

tered empirical therapy for GISA and hGISA.

**Methods:** Three hundred and Forty seven MRSA isolated from the clinical specimens of Allied hospitals of AMC/NUST and PAEC General Hospital, Pakistan were subjected to the determination of Vancomycin minimum inhibitory concentration (MIC) and isolates having vancomycin MIC  $\geq 1 \mu\text{g/ml}$  were subjected to determination of Glycopeptide resistance detection (GRD) using Etest. Susceptibility pattern of all the isolates were recorded using Kirby baur disc diffusion method and MIC for linezolid, daptomycin, chloramphenicol, minocycline and tigecycline using E-strips. MIC 50 and MIC 90 were calculated

**Results:** All isolates were sensitive to vancomycin but 197 isolates showed higher MICs and 6 turned out to be heterogenous Glycopeptide intermediate (h GISA) strains.

All the isolated organisms were highly susceptible to linezolid (98.3%), daptomycin (100%), chloramphenicol (96%), minocycline (95.7%) and tigecycline (94.8%).

**Conclusion:** Significant number of isolates having MIC of vancomycin equal to or more than 1  $\mu\text{g/ml}$  have been isolated and these can turn out to be GISA/h GISA. Vancomycin Susceptibility breakpoints as indicated by CLSI should be reevaluated because that doesn't cover GISA/h GISA isolates. This study suggests that linezolid, chloramphenicol, minocycline, daptomycin and tigecycline have high in vitro efficacy for MRSA infections. Prescribing antibiotics other than glycopeptides for MRSA infections will minimize the chances of emergence of GISA. Good hospital infection control measures prove to be the main stay against these infections because antibiotics can never be an effective alternative to good medical practice.

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#### Possible antagonism with use of ceftaroline and rifampin to treat methicillin-resistant *Staphylococcus aureus* infection

V. Sundareshan<sup>1</sup>, J. Modi<sup>2</sup>, S. Bergman<sup>3</sup>, J. Koirala<sup>1,\*</sup>

<sup>1</sup> Southern Illinois University School of Medicine, Springfield, IL, USA

<sup>2</sup> SIU school of medicine, Springfield, IL, USA

<sup>3</sup> Southern Illinois University School of Pharmacy, Edwardsville, IL, USA

**Background:** A 57 year old male was seen in the hospital for right shoulder septic arthritic with methicillin resistant *Staphylococcus aureus* (MRSA). He was treated with arthroscopic debridement and intravenous vancomycin until susceptibilities were available. The minimum inhibitory concentration (MIC) for vancomycin was 1.5 mcg/ml, therefore the patient was discharged home on 6mg/kg of daptomycin once daily to be given for 4 weeks. The MIC of daptomycin was not checked at that time. Patient returned for follow up in 3 weeks and complained of persistent fever and low back pain. Blood cultures were drawn that grew MRSA again. Spinal imaging revealed lumbar diskitis. We present here a case where ceftaroline was used for treatment along with rifampin to treat a highly resistant strain of MRSA and the results of our laboratory tests.

in the resistant range. There was now also a creep noted in the MIC of vancomycin. The patient's therapy was changed to ceftaroline which resulted in negative blood cultures within 24 hours of initiating therapy. Serum inhibitory concentration (SIC) and serum bactericidal concentration (SBC) were performed using the patient's serum prior to a dose of ceftaroline after steady state (trough). Rifampin was added to therapy after reviewing the results as shown below in table 1. The SIC and SBC were repeated when he was treated with a combination of ceftaroline and rifampin.

Results:	MIC using E-tests (mcg/ml)	SIC	SBC
Vancomycin	2.0	Not indicated	Not indicated
Daptomycin	3.0	Not indicated	Not indicated
Ceftaroline	0.38	1:8 dilution	1:16 dilution
Ceftaroline and rifampin	–	1:16 dilution	Not achieved

**Conclusion:** Even with the availability of newer antibiotics in the United States with activity against MRSA, treatment of MRSA infections (particularly bloodstream infections) can be suboptimal. Frequent laboratory testing with SIC and SBC may be necessary even in the absence of negative blood cultures as a preemptive measure to detect impending clinical failure. The SIC and SBC results with the combination of ceftaroline and rifampin suggest antagonism between the two antibiotics. Further laboratory tests are necessary to establish that. This patient was successfully treated with quinupristin/dalfopristin for 6 weeks.

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#### In vitro antimicrobial activity of colistin in combination with rifampicin against carbapenem-resistant *Acinetobacter baumannii*

K. Kongsanae<sup>1,\*</sup>, P. Naenna<sup>1</sup>, C. Dhiraputra<sup>2</sup>, A. Leelarasamee<sup>2</sup>, P. Pongpech<sup>1</sup>

<sup>1</sup> Chulalongkorn University, Bangkok, Thailand

<sup>2</sup> Mahidol University, Bangkok, Thailand

**Background:** The *in vitro* antimicrobial activity of either colistin or rifampicin could be increased in the form of combination between both drugs.

**Methods:** Thirty carbapenem-resistant *A. baumannii* isolates from Bumratnaradon Hospital between April 2007 and May 2009 were included in this study. Antimicrobial susceptibility tests were performed by both Kirby-Bauer disk diffusion and Agar dilution methods. Synergy effect of the combination of colistin and rifampicin was determined by checkerboard method. In addition, the time-kill study was used to determine the bactericidal activity at  $0.5 \times \text{MIC}$  and  $1 \times \text{MIC}$  of either colistin or rifampicin alone and the combination of both agents. Morphological cell changes of the bacteria after growth in the media plus antimicrobials were observed by using scanning electron microscopy.

**Results:** Susceptibility testing of 12 antimicrobial agents against carbapenem-resistant *A. baumannii* showed that all 30 isolates were resistant to meropenem, imipenem and rifampicin, while 96.7% of these isolates were resistant to cefepime, ceftazidime,

piperacillin/tazobactam and ciprofloxacin. Ninety percent of tested isolates were resistant to amikacin, gentamicin, netilmicin and tobramycin, but 80% were still susceptible to colistin. The MIC ranges for colistin and rifampicin were 1–4 µg/ml and 8–16 µg/ml, respectively. MIC50 and MIC90 of colistin were 1, 2 µg/ml, respectively and MIC50 and MIC90 of rifampicin were 8 µg/ml. The synergy study showed the partial synergy effect of colistin when combined with rifampicin in 26.7% of the isolates. Bactericidal activity of the combination was observed at all incubation times by time-kill study. The more damaging effect of the bacterial cell lysis was clearly observed when the bacteria were grown in the combined antimicrobials as compared with the growth in each antimicrobial agent.

**Conclusion:** The *in vitro* bactericidal activity of the combination between colistin and rifampicin was superior to the single agent. The combination could be a promising alternative for the treatment of infections due to carbapenem-resistant *A. baumannii*.

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#### Antibiotic resistance profiles of *Staphylococcus aureus* bloodstream isolates

E. Prifti, A. Papanagiotou, A. Charalabopoulou, D. Samiotaki, S. Vlachos, D. Togkas, E. Kostis\*, K. Tzanetou

“Alexandra” General Hospital of Athens, Athens, Greece

**Background:** *S. aureus* is a common and serious cause of bloodstream infections with high mortality rate.

**Objective:** To assess the resistance profiles of *S. aureus* bloodstream isolates to commonly used antimicrobial agents.

**Methods:** We retrospectively evaluated all the cases of *S. aureus* bacteraemia over a two year period from October 2009 through October 2011. Blood samples were routinely obtained in BacTec bottles (aerobic and anaerobic) and incubated in BACTEC 9050 system. Coagulase production, detection of DNase activity onto DNA agar, API STAPH and automated MicroScan system were used for *Staphylococcus* identification. Antibiotic susceptibility testing was performed by disc diffusion technique on Mueller-Hinton agar according to CLSI recommendations and MICs were determined by MicroScan system and Etest (AB Biodisk, Solna, Sweden).

**Results:** During the study period 61 cases of *S. aureus* bacteraemia were identified. Of the total bloodstream isolates 36.07% (22/61) were found to be methicillin-resistant (MRSA), and 63.93% (39/61) methicillin-susceptible (MSSA). Extended susceptibility testing of the 61 isolates to erythromycin, clindamycin, tetracycline, chloramphenicol, ciprofloxacin, rifampicin, trimethoprim-sulphamethoxazole (SXT), gentamicin, vancomycin, teicoplanin, linezolid and daptomycin showed the following resistance rates: 72.73%, 68.18%, 63.63%, 18.18%, 63.63%, 0%, 4.54%, 18.18%, 9.09%, 0%, 0%, 0% for MRSA and 12.82%, 7.69%, 12.82%, 2.56%, 5.13%, 0%, 0%, 0%, 0%, 0%, 0% for MSSA respectively. Two of the MRSA bloodstream isolates (2/22) showed increased vancomycin MICs (MICs = 3 µg/ml confirmed by Etest) according to CLSI new susceptibility breakpoint (MIC breakpoint for vancomycin has been reduced to 2 µg/ml).

**Conclusion:** (a) A significant rate of *S. aureus* bloodstream isolates is methicillin-resistant. (b) The MRSA isolates demonstrate a high resistance rate to erythromycin, clindamycin, tetracycline and ciprofloxacin, whereas a small proportion shows increased vancomycin MICs. (c) MRSA blood isolates remain daptomycin susceptible, even with a vancomycin MIC >2 µg/ml.

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#### Spectrum of causative agents of nosocomial infections (NI) and their susceptibility to antimicrobials (AM) in multiward clinical hospital: results of one-year surveillance study

R. Kozlov<sup>1,\*</sup>, S. Ratchina<sup>1</sup>, V. Mishchenko<sup>1</sup>, M. Sukhorukova<sup>1</sup>, O. Kretchikova<sup>1</sup>, E. Korneva<sup>2</sup>, A. Kuleshov<sup>1</sup>, D. Gruzdova<sup>1</sup>

<sup>1</sup> Smolensk State Medical Academy, Smolensk, Russian Federation

<sup>2</sup> Smolensk regional clinical hospital, Smolensk, Russian Federation

**Background:** Continued surveillance of etiology and resistance patterns, along with other measures is essential tool in decreasing NI burden and proper resources allocation. Our study aimed to determine the spectrum of microbial agents causing NI in Smolensk regional clinical hospital and assess their susceptibility to commonly used AM.

**Methods:** All patients with confirmed diagnosis of NI were prospectively screened during 12 months period (November 2010–October 2011). Routine culture and susceptibility testing was performed for clinical samples by disk-diffusion method. Clinically significant mechanisms of resistance were detected by phenotypic techniques (ESBL DDST, MBL DDST, cefoxitin disk). Appropriateness of AM therapy was evaluated in accordance with local guidelines.

**Results:** A total of 128 patients with 134 NI episodes were evaluated, etiology was determined in 41/134 (30.6%) of NI cases (39 patients). Overall 67% of patients were male, mean age was 57.3 years. The most common NI were skin and soft tissue infections (56%), followed by respiratory tract (22%), urinary tract (20%) and intraabdominal infections (2%). Seventy one pathogens were isolated, the most common were the *Enterobacteriaceae* family members – 23 (32.4%), including 15 (65.2%) ESBL producers, *Pseudomonas aeruginosa* – 14 (19.7%), including 2 (14.3%) MBL producers, *Staphylococcus aureus* – 11 (15.5%), including 10 (90.9%) MRSA isolates, *Acinetobacter* spp., mainly *Acinetobacter baumannii* – 11 (15.5%), *Enterococcus* spp. – 8 (11.3%), other gram-negative non-fermentative rods – 2 (2.8%), *Streptococcus pyogenes* – 1 (1.4%) and *Candida parapsilosis* – 1 (1.4%). Empirical AM choice was appropriate in 24% of cases. The regimen of AM therapy was adjusted on receipt of culture results in 39% of patients and was considered as an adequate in 54% of cases.

**Conclusion:** Gram negative rods, particularly *Enterobacteriaceae* and *Pseudomonas aeruginosa* represented the most common causative agents of NI in Smolensk regional clinical hospital. High prevalence of ESBL production and MRSA isolates causes grave concern and needs reinforcement of infectious control measures and revision of empirical AM therapy.

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