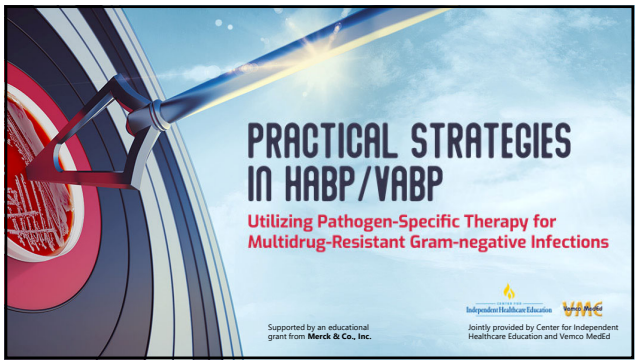


Patient Case: Jason

- 67-year-old male with stage 3 COPD
- Hospitalized 2 months ago and treated with piperacillin-tazobactam for pneumonia
- Treated with ciprofloxacin × 10 days for an exacerbation one week ago
- Admitted to hospital with URI symptoms and bilateral multifocal pneumonia
  - Initially treated with ceftriaxone IM 2 g and azithromycin IV 500 mg in the ER
- Hypoxia worsens on hospital day 2 and he is transferred urgently to medical ICU

Patient Case (cont'd)

- Upon transfer to medical ICU, he is febrile and borderline hypotensive
- SpO_2 is 93% on 60% O_2 with a PEEP of 10 cm H_2O and a respiratory rate of 33/min
- Physical exam notable for a thin-appearing male who is intubated and sedated
- He withdraws to pain in all 4 extremities
- He is started on meropenem 1g Q8h & vancomycin 1g Q12h

Points to Consider?

- Was this CAP?
- Was this patient at risk for MDR organisms
- Was meropenem a good choice in the ICU?

What do the HAP/VAP Guidelines Say? – Microbiology & Stewardship

1. We recommend that all hospitals regularly generate and disseminate a local antibiogram, ideally one that is specific to their intensive care population(s) if possible.

Kalil AC, et al. *Clin Infect Dis*. 2016;63:575-82.

CDC: Drug-Resistant Gram-Negative Bacterial Infection Threats

Urgent and Serious

Urgent	Carbapenem-resistant Enterobacteriaceae (CRE) Carbapenem-resistant *Acinetobacter*
Serious	ESBL-producing Enterobacteriaceae Multidrug-resistant *Pseudomonas aeruginosa*

CDC. Antibiotic Resistance Threats in the United States, 2019. Available at: https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf

WHO Priority Pathogens List For R&D of New Antibiotics

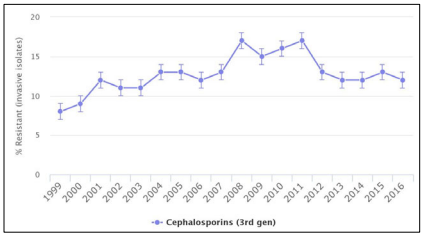
Priority 1: Critical

- ***Acinetobacter baumannii***, carbapenem-resistant
- ***Pseudomonas aeruginosa***, carbapenem-resistant
- ***Enterobacteriaceae****, carbapenem-resistant, 3rd generation cephalosporin-resistant

*Enterobacteriaceae include: ***Klebsiella pneumonia***, ***Escherichia coli***, ***Enterobacter*** spp., ***Serratia*** spp., ***Proteus*** spp., ***Providencia*** spp., and ***Morganella*** spp.

WHO. Global priority list of antibiotic-resistant bacteria to guide research, discovery, and development of new antibiotics. Available at: https://www.who.int/medicines/publications/WHO-PPL-Short_Summary_25Feb-ET_NM_WHO.pdf?ua.

Prevalence of ESBL-producing *K. pneumoniae* in the US



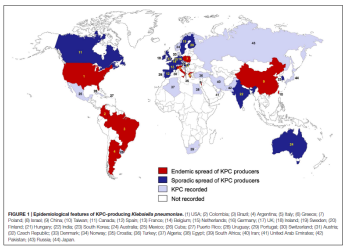
Center for Disease Dynamics, Economics & Policy. Resistance Map. https://resistancemap.cddep.org/AntibioticResistance.php.

ESBL *E. coli*: Know Your Number?

- National number approximately 15%
- Urine vs other sources
- The OHSU experience: 10% vs 37%

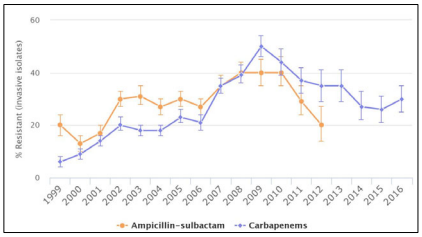
Center for Disease Dynamics, Economics & Policy. Resistance Map. https://resistancemap.cddep.org/AntibioticResistance.php.
Lewis JS. Unpublished data 2020.

World-wide Spread of KPC-producing *K. pneumoniae*



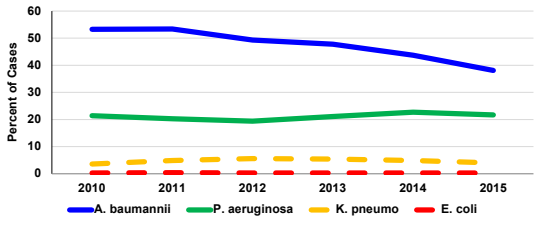
Lee C-R, et al. *Front Microbiol.* 2016;7:895.

Antibiotic Resistance of *Acinetobacter baumannii* in the US



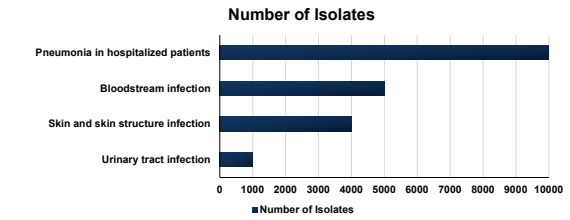
Center for Disease Dynamics, Economics & Policy. Resistance Map. https://resistancemap.cddep.org/AntibioticResistance.php.

Percentage of Total Carbapenem-Resistant Cases Contributed By Pathogen



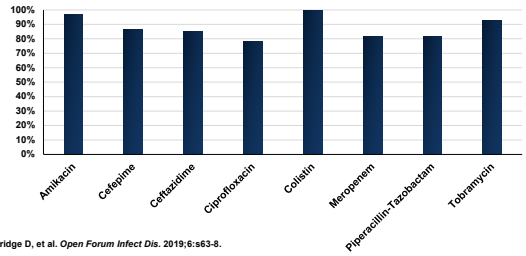
Cai B, et al. *Open Forum Infect Dis.* 2017;4: DOI: 10.1093/ofid/ofx176.

Distribution of *P. aeruginosa* Isolates by Infection Type – North America (SENTRY 1997–2016)



Shortridge D, et al. *Open Forum Infect Dis.* 2019;6:s63-8.

North America *P. aeruginosa* Susceptibility: SENTRY Antimicrobial Surveillance Program 2013–2016



Shortridge D, et al. *Open Forum Infect Dis.* 2019;6:s63-8.

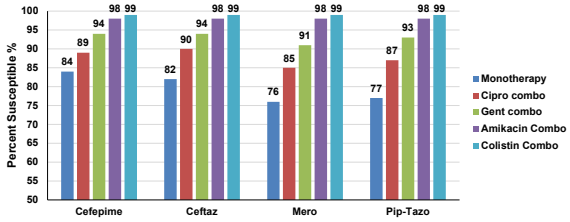
Susceptibility of *P. aeruginosa* From U.S. ICU Patients With Bloodstream Infections or Pneumonia

	MIC_{90}, mg/L	% Susceptible
Aztreonam	>16	66.5
Cefepime	16	83.8
Ceftazidime	32	82.0
Ciprofloxacin	>4	73.9
Meropenem	8	76.3
Piperacillin-tazobactam	>64	77.1

Amikacin, gentamicin, and colistin look better – 98%, 87%, 99.4% - excited to use them?

Shortridge D, et al. *Open Forum Infect Dis.* 2019;6:ofz240.

Beta-Lactam Alone or in Combination: *P. aeruginosa* from Bloodstream or Pneumonia



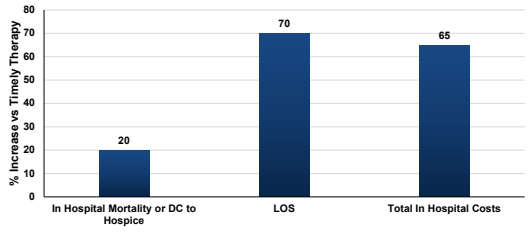
Shortridge D, et al. *Open Forum Infect Dis.* 2019;6:ofz240.

Combination Therapy with Colistin or Aminoglycosides vs Ceftolazane/Tazo for Drug-Resistant *P. aeruginosa*

- **Clinical Cure:**
  - Ceftol/Tazo = 81%
  - Polymyxins = 66% (p=0.05)
  - Aminoglycosides = 55% (p=0.002)
- **Acute Kidney Injury**
  - Ceftol/Tazo = 6%
  - Polymyxins = 43% (p=0.0001)
  - Aminoglycosides = 23% (p=0.007)
- **Pneumonia outcomes (p=0.02)**
  - 80% success ceftol/tazo
  - 56% polymyxin or aminoglycoside

Pogue JM, et al. *Clin Infect Dis.* 2020;71:304-310.

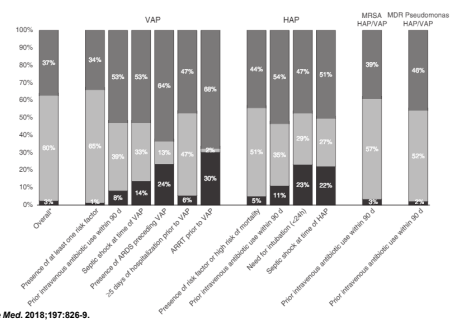
Impact of Delayed Appropriate Therapy on Clinical and Economic Outcomes: Resistant or Susceptible Organisms



Bonine NG, et al. *Am J Med Sci.* 2019;357:103-110.

Adequacy of IDSA/ATS Guidelines

- Appropriate
- Overtreatment
- Undertreatment

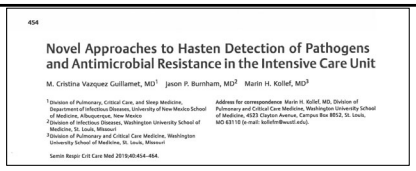


Ekren PK, et al. *Am J Respir Crit Care Med.* 2018;197:826-9.

Ceftolozane-Tazobactam for Ventilated Nosocomial Pneumonia

- In patients with positive baseline LRT cultures
  - (70%) causative Gram-negative pathogens
  - Enterobacteriaceae (74%)
  - *P. aeruginosa* (25%)
- Importance of knowing your local antibiogram for these organisms
- Importance of knowing the risk factors for MDR pathogens

Kollef MH, et al. *Lancet Infect Dis.* 2019;19:1299-1311.


454

Novel Approaches to Hasten Detection of Pathogens and Antimicrobial Resistance in the Intensive Care Unit

M. Cristina Vazquez Guillamet, MD[1] Jason P. Burnham, MD[2] Marin H. Kollef, MD[3]

[1] Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Infectious Diseases, University of New Mexico School of Medicine, Albuquerque, New Mexico
[2] Division of Infectious Diseases, Washington University School of Medicine, St. Louis, Missouri
[3] Division of Pulmonary and Critical Care Medicine, Washington University School of Medicine, St. Louis, Missouri

Address for correspondence Marin H. Kollef, MD, Division of Pulmonary and Critical Care Medicine, Washington University School of Medicine, 4523 Clayton Avenue, Campus Box 8052, St. Louis, MO 63110 (e-mail: kollefm@wustl.edu).

Semin Respir Crit Care Med 2019;40:454–464.

Patient Goals
- Optimize survival
- Reduce hospital stay
- Prevent unnecessary drug toxicity
- Reduce medical costs
- Improve functional status and quality of life

Stewardship Goals
- Avoid resistance emergence
- Prevent colonization and infection with MDROs
- Prevent *C. difficile* infection
- Contain and/or prevent outbreaks of MDRO infections
- Reduce overall healthcare exposure and expenditures

Guillamet MCV, et al. *Semin Respir Crit Care Med.* 2019;40:454-464.

Rapid Diagnostics to Hasten Pathogen Identification and Susceptibility

Technology	Examples	Pathogen/Resistance Detection	Turnaround Time	Clinical Considerations
Real time PCR	Xpert® MRSA/SA BC	MRSA, MSSA, mec A/C	≤ 2 hr	• Prompt differentiation between MRSA and MSSA
	BD Max™ MRSA Staph SR/XT	MRSA, MSSA, mec A/C	≤ 2 hr	
Multiplex PCR	Biofire Filmarray® BC	GBP, GNB, *Candida* spp., mecA, vanA/B, KPC	≤ 2 hr	• Comprehensive number of targets • Not Gram-stain dependent • Many false negatives for *S. pneumoniae*
	Verigene® BC-GP	GPB, mecA, vanA/B	2.5 hr	
	Verigene® BC-GN	GNB, CTX-M, IMP, KPC, NDM, OXA, VIM	2 hr	
	Curetis Unyuero™ BCU	GPB, GNB, fungal panel, mycobacteria, 16 resistance genes	4 hr	
	Icubate IC GPC	GPC, mec A, vanA, vanB	4-5hr	
MALDI-TOF MS	bioMérieux VITEK® MS	Database for bacteria, fungi, mycobacteria, molds	<2 hr	• Detect many potential pathogens • Able to detect limited resistance mechanisms
	Bruker Sepsityper®		<2 hr	
PNA-FISH	AdvanDx QuickFISH®	GPB, GNB, *Candida* spp.	<2 hr	• Limited target detection • Rapid phenotypic AST

Guillamet MCV, et al. *Semin Respir Crit Care Med*. 2019;40:454-464.

Availability of Susceptibility Testing

Antimicrobial	Disk Diffusion	Gradient Diffusion		Other	
		Liofilchem	E-Test	Sensititre Tray	Automated Systems
Ceftazidime-avibactam	Yes	Yes	Yes	Yes	Microscan Vitek-2 (Q4 2020?)
Ceftolozane-tazobactam	Yes	Yes	Yes	Yes	Microscan Vitek-2
Eravacycline	Yes	Yes	No	No	No
Meropenem-vaborbactam	Yes	Yes	Yes	Yes	BD Phoenix
Omadacycline	Yes	Yes	No	No	No
Plazomicin	Yes	Yes	Soon (Q3 2020?)	No	No
Imipenem-Relebactam	Yes	Yes	Yes	Yes	No
Cefiderocol	Yes	No	No	Yes	No

Original Slide Courtesy of Kristi Traugott, PharmD. – Updated 7-2020

What do the Guidelines Say?

Values and preferences: These recommendations place a high value on targeting the specific pathogens associated with VAP as narrowly as possible to assure adequate treatment while minimizing overtreatment and its undesirable consequences.

Kalil AC, et al. *Clin Infect Dis*. 2016;63:575-82.

What do the Guidelines Say? Stewardship & Empiric Antibiotic Selection

Table 2. Risk Factors for Multidrug-Resistant Pathogens
Risk factors for MDR VAP
Prior intravenous antibiotic use within 90d
Septic shock at time of VAP
ARDS preceding VAP
Five or more days of hospitalization prior to the occurrence of VAP
Acute renal replacement therapy prior to VAP onset
Risk factors for MDR HAP
Prior intravenous antibiotic use within 90d
Risk factors for MRSA HAP/VAP
Prior intravenous antibiotic use within 90d
Risk factors for MDR *Pseudomonas* VAP/HAP
Prior intravenous antibiotic use within 90d

Kalil AC, et al. *Clin Infect Dis.* 2016;63:575-82.

Empiric Treatment Options for Clinically Suspected VAP Where Empiric MRSA Coverage & Double Antipseudomonal/Gram-Negative Coverage Are Appropriate

Gram-positive MRSA Antibiotic	Gram-negative Antibiotic With Antipseudomonal Activity: β-Lactam-Based Agents	Gram-negative Antibiotic With Antipseudomonal Activity: Non-β-Lactam-Based Agents
Vancomycin 15mg/kg IV q8-12h	Piperacillin-tazobactam 4.5g IV Q6h	Ciprofloxacin 400mg IV Q8h
		Levofloxacin 750mg IV Q24h
OR	OR	OR
Linezolid 600mg IV Q12h	Cefepime 2g IV Q8h	Amikacin 15-20mg/kg IV q24h
	Ceftazidime 2g IV Q8h	Gentamicin 5-7mg/kg IV Q24h
		Tobramycin 5-7mg/kg IV Q24h
	OR	OR
	Imipenem 500mg IV q6h	Colistin 2.5mg IV Q12h (after load)
	Meropenem 1g IV q8h	Polymyxin B 1.25-1.5mg/kg IVQ12h

Kalil AC, et al. *Clin Infect Dis.* 2016;63:575-82.

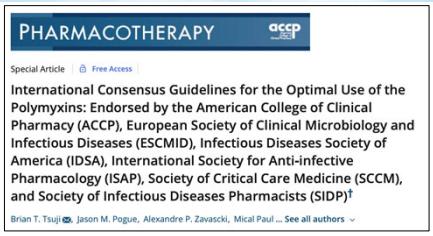
What's Missing, What's New, & What's an Option?

- Ceftolozane-Tazobactam: FDA-approved pneumonia indication
- Ceftazidime-Avibactam: FDA-approved pneumonia indication
- Meropenem-Vaborbactam: Not active for Mero-R *P. aeruginosa*
- Imipenem-Relebactam – FDA-approved pneumonia indication
- Cefiderocol – FDA-approved pneumonia indication

What's Missing, What's New, & What's an Option?

- Plazomicin:
  - Variable *P. aeruginosa* activity
  - <<potent than tobramycin
  - Issues with aminoglycosides in pneumonia
- Eravacycline:
  - No *P. aeruginosa* activity, no pneumonia data
  - MDR *Acinetobacter* spp.?
  - Metallo-beta-lactamase stability
- Delafloxacin:
  - No advantage over levofloxacin or ciprofloxacin for *P. aeruginosa*
  - Comparable to levofloxacin and ciprofloxacin for other GNRs

New Consensus Guidelines for the Optimal Use of Polymyxins


PHARMACOTHERAPY accp

Special Article | Free Access

International Consensus Guidelines for the Optimal Use of the Polymyxins: Endorsed by the American College of Clinical Pharmacy (ACCP), European Society of Clinical Microbiology and Infectious Diseases (ESCMID), Infectious Diseases Society of America (IDSA), International Society for Anti-infective Pharmacology (ISAP), Society of Critical Care Medicine (SCCM), and Society of Infectious Diseases Pharmacists (SIDP)†

Brian T. Tsuji, Jason M. Pogue, Alexandre P. Zavascki, Mical Paul ... See all authors

Tsuji, BT, et al. *Pharmacotherapy*. 2019;39:10-39.

Interesting Quotes

- "…in the lung infection model ... for *A. baumannii*, it was **not even possible to achieve bacteriostasis** for two of the three tested strains with the highest tolerable systemic dosage regimen of colistin."
- "…based on the thigh infection model, this exposure would be expected to achieve bactericidal activity against an isolate with an MIC of 2 mg/L … unless the MIC of the infecting strain is well below the breakpoint, this target is **very likely to be suboptimal for the systemic treatment of a lung infection**."

Tsuji, BT, et al. *Pharmacotherapy*. 2019;39:10-39.

New CLSI Colistin/Polymyxin B Comments

- Clinical and PK/PD data suggest that this agent is of limited clinical efficacy, even if a susceptible result is obtained.
- If available, alternative non-polymyxin agents are strongly preferred. If these agents are not available, this breakpoint presumes use of colistin in combination with one or more additional, active antimicrobials.
- Colistin (methanesulfonate) should be given with a loading dose and maximum renally-adjusted doses.
- Polymyxin B should be given with a loading dose and maximum recommended doses.
- When given intravenously, this drug is unlikely to be effective for pneumonia.

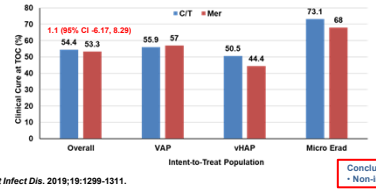
CLSI M100 30th ed. 2020
Satlin MJ, et al. *Clin Infect Dis*. 2020;ciaa121. doi: 10.1093/cid/ciaa121.

What Do We Know About the Newer Agents in HAP/VAP?

- Ceftazidime-avibactam: FDA-approved indication
- Ceftolozane-tazobactam: FDA-approved indication – NEW DOSE
- Imipenem-Relebactam: FDA-approved indication
- Cefiderocol: FDA-approved indication
- In vitro vs clinical and struggles in HAP/VAP with new agents

Ceftolozane-Tazobactam for Nosocomial Pneumonia (ASPECT-NP)

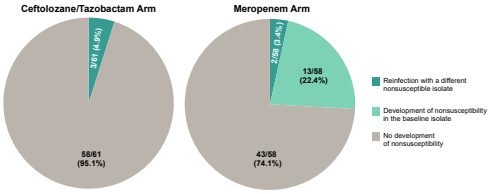
- Randomized controlled, double-blind phase III, non-inferiority trial comparing ceftolozane-tazobactam (3 g q8h) vs. meropenem (1 g q8h) for treatment of nosocomial pneumonia
  - **All patients were ventilated**



Conclusions:
- **Non-inferior in all patient populations**

Kollef MH, et al. *Lancet Infect Dis*. 2019;19:1299-1311.

Emergence of Nonsusceptibility Among Baseline *P. aeruginosa* Isolates (ASPECT-NP)

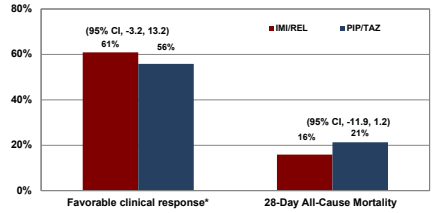


No baseline *P aeruginosa* isolates in the ceftolozane/tazobactam arm developed nonsusceptibility, compared with 22.4% in the meropenem arm

Motyl M, et al. 30th ECCMID; Paris, France; April 18–21, 2020. Poster 1215.

Imipenem-Relebactam (IMI/REL) vs. Piperacillin-Tazobactam (PIP/TAZ) for HABP/VABP (RESTORE-IMI 2)

Multicenter, randomized, DB trial comparing IMI/REL (500/250mg q6h) vs PIP/TAZ (4g/500mg q6h)



Drug-related AEs:
- **12% (31/266) IMI/REL**
- **10% (26/269) PIP/TAZ**

*At 7 to 14 days after completing therapy
Titov I, et al. *Clin Infect Dis*. 2020;ciaa803, https://doi.org/10.1093/cid/ciaa803 [Online ahead of print].

Ceftolozane-Tazobactam & Imipenem-Relebactam for MDR *P. aeruginosa*

Cross-susceptibility of ceftolozane-tazobactam and imipenem-relebactam vs MDR *P. aeruginosa* from ICU & non-ICU wards (n=442)

		Imipenem-Relebactam		
		Susceptible	Intermediate	Resistant
Ceftolozane-Tazobactam	Susceptible	297 (67.2%)	37 (8.4%)	24 (5.4%)
	Intermediate	31 (7.0%)	6 (1.4%)	7 (1.6%)
	Resistant	21 (4.8%)	7 (1.6%)	12 (2.7%)

21/40 (52.5%) of ceftolozane-tazobactam R isolates were imipenem-relebactam susceptible

Depestel D, et al. *Crit Care Med.* 2019;47(suppl 1): Abstract 658.

Ceftazidime-Avibactam Phase 3 Trials

Ceftazidime-avibactam versus meropenem in nosocomial pneumonia, including ventilator-associated pneumonia (REPROVE): a randomised, double-blind, phase 3 non-inferiority trial

Antoni Torres, Nanshan Zhong, Jan Pachl, Jean-François Timsit, Marin Kollef, Zhangjing Chen, Jie Song, Dianna Taylor, Peter J Laud, Gregory G Stone, Joseph W Chow

- HABP/VABP
- cUTI
- cIAI

Torres A, et al. *Lancet Infect Dis.* 2018;18:285-295.
Avycaz® (ceftazidime-avibactam) Prescribing Information. Allergan USA Inc., Madison, NJ. Updated March 2019.

Ceftazidime-Avibactam HAP/VAP Trial – An Interesting Finding

- Increasing MICs (≥4× baseline) at EOT or TOC and same genotype as the baseline isolate were observed in:
  - 1 patient in ceftazidime/avibactam group – *K. pneumoniae*
  - 11 patients in meropenem group – 10 with *P. aeruginosa*
- Consistent theme with *P. aeruginosa* & carbapenems?

Torres A, et al. *Lancet Infect Dis.* 2018;18:285-295.

Further Evidence

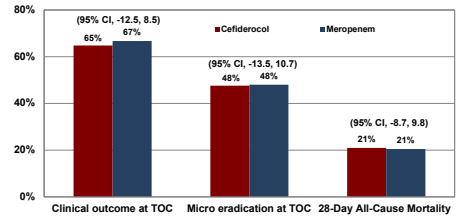
Ceftazidime vs. Carbapenems vs. Piperacillin-Tazobactam as Single Definitive Therapy for *Pseudomonas aeruginosa* Bloodstream Infection – A Multi-Site Retrospective Study

- No difference in mortality
- No difference in clinical or microbiologic failure
- Adverse events similar
- Higher rates of antipseudomonal drug-resistant *P. aeruginosa* with carbapenem use (p=0.007)

Babich T, et al. *Clin Infect Dis.* 2020;70:2270-80.

Cefiderocol (CFDC) Vs. Meropenem (MER) for Nosocomial Pneumonia (APEKS-NP)

Multicenter, randomized, DB comparing CFDC (2 g q8h) vs MER (2 g q8h) for HAP, VAP, or HCAP



Drug-related AEs:
- **9.5% (14/148) CFDC**
- **11.3% (17/150) MER**

Wunderink RG, et al. *Lancet Infect Dis.* 2020; DOI: https://doi.org/10.1016/S1473-3099(20)30731-3 (Online first).

Activity of New Agents vs. Problematic Organisms/Resistance Mechanisms

	CR-Pa	CR-Acineto	ESBL-Eb	KPC-Eb	Metallo-BL	OXA-48-Eb
Ceftolozane-Tazobactam	+	-	+/-	-	-	?
Ceftazidime-Avibactam	+	-	+	+	-	+
Meropenem-Vaborbactam	-	-	+	+	-	-
Imipenem-Relebactam	+	-	+	+	-	-
Cefiderocol	+	+	+	+	+	+
Plazomicin	-	-	+	+	-*	-*
Eravacycline	-	+/-	+	+/-	+/-	+/-

*Resistance due to presence of 16rRNA methyltransferases in many of these organisms

Jacobs MR, et al. *IDWeek* 2108 Poster 1348.; Livermore DM, et al. *Antimicrob Agents Chemother.* 2016;60:3840.
Stewart A, et al. *Antimicrob Agents Chemother.* 2018;62:e01195.

2020 IDSA Guidance on Treatment of Antimicrobial-Resistant Gram-negative Infections

Goal: Assist clinicians in the selection of antibiotic therapy for infections caused by ESBL-Enterobacterales*, CRE, and difficult-to-treat (DTR)** *P. aeruginosa*

- Pathogens selected as they are:
  - Designated urgent or serious threats by CDC
  - Encountered in hospitals of all sizes
  - Cause a wide range of serious infections that carry significant morbidity and mortality

*Enterobacterales replaces the prior nomenclature of Enterobacteriaceae
**DTR defined as non-susceptibility to piperacillin-tazobactam, ceftazidime, cefepime, aztreonam, meropenem, imipenem-cilastatin, ciprofloxacin, and levofloxacin
IDSA. IDSA Guidance on the Treatment of Antimicrobial Resistant Gram-negative Infections, Sept. 8, 2020. Available at: https://www.idsociety.org/practice-guideline/amr-guidance/.

IDSA Guidance: ESBLs and DTR *P. aeruginosa*
(Non-Urinary Tract Infections)

Pathogen	Preferred Therapy
ESBL Enterobacterales[a]	Meropenem Imipenem-cilastatin Ertapenem
DTR *P. aeruginosa*[b]	Ceftolozane-tazobactam Ceftazidime-avibactam Imipenem-cilastatin-relebactam Alternative: cefiderocol

[a]For ESBL Enterobacterales infections, piperacillin-tazobactam and cefepime should be avoided, even if susceptibility to these agents has been demonstrated
[b]For DTR *P. aeruginosa* infections, combination therapy is not routinely recommended if in vitro susceptibility to a preferred agent is confirmed

DTR, difficult-to-treat
IDSA. IDSA Guidance on the Treatment of Antimicrobial Resistant Gram-negative Infections, Sept. 8, 2020. Available at: https://www.idsociety.org/practice-guideline/amr-guidance/.

IDSA Guidance: Treatment for CRE Infections
(Non-Urinary Tract Infections)

CRE Phenotype/Genotype	Preferred Therapy
Ertapenem resistant, Meropenem susceptible*	Meropenem (extended infusion)
Ertapenem and meropenem resistant*	Ceftazidime-avibactam Meropenem-vaborbactam Imipenem-cilastatin-relebactam
KPC identified (or carbapenemase positive but identity unknown)	Ceftazidime-avibactam Meropenem-vaborbactam Imipenem-cilastatin-relebactam
Metallo-beta-lactamase carbapenemase identified	Ceftazidime-avibactam + Aztreonam Cefiderocol
OXA-48-like carbapenemase identified	Ceftazidime-avibactam

Note: For CRE infections, polymyxin B and colistin should be avoided; combination therapy (i.e., a beta-lactam plus an aminoglycoside, fluoroquinolone, or polymyxin) is not routinely recommended.

*Carbapenemase testing results are either not available or negative
IDSA. IDSA Guidance on the Treatment of Antimicrobial Resistant Gram-negative Infections, Sept. 8, 2020. Available at: https://www.idsociety.org/practice-guideline/amr-guidance/.

Conclusions

- Knowing the susceptibility of the organisms you're likely to encounter in HABP/VABP is critical
- Resistance is more common in ICU settings/patients
- Susceptibility testing of newer agents can be challenging
- Colistin/Polymyxin B need to largely disappear from clinical use
- There are very important differences between new agents both in available clinical data and in vitro activity

Back to Patient Case

Patient Case (Review)

Transferred to medical ICU (Hospital Day 2)

- Changed to meropenem 1g Q8h and vancomycin 1g BID
- SpO_2 is 93% on 60% O_2 with a PEEP of 10 cm H_2O and a respiratory rate of 33/min
- Borderline hypotensive

Patient Case (cont'd)

- CXR day 2 reveals bilateral airspace disease involving the lower lung zones, worsening on the right
- WBC is 15,700/mm^3 with a lactate of 2.2 mmol/L
- Blood cultures are negative thus far

Patient Case (cont'd)

Hospital Day 3 - in the Medical ICU

Blood culture is negative

- WBC=21,500/mm^3 ,Tmax 38.6°C overnight
- Severe bilateral necrotizing pneumonia is noted on CXR with slightly increased opacification of the left lower lobe
- Additional cultures are sent from multiple sites
- Patient expires overnight
- ET tube aspirate & 3 blood cultures grow *P. aeruginosa*
  - Resistant to meropenem, ciprofloxacin, cefepime, and pip-tazo
  - Susceptible to gentamicin and tobramycin

Patient Case: What Could Have Been Done Differently?

- CAP therapy in ER not appropriate
- Recognition of recent antibiotics
  - Ciprofloxacin
  - Piperacillin-tazobactam
- Recognition of likely nosocomial pathogen, potential for resistance & cross resistance