2436. Use of Piperacillin/Tazobactam vs. Cefepime or Carbapenem for Infections Due to *Serratia, Citrobacter*, or *Enterobacter*

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Background. AmpC β-lactamases are an inducible type of resistance not readily detected by rapid diagnostics. Carbapenems and cefepime are considered the standard of care antibiotics for organisms likely to harbor the AmpC gene. However, data on the efficacy of piperacillin–tazobactam are lacking. The objective of this study was to compare clinical outcomes between piperacillin–tazobactam (PTZ) vs. cefepime (FEP) or a carbapenem (CAR) for pneumonia or bacteremia caused by *Serratia, Citrobacter*, or *Enterobacter* species.

Methods. This single-center retrospective cohort study evaluated adult patients admitted between January 2007 to October 2017 with either a blood culture or bronchoalveolar lavage (BAL) positive for either *S. marcescens, C. freundii, E. cloacae*, or *E. aerogenes*. Data came from the University of Kentucky Microbiological Laboratory and Center for Clinical and Translational Science (CCTS) Data Bank. Patients included must have received PTZ, FEP, or CAR for at least 72 hours. Patients were excluded if they received other antibiotics as definitive therapy (defined as antibiotic used for majority of treatment), Gram-negative combination therapy for more than 72 hours, had isolates resistant to definitive antibiotic therapy, or expired within 48 hours of admission.

Results. A total of 321 patients were identified (154 PTZ and 167 FEP/CAR). Demographics were similar between the two groups, although patients treated with PTZ tended to be slightly older and admitted to the ICU. More patients in the PTZ group (56.5%) had positive BAL cultures compared with the FEP/CAR group (40.7%) ($P = 0.0047$). The most common pathogen isolated among both PTZ and FEP/CAR patients was *Enterobacter* spp. (60.4% and 56.3%, respectively) ($P = 0.5040$). Overall, 11% of PTZ patients died in-hospital compared with 12.6% of FEP/CAR patients ($P = 0.6704$). In terms of 30-day readmission rate, 2.6% of PTZ patients and 2.4% of FEP/CAR patients were readmitted within 30 days of discharge ($P = 0.9076$).

Conclusion. Compared with FEP/CAR, patients with *Serratia, Citrobacter*, or *Enterobacter* bacteremia or pneumonia treated with PTZ did not show a significant difference in terms of in-hospital mortality and 30-day readmission rate.

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2437. Colistin Usage, Do We Need to Worry About Its Toxicity Among Children With Cancer?

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Background. Gram-negative bacteria susceptible only to colistin are emerging causes of complicated infections especially in the immunocompromised patients, reviving interest in the use of colistin. The purpose of this study was to test the renal toxicity along with efficacy of a salvage therapy with a colistin among pediatric cancer patients in our hospital.

Methods. A prospective, observational, cohort study was performed from May 2017 to October 2017 in Children's cancer hospital Egypt 57357. All patients who had Blood Stream Infections due to COS Gram-negative bacteria and received intravenous Colistin were prospectively enrolled. A standardized case form was used to record patient characteristics, including age, sex, weight, underlying comorbidities, type of infection, causative organism and *in vitro* susceptibility, daily doses and duration of colistin therapy, cumulative dose of colistin, co-administered antibiotics, nephrotoxic agents, and clinical and microbiological responses to therapy, daily serum creatinine clearance, and estimated creatinine clearance were recorded.

Results. One hundred and Thirty-four Blood Stream infectious episodes due to *Klebsiella* species (pneumoniae and Oxytoca) (32%), and *E. coli* (68%) were analyzed. All strains were fully susceptible to colistin, with MICs of 0.19–1.5 mg/L. It was employed as combination therapy with carbapenems (69.2%) or aminoglycosides (30.8%). Median duration of treatment was 9 days (range 1–50 days). Clinical and Microbiological cure was observed in 107 cases (80%). Acute kidney injury developed during 5 treatment courses (4%)in combination with Amikacin. No renal replacement therapy was required and subsided within 7 days from Colistin discontinuation. No correlation was found between variation in serum creatinine level (from base line to peak) and daily and cumulative doses of CMS.

Conclusion. Our study shows that in severe infections due to COS Gram-negative bacteria, Colistin had a high efficacy, without significant renal toxicity. Looking into the failure of microbiological cure, we need to further study the possibility of increasing the Colistin with cautious monitoring of renal functions, and Therapeutic Drug

monitoring. Furthermore, the bacterial isolates should be studied at the genetic level for resistance.

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2438. Ceftolozane/Tazobactam (C/T) Against Multidrug-Resistant *Pseudomonas aeruginosa* (MDR-Pa) Infections: Clinical Efficacy, and Baseline and Emergent Resistance

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Background. Experience is mounting for C/T against MDR-Pa infections. More data are needed on efficacy for different infections, and baseline and emergent resistance.

Methods. We retrospectively reviewed patients receiving >48 hours of C/T for MDR-Pa infections. Clinical success was defined at 30 days as survival, improved symptoms, and absence of recurrent infection. Microbiologic failures were defined as isolation of MDR-Pa following ≥7 days of C/T. Minimum inhibitory concentrations (MICs) were determined by broth microdilution.

Results. 63 patients were included. Median age was 58 (range: 23–91), 54% were men, and median Charlson score was 4 (0–12). 35% were transplant recipients. At onset of infection, median APACHE II and SOFA scores were 21 (2–49) and 5 (0–17), respectively. Infections included pneumonia ($n = 45$), tracheobronchitis ($n = 4$), intra-abdominal ($n = 4$), skin/soft tissue ($n = 3$), urinary tract ($n = 3$), bacteremia ($n = 2$), endocarditis and empyema ($n = 1$ each). Median duration of C/T was 13 days (3–52). 58% of patients with pneumonia received concomitant inhaled antibiotics. 30% patients received concomitant intravenous antibiotics. Overall rates of clinical success and survival at 30 days were 57% and 78%, respectively. Failures were due to death ($n = 14$), recurrent infection ($n = 7$), lack of clinical improvement ($n = 5$), or early discontinuation of C/T ($n = 1$). Rates of success and survival for pneumonia were 53% and 71%, respectively. Success rates were 67% and 51% among patients receiving C/T mono- *vs.* combination therapy ($P = 0.29$). Among surviving patients ($n = 49$), microbiologic failures occurred in 49% at a median of 23 days (7–64) from C/T initiation. Micro failures were due to recurrent pneumonia ($n = 6$) or colonization ($n = 18$). 56% of patients survived at 90 days. Median C/T MIC vs. baseline MDR-Pa isolates was 2 µg/mL (range: 0.5–>256); 10% of patients had C/T resistant isolates at baseline. Among patients with microbiologic failures infected by C/T susceptible isolates at baseline ($n = 21$), 38% developed resistance. The median duration of treatment prior to the emergence of resistance was 17 days (6–53).

Conclusion. C/T was effective for treatment of various MDR-Pa infections. MDR-Pa cannot be assumed to be C/T susceptible at baseline, and MICs should be measured before treatment and following microbiologic failure.

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2439. Outcomes of Minocycline Use on Gram-Negative Infections and Implications of MIC

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Background. Minocycline (MINO) is a treatment option for *Acinetobacter baumannii* and *Stenotrophomonas maltophilia* infections due to high *in vitro* susceptibility. Literature suggests it may also be an option for carbapenamase-producing enterobacteriaceae. MINO minimum inhibitory concentrations (MICs) vary by organism and dosing varies by center. Additional data are needed to assess MINO effectiveness in Gram-negative infections and determine if a relationship exists between MIC and treatment outcomes.

Methods. Retrospective study evaluating MINO use in adults at NewYork-Presbyterian Hospital from 2012 to 2017. Patients included received MINO ≥2 days for a culture-positive Gram-negative infection (CDC/NHSN criteria) susceptible to MINO. Patients with MINO started >5 days after positive culture or with untreated polymicrobial infections were excluded. The primary outcome was clinical failure at the end of therapy. Secondary outcomes included 30-day mortality, development of resistance or recurrence within 90 days.

Results. 114 patients were included: majority were male (51%) with median age 57 years. Median duration was 12 days with 8 patients receiving high-dose MINO (≥150 mg q12H). *S. maltophilia* was the most prevalent pathogen (72%) followed by

Klebsiella pneumoniae (16%) with a median MINO MIC of 1 mg/L. 68% of patients received combination therapy. Treatment success was observed in 71 patients (63%). Patients with treatment failure had higher median Charlson Comorbidity Index (5 vs. 3; $P = 0.026$), SOFA score (7 vs. 5; $P = 0.028$), and were more likely to have underlying leukemia or lymphoma (39% vs. 7%; $P < 0.001$). No differences were seen in primary or secondary outcomes between combination and monotherapy regimens. MICs had no impact on failure outcome, 30-day mortality or 90-day recurrence (all $P > 0.05$); however, MICs ≤ 2 mg/L were associated with increased development of resistance (34% vs. 12%; $P = 0.021$). In a multivariable analysis, vasopressor use (OR 2.79; 95% CI 1.05,7.41; $P = 0.04$) and underlying leukemia/lymphoma (OR 4.49; 95% CI 1.26,15.95; $P = 0.02$) were associated with increased risk of treatment failure.

Conclusion. MINO MIC impacted resistance, but did not correlate with treatment failure, mortality or recurrence. Severity of illness and comorbidities but not choice of MINO may be associated with clinical failures.

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2440. Weight-Adjusted Piperacillin–Tazobactam (PIP/TAZ) Therapy in Obese Patients vs. Optimized Doses in Non-obese Patients: A Retrospective Cohort Study

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Background. Dose optimized PIP/TAZ utilizing prolonged infusion has been shown to improve clinical outcomes. Previous pharmacokinetic studies of these prolonged infusion PIP/TAZ doses that achieve adequate time above minimum inhibitory concentration (T>MIC) in non-obese patients do not achieve similar concentrations in obese patients. Due to this higher doses are necessary in obese patients to achieve adequate T>MIC. Our institution utilizes weight-based dose optimization of PIP/TAZ in obese patients. The purpose of this study was to investigate clinical outcomes and adverse events with these dosing strategies compared with optimized doses in non-obese patients

Methods. A retrospective single-center cohort study was conducted in patients ≥18 years old with culture-confirmed non-urinary tract *Pseudomonas aeruginosa* infections. Patients with positive cultures and PIP/TAZ treatment ≥24 hours were classified in groups as obese (≥120 kg) or non-obese (<120 kg).

Results. 44 patients were studied in each arm with mean age 56 ± 13.8 and 65 ± 17.5, median weight 144 [132–170] and 77 [65–99] and median BMI 48 [40.5–56.2] and 26.4 [21.8–29.7] in the obese and non-obese groups respectively. Outcomes in obese compared with non-obese included composite clinical cure/improvement 86.4% and 77.2%, length of stay 8 and 10 days, ICU length of stay 10 and 8 days, hospital mortality 9.1% and 11.3%, 30 day mortality 15.9% and 18.2%, respectively. Adverse events in obese and non-obese groups occurred at 34.1% and 27.3% including AKI at 27% and 16% and thrombocytopenia at 7.1% and 12.8%, respectively. PIP/TAZ was discontinued due to safety concerns in 1 obese patient and 2 non-obese patients.

Conclusion. Weight-adjusted PIP/TAZ doses in obese patients produce similar clinical outcomes to optimized doses in non-obese patients.

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2441. Outcomes of Patients With Vancomycin-Resistant *Enterococcus* Blood Stream Infections (BSI) Treated With Daptomycin

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Background. Reports of poor outcomes in patients (patients) infected with VRE strains with daptomycin (DAP) minimum inhibitory concentrations (MIC) near the susceptible breakpoint (<=4 µg/ml) are noted in the literature. We assessed the relationship of clinical outcomes for patients treated with DAP to the initial MIC.

Methods. Retrospective study of consecutive adult patients with VRE BSI treated with DAP for at least 48 hours (November 2011–January 2015) in a tertiary hospital in Cleveland, OH. Patients were grouped based on the initial DAP MIC (MIC ≤ 2 µg/mL and MIC = 4 µg/mL) determined by a commercial broth microdilution method (Sensititre). Demographic and clinical data were extracted via EMR. Outcomes for all-cause mortality at 30 days (30-D mortality) and 90 days (90-D mortality), 30-day mortality attributed directly to VRE BSI (30-D mortality VRE) and microbiological failure (MF) were measured. MF was defined as duration of bacteremia ≥4 days after at least 48 hours of DAP use and achievement of source control when possible. We also assessed the impact of concomitant β-lactam use on MF.

Results. A total of 192 patients were identified. Baseline characteristics are shown in Table 1. Outcomes for MF, 30-D mortality VRE, 30-D mortality and 90-D mortality are shown in Table 2. Impact of concomitant β-lactam use on MF is shown in Figure 1.

Conclusion. In this retrospective study, MF and mortality were not significantly higher for BSI caused by VRE with DAP MICs of 4 µg/ml, regardless of concomitant β-lactam use.

Table 1.

	Total (N=192)	MIC≤2 (N=138)	MIC =4 (N=54)
	N (%)	N (%)	N (%)
Age (Mean)	58	59	58
Female	75 (39.1)	59 (42.8)	16 (29.6)
Male	117 (60.9)	79 (57.2)	38 (70.4)
ICU	119 (62)	85 (61.6)	34 (63)
Immunosuppression*	145 (75.5)	104 (75.4)	41 (75.9)
Source of BSI			
Primary	61 (31.8)	48 (34.8)	13 (24.1)
Secondary	131 (68.3)	90 (65.2)	41 (75.9)
Dose of DAP			
≤6mg/kg	168 (87.5)	119 (86.3)	49 (90.7)
≥8mg/kg	24 (12.5)	19 (13.7)	5 (9.3)
Concomitant β-lactam	50 (26)	36 (26.1)	14 (25.9)

*Hematologic & solid malignancy, transplant (solid organ & bone marrow), and other such as cirrhosis.

Table 2.

	Total (N=192)	MIC≤2 (N=138)	MIC=4 (N=54)	
	N (%)	N (%)	N (%)	p-value*
MF	27 (14.1)	20 (14.5)	7 (13)	1
30-D Mortality VRE	14 (7.3)	12 (8.7)	2 (3.7)	0.35
30-D Mortality	58 (30.2)	41 (29.7)	17 (31.5)	0.86
90-D Mortality	82 (42.7)	59 (42.8)	23 (42.6)	1

*Fisher Exact test

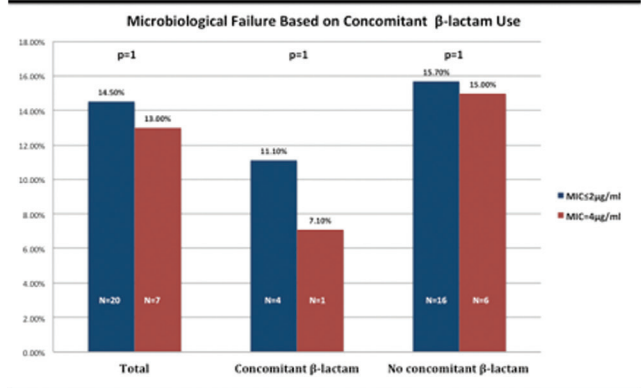**Figure 1.** MF based on concomitant β-lactam use. Blue bars indicates subgroup of VRE with DAP MIC≤2 µg/ml. Red bars indicate subgroup of VRE with DAP MIC=4 µg/ml. P values calculated with Fisher Exact test.

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2442. Outcomes in ESBL Bacteremia Empirically Treated With Piperacillin/Tazobactam or Carbapenems

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