— Note —

Drug Resistance in *Streptococcus faecalis*, *Streptococcus faecium* and *Staphylococcus epidermidis* Isolated from Laboratory Animals

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A total of 1,278 strains of *Streptococcus faecalis*, 688 of *Str. faecium* and 796 of *Staphylococcus epidermidis* were collected from laboratory animals of 20 colonies in 1980, and tested for their resistance to 20 drugs. Thirteen percent of *Str. faecalis*, 12% of *Str. faecium* and 25% of *Staph. epidermidis* were drug resistant. Multiple drug resistant organisms were frequently detected in laboratory animal colonies where antibiotic treatment had been undertaken. TC-resistant streptococci and EM-resistant *Staph. epidermidis* were distributed in about half of the colonies regardless of the history of antibiotic usage.

Application of antibiotic agents has resulted in an increase in drug resistant organisms in laboratory animals as well as in man and domestic animals. We reported [1,2] that most laboratory animals were free of drug resistant organisms, although a high incidence of drug resistant organisms was demonstrated in a few colonies where antibiotics had been administered. The appearance of drug resistant organisms in laboratory animal colonies was closely related to the history of antibiotic treatment.

The present study deals with the distribution of drug resistant strains of *Streptococcus faecalis*, *Str. faecium* and *Staphylococcus epidermidis* from laboratory animals in this country. A total of 1,278 *Str. faecalis*, 688 *Str. faecium* and 796 *Staph. epidermidis* were collected from

feces of laboratory animals (254 mice and 180 rats including captured rodents, 26 guineapigs and 16 rabbits) from the colonies of 9 research laboratories and 11 commercial breeders between April and October 1980. As a rule, 5 organisms were isolated from each of the animals. SF agar (Difco) was used for the isolation of *Str. faecalis* and *Str. faecium*, and mannitol salt agar (Eiken) was used for the selection of *Staph. epidermidis*. Drug resistance was determined by the agar dillution method [3] using the following 20 drugs: tetracycline (TC), chloramphenicol (CP), streptomycin (SM), kanamycin (KM), erythromycin (EM), oleandomycin (OM), kitasamycin (KT), spiramycin (SP), tylosin (TS), benzylpenicillin, ampicillin, cloxacillin, cephaloridine, gentamycin, bacitracin, thiopeptin, virginiamycin, novobiocin, sulfad-

Table 1. Number of drug resistant *Str. faecalis* and *Str. faecium*.

	<i>Str. faecalis</i> isolated from					<i>Str. faecium</i> isolated from				
	Mouse	Rat	Guinea-pig	Rabbit	Total (%)	Mouse	Rat	Guinea-pig	Rabbit	Total (%)
No. of strains tested	711	537	14	16	1,278	395	203	42	48	688
No. of strains resistant to*										
TC CP EM OM KT SP TS	0	3	0	0	3 (0.2)	0	0	0	0	0 (0)
TC KM EM OM KT SP TS	0	1	0	0	1 (0.1)	2	0	0	0	2 (0.3)
TC EM OM KT SP TS	34	1	0	0	35 (2.7)	9	0	0	0	9 (1.3)
KM EM OM KT SP TS	0	0	0	0	0 (0)	2	0	0	0	2 (0.3)
EM OM KT SP TS	0	0	0	0	0 (0)	1	5	0	0	6 (0.9)
TC SM	0	6	0	0	6 (0.5)	0	0	0	0	0 (0)
EM OM	0	15	0	0	15 (1.2)	0	0	0	0	0 (0)
TC	58	44	1	5	108 (8.4)	60	6	0	0	66 (9.6)
SM	0	2	0	0	2 (0.2)	0	0	0	0	0 (0)
Total (%)	92 (12.9)	72 (13.4)	1 (7.1)	5 (31.3)	170 (13.3)	74 (18.7)	11 (5.4)	0 (0)	0 (0)	85 (12.4)

* Resistance to other drugs was not detected.

imethoxine and furazolidone. The concentration of drugs was as noted in a previous report [1].

As shown in Table 1, 170 strains (13.3%) of 1,278 *Str. faecalis* and 85 (12.4%) of 688 *Str. faecium* were drug resistant. Resistance was most frequently demonstrated to TC, followed by macrolide antibiotics (EM, OM, KT, SP, and TS) in both *Str. faecalis* and *Str. faecium*. Drug resistant streptococci were found in 8 colonies, while multiple drug resistant organisms were detected in only 4 colonies (A, E, S, and T) (Table 2). Antibiotic treatment had been undertaken in colonies S, T and U, but not in colonies P and Q. The antibiotic usage in colonies A, C and E was not recorded. Half of the colonies in which multiresistant organisms were isolated had a history of drug administration. Although single resistant streptococci to TC were found in various colonies, no drug resistant organisms were isolated from the laboratory animals of the remaining 12 colonies.

The resistance of *Staph. epidermidis* is shown Table 3. Of the 796 *Staph. epidermidis*, 199 strains (25.0%) were resistant to EM, TC and SM. Single resistant organisms to EM were frequently isolated from animals in 14 out of the 20 colonies investigated in this study (Table 4). On the other hand, double resistant organisms were found in colony U, in which the animals were supplied TC with the drinking water. We have no research data concerning the wide distribution of EM resistance. However, the appearance of EM-resistant organisms could be explained by contamination from human and domestic animals, and usage of antimicrobial agents in these colonies.

We obtained results indicating that 4 to 25% of organisms isolated from feces of laboratory animals in this country were drug resistant [1,2]. This low frequency might be due to the wide abstention from prophylactic use of antibiotic agents in laboratory animals. From the standpoint of hygiene and public health, control of

Table 2. Drug resistance patterns of *Str. faecalis* and *Str. faecium* in individual colonies.

Animal	Colony*	History of antibiotic treatment	No. of strains isolated	No. of resistant strains (%)	Resistance pattern (No. of strains)
<i>Str. faecalis</i>					
Mouse	C	NR**	69	13 (18.8)	TC (13)
	E	NR	95	52 (54.7)	TC EM OM KT SP TS (34)
Rat					TC (18)
	P	No	57	5 (8.8)	TC (5)
	S	Yes	41	22 (53.7)	TC (22)
	A	NR	25	15 (60.0)	EM OM (15)
	P	No	71	4 (5.6)	TC (4)
	S	Yes	43	31 (72.1)	TC C P EM OM KT S P T S (3) TC K M EM OM KT S P T S (1) TC EM OM KT S P T S (1) TC SM (6) TC (18) SM (2)
Guineapig	U	Yes	50	22 (44.0)	TC (22)
Rabbit	S	Yes	11	1 (9.1)	TC (1)
	S	Yes	13	5 (38.5)	TC (5)
<i>Str. faecium</i>					
Mouse	C	NR	46	3 (6.5)	TC (3)
	P	No	21	20 (95.2)	TC (20)
	Q	No	19	19 (100)	TC (19)
	T	Yes	45	32 (71.1)	TC K M EM OM KT S P T S (2) TC EM OM KT S P T S (9) K M EM OM KT S P T S (2) EM OM KT S P T S (1) TC (18)
Rat	A	NR	5	5 (100)	EM OM KT S P T S (5)
	P	No	14	1 (7.1)	TC (1)
	S	Yes	7	5 (71.4)	TC (5)

* Drug resistant organisms were not detected in other colonies.
** Not recorded.

Table 3. Number of drug resistant *Staph. epidermidis*.

Animal	Mouse	Rat	Guinea-pig	Rabbit	Total (%)
No. of strains tested	402	346	47	1**	796
No. of strains resistant to*					
TC EM	1	6	0	0	7 (0.9)
SM EM	1	0	0	0	1 (0.1)
TC	18	20	0	0	38 (4.8)
EM	56	92	5	0	153 (19.2)
Total (%)	76 (18.9)	118 (34.1)	5 (10.6)	0 (0)	199 (25.0)

* Resistance to other drugs was not detected.
** Only one strain of *Staph. epidermidis* could not be isolated from a rabbit.

Table 4. Drug resistance patterns of *Staph. epidermidis* in individual colonies.

Animal	Colony*	History of antibiotic treatment	No. of strains isolated	No. of resistant strains (%)	Resistance pattern (No. of strains)
Mouse	A	NR**	12	2 (16.6)	EM (2)
	B	Yes	18	14 (77.8)	EM (14)
	F	Yes	15	8 (53.3)	EM (8)
	G	No	10	5 (50.0)	EM (5)
	H	No	21	3 (14.3)	EM (2)
					TC (1)
	I	No	41	2 (4.9)	EM (2)
	Q	No	27	5 (18.5)	EM (5)
	R	No	37	5 (13.5)	EM (5)
	T	Yes	48	10 (20.8)	EM (10)
	U	Yes	40	22 (55.0)	TC EM (1)
					SM EM (1)
Rat					EM (3)
					TC (17)
	A	NR	22	13 (59.1)	EM (13)
	C	NR	90	31 (34.4)	EM (31)
	D	No	8	5 (62.5)	EM (5)
	F	No	6	1 (16.7)	EM (1)
	H	No	21	16 (76.2)	EM (16)
	I	No	22	11 (50.0)	EM (11)
	J	No	29	3 (10.3)	EM (3)
	Q	No	39	2 (5.1)	EM (2)
Guineapig	S	Yes	28	3 (10.7)	EM (3)
	U	Yes	47	33 (70.2)	TC EM (6)
					EM (7)
					TC (20)
	R	No	12	5 (41.7)	EM (5)

* Drug resistant organisms were not detected in other colonies.

** Not recorded.

infectious diseases in the laboratory animals should not be made through the application of antibiotics, but by careful sanitary management such as sterilization and the establishment of microbiological barriers.

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実験動物の糞便由来レンサ球菌および表皮ブドウ球菌の薬剤耐性に関する検索

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1980年わが国の主要な9研究施設および11生産施設に由来する実験動物より *Streptococcus faecales* 1,278株, *Str. faecium* 688株および *Staphylococcus epidermidis* 796株を採取し, 薬剤耐性を調べた。*Str. faecalis* の13%, *Str. faecium* の12%および *Staph. epidermidis* の25%が薬剤耐性であった。レンサ球菌

ではマクロライド系抗生物質に交叉耐性を有する多剤耐性菌が, ブドウ球菌では2剤耐性菌が主として薬剤使用歴を有する施設より検出された。一方, テトラサイクリン単剤耐性レンサ球菌およびエリスロマイシン単剤耐性ブドウ球菌は, 薬剤使用歴にかかわらず検索した20施設のうち約半数の施設に分布していた。