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Antimicrobial susceptibility

Antimicrobial susceptibility of anaerobic bacteria in Bulgaria

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ABSTRACT

Objectives: The antimicrobial susceptibility of anaerobic bacteria isolated from clinical specimens in the referent for Bulgaria anaerobic laboratory was studied in a period of 25 years/1983–2007/.

Methods: NCCLS – recommended agar dilution methods were used. β-lactamase activity was determined with nitrocefin discs.

Results: The 29 antimicrobial agents included in the study were divided according to their in vitro activity against the anaerobic isolates into 4 main groups for guiding empirical treatment: 1st group of metronidazole, chloramphenicol, meropenem, imipenem and combinations of β-lactam antibiotics with sulbactam – with high activity and drugs of choice for treatment; 2nd group – clindamycin, cefoxitin, carbenicillin/and azlocillin, piperacillin/ – with a good activity and low percent of resistant strains; 3rd group – of tetracycline and erythromycin with higher percent of resistant strains including the new macrolides as josamycin, clarithromycin, roxithromycin and azithromycin; 4th group – penicillins/ampicillin, amoxicillin, penicillin/and cephalosporins/cefamandole, cefazolin, cefotaxime and cefoperazone/ – not suitable for treatment of infections including *Bacteroides fragilis* group strains, with a very high percent of resistant strains, probably due to β-lactamase activity in most of the strains.

Conclusion: A continued updating and a follow-up in the changes of antibiotic susceptibility are necessary in every country as resistance patterns vary not only between geographical regions but also even among medical centers and hospitals which may be connected with differences in antibiotic usage in man and animals.

1. Introduction

The clinical significance of obligately anaerobic bacteria has been well recognized during the last decades. However, routine antibiotic susceptibility testing of anaerobes is generally not often performed in the microbiology laboratories and clinical therapy relies on antimicrobial agents with well established activity. Surveys of Goldstein et al. [17,18] showed that up to 23% of the laboratories in the USA do susceptibility tests on anaerobes. The reason is that testing techniques are complex, anaerobic infections are frequently polymicrobial and the isolation and identification of those bacteria can be very time consuming.

Taking into account that there are no such studies in Bulgaria till now and that they are only few in Eastern Europe where antibiotic usage differs considerably [24,27], we decided to study the susceptibility of anaerobic bacteria in our country as an useful information for clinicians and a guidance for empirical treatment and to compare the possible efficacy of new antibiotics in comparison with established agents.

2. Materials and methods

2.1. Bacterial strains

1103 isolates of obligately anaerobic bacteria, isolated from clinical specimens in the Anaerobic Laboratory from the National Center of Infectious and Parasitic Diseases in Sofia, Bulgaria in the period of 25 years/1983–2007/, were included in the study. They were identified by the standard methods described in the Wadsworth Anaerobic Bacteriology Manual, 2002.

2.2. Antimicrobial agents

Ampicillin and carbenicillin were obtained from Beecham – Sevigne, penicillin/Roger–Bellon/, chloramphenicol/Sigma/, imipenem and cefoxitin/Merck Sharp & Dohme/, clindamycin/Upjohn/, tetracycline/Pfizer/, metronidazole/Specia/, meropenem/Zeneca Pharmaceuticals/, erythromycin and clarithromycin/Abbott

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Table 1
Susceptibility of anaerobic bacteria to 9 antimicrobial agents.

Microorganisms	Antimicrobial agent	Range	MIC/mg/L/[a]		% resistant[b]
			MIC_{50}	MIC_{90}	
Bacteroides fragilis group/72/	Ampicillin	4–>128	32	128	96/99/
	Penicillin	4–>128	32	64	89/97/
	Carbenicillin	1–128	16	64	0
	Cefoxitin	0.5–64	8	16	0/1/
	Chloramphenicol	2–8	4	8	0
	Tetracycline	0.25–64	8	32	28/47/
	Erythromycin	0.5–>64	4	32	15/21/
	Clindamycin	0.125–32	0.5	4	0/3/
	Metronidazole	0.25–2	0.5	1	0
Prevotella sp./10/	Ampicillin	0.125–32	2	16	20/40/
	Penicillin	0.125–64	2	32	20/40/
	Carbenicillin	≤1–128	≤1	32	0
	Cefoxitin	0.5–64	2	16	10/10/
	Chloramphenicol	1–16	4	8	0
	Tetracycline	0.25–32	4	16	10/30/
	Erythromycin	0.5–8	1	4	0/10/
	Clindamycin	≤0.125–0.25	0.125	0.25	0
	Metronidazole	0.125–4	0.5	2	0
Fusobacterium sp./11/	Ampicillin	≤0.25–4	≤0.25	1	0
	Penicillin	0.25–8	0.25	2	0
	Carbenicillin	≤1–2	≤1	1	0
	Cefoxitin	≤0.5–32	1	4	0
	Chloramphenicol	≤0.5–4	0.5	2	0
	Tetracycline	≤0.25–4	0.5	2	0
	Erythromycin	≤0.5–64	8	16	9/36/
	Clindamycin	≤0.125–2	0.25	1	0
	Metronidazole	≤0.125–2	0.5	1	0
Peptostreptococcus sp./15/	Ampicillin	≤0.25–8	≤0.25	2	0
	Penicillin	≤0.25–8	≤0.25	8	0
	Carbenicillin	≤1–16	≤1	8	0
	Cefoxitin	≤0.5–16	0.5	4	0
	Chloramphenicol	≤0.5–8	1	4	0
	Tetracycline	0.25–32	4	16	9/33/
	Erythromycin	≤0.25–64	2	16	9/17/
	Clindamycin	≤0.125–8	0.25	2	0/3/
	Metronidazole	≤0.125–>32	0.5	16	3/6/
Other GPAC[c]/17/	Ampicillin	≤0.25–1	≤0.25	1	0
	Penicillin	≤0.25–4	0.25	2	0
	Carbenicillin	≤1–8	≤1	1	0
	Cefoxitin	≤0.5–16	0.5	2	0
	Chloramphenicol	≤0.5–8	1	2	0
	Tetracycline	0.25–32	1	16	35
	Erythromycin	≤0.25–64	2	16	18
	Clindamycin	≤0.125–16	0.25	2	6
	Metronidazole	≤0.125–>32	0.5	16	6
Veillonella sp./2/	Ampicillin	0.5–2	0.5	2	0
	Penicillin	0.5–2	0.5	2	0
	Carbenicillin	≤1–2	≤1	2	0
	Cefoxitin	≤0.5–0.5	≤0.5	0.5	0
	Chloramphenicol	≤0.5–2	≤0.5	2	0
	Tetracycline	1–4	1	4	0
	Erythromycin	0.25–4	0.25	4	0
	Clindamycin	≤0.125–0.25	≤0.125	0.25	0
	Metronidazole	0.5–4	0.5	4	0
Clostridium perfringens/12/	Ampicillin	≤0.25–4	0.25	2	0
	Penicillin	≤0.25–2	0.25	2	0
	Carbenicillin	≤1–1	≤1	1	0
	Cefoxitin	≤0.5–16	0.5	2	0
	Chloramphenicol	2–8	2	4	0
	Tetracycline	0.5–16	1	8	0/8/
	Erythromycin	1–16	4	8	0/8/
	Clindamycin	0.125–8	0.25	4	0
	Metronidazole	0.25–4	0.5	1	0
Other *Clostridium sp.*/21/	Ampicillin	≤0.25–8	0.25	4	0
	Penicillin	≤0.25–16	0.25	4	0
	Carbenicillin	≤1–128	8	32	0
	Cefoxitin	0.5–128	4	32	5/10/
	Chloramphenicol	0.5–16	2	8	0
	Tetracycline	0.25–32	1	16	10/10/
	Erythromycin	0.25–16	0.5	4	5/5/
	Clindamycin	≤0.125–>32	0.5	16	10/10/
	Metronidazole	≤0.125–8	0.5	1	0