

ANTIMICROBIAL RESISTANCE AMONG NOSOCOMIAL ACINETOBACTER BAUMANNII FROM RUSSIAN INTENSIVE CARE UNITS

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Revised abstract

Objectives: Emergence of *Acinetobacter baumannii* as one of the most important nosocomial pathogens in Intensive Care Unit (ICUs) patients has been observed worldwide. Antimicrobial resistance of this microorganism is a matter of special concern. Thus the objective of our study was to evaluate the antimicrobial resistance in nosocomial *A.baumannii* from Russian ICUs.

Methods: Antimicrobial susceptibility testing of nosocomial *A.baumannii* strains isolated from ICU patients was performed by agar dilution method, NCCLS. Breakpoints for cefoperazone were used to interpret results of cefoperazone/sulbactam testing.

Results: A total of 459 nosocomial *A.baumannii* were obtained from 30 Russian ICUs during 2002-2004. Resistance rates (intermediate + resistant strains, %) were: cefoperazone - 97.8%, piperacillin - 91.7%, gentamicin - 89.1%, ceftazidime - 76.2%, piperacillin/tazobactam - 74.7%, ciprofloxacin - 73.9%, amikacin - 65.6%, cefepime - 63.9%, levofloxacin - 62.4%, meropenem - 3.5%, cefoperazone/sulbactam - 2.2%, imipenem - 2.2%. Imipenem and meropenem showed the highest activity according to MIC₅₀ and MIC₉₀ values.

Conclusion: High level resistance to beta-lactams, inhibitor-protected beta-lactams, aminoglycosides, and fluoroquinolones was observed. Carbapenems and cefoperazone/sulbactam exhibited the best in vitro activity against nosocomial *A.baumannii*, but the emergence of resistance to carbapenems is worrisome.

Introduction and purpose

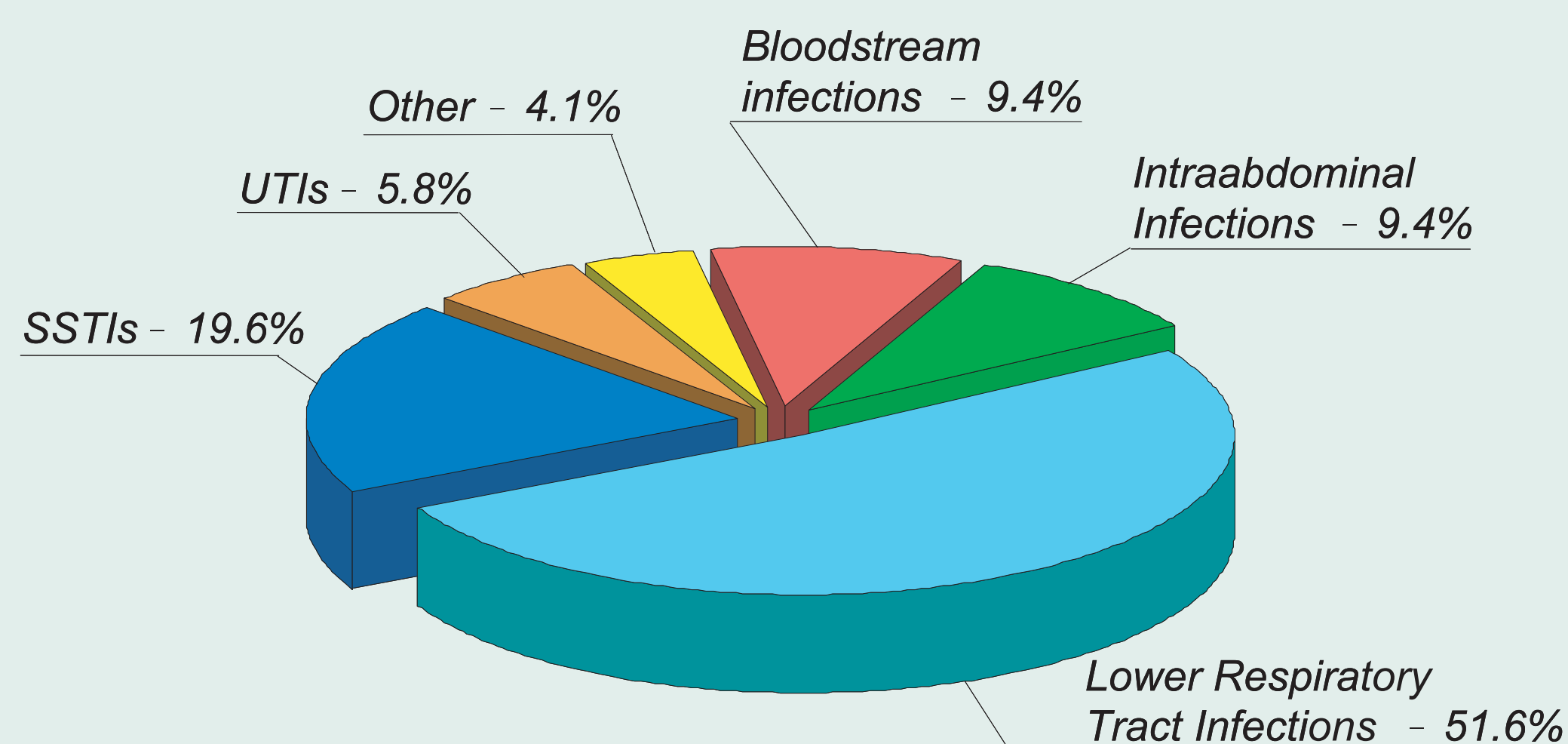
Acinetobacter baumannii is a microorganism frequently implicated in colonization and infection in hospitalized patients, especially those in Intensive Care Units (ICUs), where these opportunistic pathogens are capable of causing severe invasive infections in critically ill and immunocompromised patients. Emergence of *A.baumannii* as one of the most important nosocomial pathogens in ICUs patients has been observed worldwide^{1,2}. An increase of resistance during recent years made these infections difficult to treat. Success of antimicrobial therapy depends on appropriateness of the choice of antibiotics that should be based on the known susceptibility of causative pathogen. Thus, the objective of this study was to determine in vitro activity of different antimicrobials against *A.baumannii* isolated from ICUs patients in different regions of Russia.

Methods

The current study included *A.baumannii* strains isolated from ICU patients with clinical and laboratory confirmed infections developed not earlier than in 48 hours from the moment of hospitalization. The repeated strains isolated from the same patients were excluded. Antimicrobial susceptibility testing of nosocomial *A.baumannii* strains was performed by agar dilution method in accordance with recommendation of National Committee for Clinical Laboratory Standards (NCCLS). Minimal inhibitory concentrations (MICs) of following antibiotics were determined: amikacin, cefepime, cefoperazone, cefoperazone/sulbactam, cefotaxime, ceftazidime, ciprofloxacin, gentamicin, imipenem, levofloxacin, meropenem, piperacillin, piperacillin/tazobactam. Breakpoints for cefoperazone were used to interpret results of cefoperazone/sulbactam testing.

Results

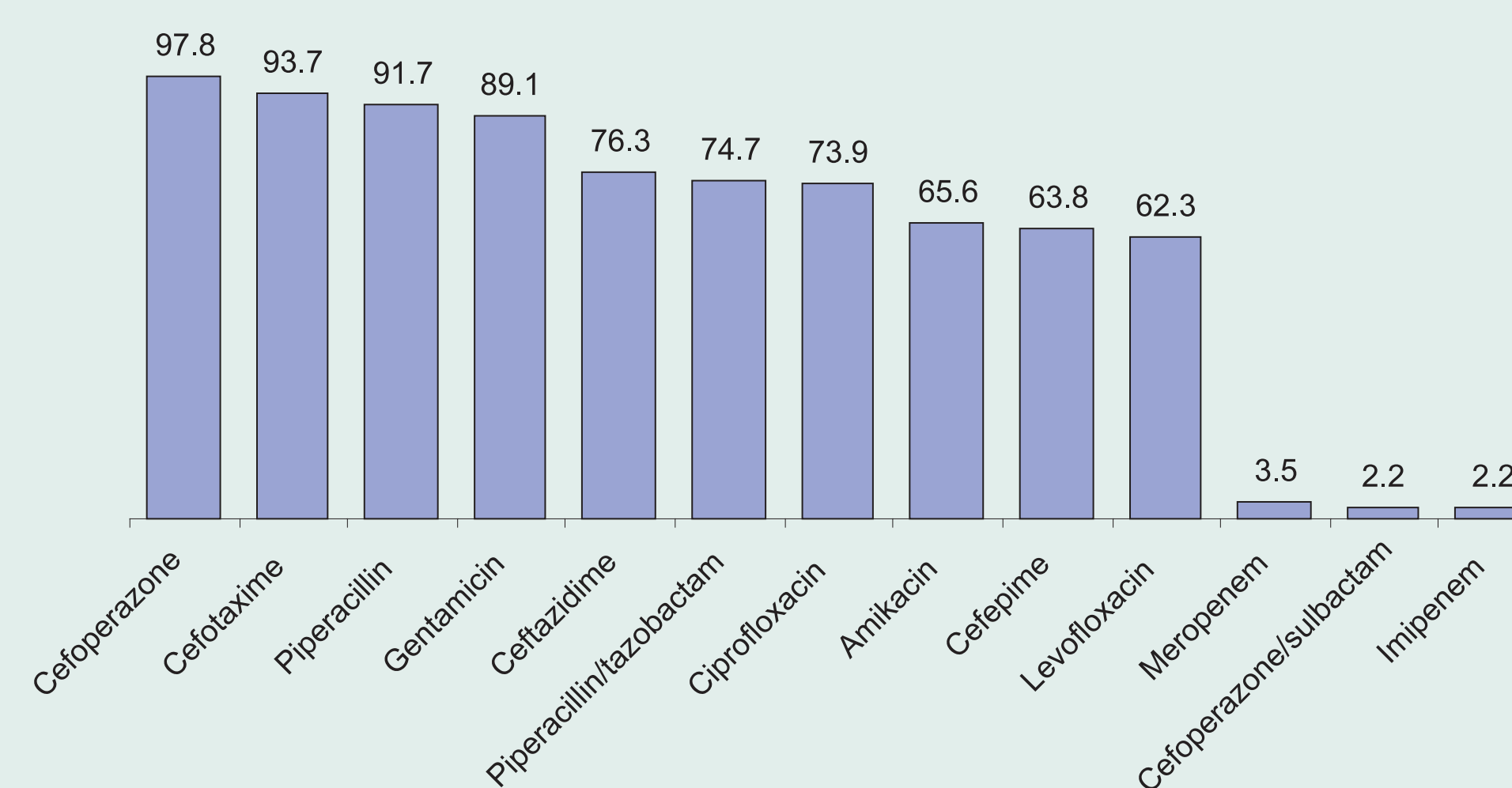
A total of 459 nosocomial *A.baumannii* were collected from 30 ICUs located in different parts of Russia during 2002-2004. Strains were obtained from different clinical specimens (urine, blood, sputum, pleural fluid, abscess, wound, drainage, peritoneal fluid, bile, skin and soft tissues, liquor, bronchoalveolar aspirate). The majority of strains were isolated from patients with lower respiratory tract infections (51.6%) and skin and soft tissue infections (19.6%). Equal amount of strains (9.4%) were isolated from patients with bloodstream infections and intraabdominal infections; 5.8% strains were isolated from patients with urinary tract infections. Amount of strains isolated from biological sample of patients with other different infections was 4.1%. Distribution of sites of nosocomial infections with tested *A.baumannii* involvement is shown on the picture 1. *A.baumannii* tested showed high level of resistance to all studied antimicrobials except carbapenems and cefoperazone/sulbactam, which possessed the lowest MIC₅₀, MIC₉₀ values. Results of antimicrobial susceptibility testing are presented on table 1 and picture 2.



Picture 1. Sites of nosocomial infections the studied *A.baumannii* isolates were involved in.

Table 1. Results of antimicrobial susceptibility testing of nosocomial *A.baumannii* (n=459).

Antimicrobial	S(n)	I(n)	R(n)	S(%)	I(%)	R(%)	I+R(%)	MIC ₅₀ , mg/l	MIC ₉₀ , mg/l	MIC range, mg/l
Amikacin	158	20	281	34.4	4.4	61.2	65.6	128	256	0.5-512
Cefepime	166	195	98	36.2	42.5	21.4	63.8	16	32	1-256
Cefoperazone	10	22	427	2.2	4.8	93.0	97.8	256	256	4-256
Cefoperazone/sulbactam	449	7	3	97.8	1.5	0.7	2.2	4	16	0.25-256
Cefotaxime	29	51	379	6.3	11.1	82.6	93.7	128	256	4-256
Ceftazidime	109	102	248	23.7	22.2	54.0	76.3	32	64	0.5-256
Ciprofloxacin	120	4	335	26.1	0.9	73.0	73.9	64	128	0.06-128
Gentamicin	50	22	387	10.9	4.8	84.3	89.1	128	256	1-256
Imipenem	449	1	9	97.8	0.2	2.0	2.2	1	2	0.125-32
Levofloxacin	173	48	238	37.7	10.5	51.9	62.3	8	16	0.06-32
Meropenem	443	6	10	96.5	1.3	2.2	3.5	1	4	0.125-32
Piperacillin	38	23	398	8.3	5.0	86.7	91.7	256	256	4-256
Piperacillin/tazobactam	116	152	191	25.3	33.1	41.6	74.7	64	256	1-256



Picture 2. Resistance pattern (I+R, %) of nosocomial *A.baumannii*.

Discussion

The potential for antimicrobial resistance is an important concern for clinicians treating patients with confirmed or suspected *A.baumannii* infections. In the present study, cumulative 2002 to 2004 results for *A.baumannii* demonstrated that 90% of the isolated tested were susceptible to cefoperazone/sulbactam (97.8%), imipenem (97.8%) and meropenem (96.5%), for other antimicrobials susceptible was significant less (38%). Centralized *in vitro* studies conducted from 1998 to 2001 for clinical isolates of *A.baumannii* from ICU patients in the United States have published similar susceptible results for above mentioned antimicrobials. The susceptible to imipenem was 96.6% and susceptible to meropenem was 91.7%, cefoperazone/sulbactam was not tested. Nosocomial isolates of *A.baumannii* collected from patients in the United States and Canada as part of the SENTRY surveillance program from 1997 to 1999 demonstrated the similar carbapenem susceptibilities (4% to 8%)³. But when compared to results of susceptibility testing of *A.baumannii* collected from Russian ICUs during 1997-99 when all strains studied were susceptible to imipenem⁴, the emergence of carbapenem-resistant strains was observed in our current study.

Conclusions

- Nosocomial *A.baumannii* isolated from Russian ICUs were found to be highly resistant to beta-lactams, inhibitor-protected beta-lactams, aminoglycosides and fluoroquinolones.
- Imipenem, meropenem and cefoperazone/sulbactam expressed the highest in vitro activity against nosocomial *A.baumannii*.
- Emergence of resistance to carbapenems is worrisome thus monitoring of resistance to this antimicrobials among nosocomial *A.baumannii* in Russian ICUs is of paramount importance.

References

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