Antimicrobial Pharmacodynamics: PK/PD Indices (T > MIC, Peak/MIC, AUC/MIC) (Clinical Treatise 2012)

Por Cristiano Ricardo · Publicado em 31/10/2012

University clinical pharmacology treatise by Prof. Cristiano Ricardo on antimicrobial pharmacodynamics: pk/pd indices (t > mic, peak/mic, auc/mic) (Clinical Pharmacotherapy & Infectious Disease Modeling), featuring mathematical PK/PD modeling, clinical cases, and colorful schematics.

Versão online e eventuais atualizações:
https://professor.cristianoricardo.com/post/antimicrobial-pharmacodynamics-pkpd-indices-t-mic-peakmic-aucmic-2012-10-31

Clinical Pharmacotherapy & Infectious Disease Modeling · Clinical Pharmacology & Pharmacotherapy

Eradicating bacterial pathogens while suppressing the emergence of antimicrobial resistance demands alignment with specific class-dependent PK/PD drivers.

Pharmacological Mechanism & Kinetic Schema

% Time > MIC
Beta-Lactams (Carbapenems)
Continuous/Extended Infusion
Target: 40-70% of dosing interval

Peak / MIC (Cmax/MIC)
Aminoglycosides
Single High-Dose Infusion
Target: Cmax/MIC >= 8-10

AUC24 / MIC
Vancomycin, Fluoroquinolones
Total Daily Exposure
Target: AUC/MIC >= 400

Time-Dependent Killing of Beta-Lactams and Extended Infusions

Penicillins, Cephalosporins, and Carbapenems exhibit zero concentration-dependent killing once levels exceed 4 to 5 times the bacterial MIC. Clinical cure is determined strictly by the percentage of the dosing interval that unbound drug concentration exceeds MIC (%fT > MIC). Administering Meropenem or Piperacillin-Tazobactam as prolonged 3-to-4-hour infusions

© 2026 Cristiano Ricardo · cristianoricardo.com

significantly elevates clinical survival in critically ill septic patients.

Concentration-Dependent Synergy of Aminoglycosides

For Gentamicin, Tobramycin, and Amikacin, the killing velocity and post-antibiotic suppression of regrowth depend entirely on achieving high peak-to-MIC ratios (Cmax/MIC >= 10). High-dose extended-interval dosing achieves rapid bacterial lysis while lowering trough exposure to prevent proximal tubule phospholipidosis.

Suppression of the Mutant Selection Window (MSW)

Sub-therapeutic antibiotic exposure within the Mutant Selection Window (between the MIC and the Mutant Prevention Concentration, MPC) selectively enriches resistant bacterial subpopulations. Maintaining clinical exposure targets above the MPC prevents the emergence of secondary resistance mutations.

Prof. Cristiano Ricardo

Clinical Pharmacologist & Biochemist · Specialist in Pharmacokinetics & Hospital Pharmacotherapy · Published on October 31, 2012 at 02:28

© 2026 Cristiano Ricardo · cristianoricardo.com