

## ANTIBIOTIC SUSCEPTIBILITY OF ANAEROBIC BACTERIA ISOLATED FROM PUS\*

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### ÖZET

*Cerahatten izole edilen anaerop bakterilerin antibiyotiklere duyarlılıkları.*

Ocak 1995-Temmuz 1996 arasında cerahat örneklerinden 218 anaerop bakteri suşu izole edilmiştir. Bu suşların 106'sı *Peptostreptococcus* spp, 34'ü *Bacteroides* spp, 28'i sporsuz Gram pozitif çomak, 27'si *Propionibacterium acnes*, 8'i *Clostridium* spp, 6'sı siyah pigmentli Gram negatif çomak, 5'i *Fusobacterium* spp, 3'ü *Veillonella* spp, 1'i *Actinomyces* spp olarak idantifiye edilmiştir. Suşların tümü dikkate alındığında beta-laktam ve beta-laktamaz inhibitörü kombinasyonları, kloramfenikol, imipenem ve piperasilin en etkili antibiyotikler (% 89-92 duyarlılık), eritromisin, tetrasiklin, penisilin ve sefalotin ise en az etkili antibiyotikler (% 57-69 duyarlılık) olarak saptanmıştır. Dirençli suş oranı yalnız *Bacteroides* spp suşlarında ve sadece penisilin, eritromisin ve sefalotin için % 50'yi aşmıştır. *P.acnes* suşlarında ampicilin+sulbaktam, piperasilin ve kloramfenikole dirençli olana rastlanmamıştır. En sık izole edilen iki tür dikkate alındığında 1991'den bu yana antibiyotik duyarlılıklarında önemli bir değişme saptanmamıştır.

### SUMMARY

Between January 1995 and July 1996, 218 strains of anaerobic bacteria were isolated from pus specimens. Of these strains, 106 were *Peptostreptococcus* spp, 34 *Bacteroides* spp, 28 nonsporeforming Gram positive rods, 27 *Propionibacterium acnes*, 8 *Clostridium* spp, 6 black pigmented Gram negative rods, 5 *Fusobacterium* spp, 3 *Veillonella* spp, 1 *Actinomyces* spp. When all strains were considered together, the most effective antibiotics were found to be beta-lactam and beta-lactamase inhibitor combinations, chloramphenicol, imipenem and piperacillin (89-92 % susceptibility). Erythromycin, tetracycline, penicillin and cephalothin were found to be the least effective antibiotics (57-69 % susceptibility). Only in *Bacteroides* spp the resistant rates exceeded 50 % for only penicillin, erythromycin and cephalothin. No resistant strain was encountered in *P.acnes* for ampicillin+sulbactam, piperacillin and chloramphenicol. When the first two species with higher number of isolates were considered, the overall susceptibility rates did not differ considerably since 1991.

### INTRODUCTION

Anaerobic bacteria are the predominant components of the human body flora. On the other hand, they may cause infections in any organ or tissue under certain conditions. These infections may be serious and even fatal. Studies on the isolation, pathogenesis and antibiotic resistance of anaerobes have been intensified especially in the last two decades (3).

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Anaerobic bacteria can gain resistance to many antibiotics as aerobic bacteria (1,2,3). As a consequence, performing susceptibility tests for anaerobic bacteria may be necessary in many occasions.

In this study, the anaerobic bacteria isolated from pus during the period January 1995 and July 1996, and the sensitivity of these bacteria to antibiotics are presented.

## MATERIALS AND METHODS

For primary isolation of anaerobes chopped-meat broth and Schaedler blood agar were used. All media were supplemented with hemin, vitamin K, yeast extract and cysteine monohydrochloride.

The susceptibility tests were performed by the broth disk elution method in Brucella broth supplemented as isolation media (5). Desired antimicrobial concentrations in tubes with 5 ml broth were obtained by adding antibiotic disks into medium in appropriate numbers as shown in table 1. From young cultures of strains, adjusted to 0.5 McFarland standard, 0.1 ml was used as inoculum. Absence of visible growth at the end of 24 hours' incubation at 37°C in anaerobic conditions (GasPak) was accepted as a sign of susceptibility.

Table 1. Preparation of antibiotic containing media for anaerobic susceptibility tests.

Antibiotics	Contents of each disk (µg)	No of disk in 5 ml broth	Final concentration (µg/ml)
Penicillin G	10 Ü	1	2 Ü
Ampicillin	10	2	4
Mezlocillin	75	4	60
Cephalothin	30	1	6
Cefuroxime	30	3	18
Ceftriaxone	30	3	18
Cefoperazone	75	2	30
Cefotaxime	30	3	18
Ceftazidime	30	3	18
Cefoxitin	30	3	18
Imipenem	10	4	8
Piperacillin	100	3	60
Ampicillin/sulbactam	20(10+10)	8	32
Amoxycillin/ clavulanic acid	30(20+10)	1	6
Clindamycin	2	8	3.3
Erythromycin	15	1	3
Chloramphenicol	30	2	12
Tetracycline	5	3	3

## RESULTS

In 1995 and in the first six months of 1996, 218 anaerobic bacterial strains were isolated from pus specimens. The identification of these strains and the results of susceptibility tests were shown in table 2. Beta-lactam and beta-lactamase inhibitor combinations, chloramphenicol, imipenem and piperacillin were found as the most effective antibiotics.

Table 2. The number of anaerobic isolates and the percentages or numbers of susceptible strains to antibiotics.

Bacteria (n)	Penicillin G	Ampicillin	Mezlocillin	Cephalothin	Cefuroxime	Ceftriaxone	Cefoperazone	Cefotaxime	Ceftazidime	Cefoxitin	Imipenem	Piperacillin	Ampicillin/ sulbactam	Amoxicillin/ clavulanic acid	Erythromycin	Clindamycin	Chloramphenicol	Tetracycline
Peptostreptococcus spp (106)	% 73	85	86	75	84	89	78	88	75	85	92	89	97	94	57	79	88	63
Bacteroides spp (34)	% 38	53	79	44	56	65	71	65	56	74	91	82	82	82	35	74	82	65
Nonsporiforming Gram positive rods (28)	% 71	79	79	68	89	86	86	89	86	93	86	93	86	89	57	68	82	64
Propionibacterium acnes (27)	% 89	96	96	85	96	96	96	93	93	89	89	100	100	93	85	81	100	92
Clostridium spp (8)	n 7	7	8	5	5	8	8	7	6	8	8	7	7	8	6	7	8	6
Black pigmented Gram negative rods (6)	n 1	2	5	0	2	3	2	4	3	4	4	3	3	4	3	4	6	3
Fusobacterium spp (5)	n 5	5	5	5	5	5	5	5	5	4	5	5	4	5	2	3	5	5
Veillonella spp (3)	n 3	2	3	2	3	3	3	3	3	3	2	3	3	3	2	2	3	2
Actinomyces spp (1)	n 1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total (218)	% 69	79	86	69	80	85	81	85	76	85	89	89	92	91	57	77	89	69

Table 3. Comparison of susceptibility (%) to some antibiotics of Bacteroides and Peptostreptococcus strains isolated in our laboratory in different years.

Bacteria	Year	Number of strains	Penicillin G	Ampicillin	Mezlocillin	Cephalothin	Cefuroxime	Ceftriaxone	Cefoperazone	Cefotaxime	Amoxicillin/ clavulanic acid	Erythromycin	Clindamycin	Chloramphenicol
Bacteroides	1991	151	34	39	64	44	48	60	69	63	77	51	66	77
	1992	175	33	36	61	43	46	63	65	60	76	51	62	77
	1996	34	38	53	79	44	56	65	71	65	82	35	74	82
Peptostreptococcus	1991	121	72	79	88	90	88	93	93	84	91	72	72	93
	1992	164	63	76	80	79	78	85	91	79	90	68	70	90
	1996	106	73	85	86	75	84	89	78	88	94	57	79	88

Data for 1991 are from ref 4, for 1992 from ref 6, for 1996 from this paper.

## CONCLUSIONS

- Although antibiotic resistance does not increase in anaerobic bacteria as speedy as in aerobic bacteria, 10 to 50 % of the strains may be resistant to some antibiotics. Table 3 also shows our results from 1991 and 1992 for the most frequently isolated anaerobic genera. As seen in the table, the susceptibility percentages did not differ too much between these years for most cases.

- When all strains were considered together, the most effective antibiotics were beta-lactam/beta-lactamase inhibitor combinations, chloramphenicol, imipenem and piperacillin. Erythromycin, tetracycline, penicillin and cephalothin were found less active on anaerobes than other antibiotics.

- Although the disk elution method is not a highly recommended method for susceptibility tests of anaerobic bacteria, it seems that it does not give too many erroneous results provided that control strains are used. Furthermore it gives results in short period of time and it may be easily performed in any laboratory dealing with anaerobes.

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