actually achievable (safely) in humans.

Two Examples
- Vancomycin and S. aureus (http://www.aliem.com/2013/diminishing‐returns‐vancomycin‐and‐mic/)
  - MIC cutoff for S. aureus was decreased to ≤ 2 mcg/mL in 2007
  - Over time it seems the MIC needed for vancomycin to eradicate MRSA is increasing, as evidenced by increasing vancomycin MIC distribution in S. aureus isolates. (Steinkraus G, et al. J Antimicrob Chemother 2007;60:788-94.)
  - What It All Means
    - Although in the ED we often don’t have access to the patient’s susceptibility data, make sure to look at previous records from your institution or the transferring institution. Just because the culture report says ‘S’ (for susceptible), the MIC may be between 1.5 and 2 mcg/mL.
    - For bacteremia/endocarditis: if the S. aureus MIC ≥ 1.5 mcg/mL, don’t use vancomycin!
    - For all other MRSA infections: if the S. aureus MIC ≥ 2 mcg/mL, don’t use vancomycin!
- IV Ceftriaxone for Gonorrhea (http://www.aliem.com/2012/trick‐of‐trade‐iv‐ceftriaxone‐for/)
  - There is no depot effect with ceftriaxone for presumed gonococcal infection. IV and IM ceftriaxone have similar pharmacokinetic profiles, from the FDA-approved package insert.

According to a 2012 CDC Report the MIC for N. gonorrhoeae strains to ceftriaxone is 0.125 mcg/mL. IV therapy provides concentrations above this resistance cutoff well after 24-48 hours, similar to IM therapy.

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