TABLE
FREQUENCY OF METHICILLIN-SENSITIVE AND METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* NASAL CARRIAGE BY CATEGORY OF HEALTHCARE WORKER AT THE UNIVERSITY HOSPITAL OF SAINT-ETIENNE, SAINT-ETIENNE, FRANCE, IN FEBRUARY 2000

Category of HCW	No. of Samples	MSSA Prevalence		MRSA Prevalence	
		No. (%)	CI_{95}	No. (%)	CI_{95}
Student					
Fellow	120	33 (27.5)	19.4–35.6	5 (4.2)	0.6–7.8
Medical student	124	34 (27.4)	19.4–35.4	1 (0.8)	0–2.3
Nursing student	89	21 (23.6)	14.6–32.6	2 (2.2)	0–5.2
Control subject					
Practitioner	38	7 (18.4)	5.8–31.0	2 (5.3)	0–12.6
Nurse	102	24 (23.5)	15.1–31.9	3 (2.9)	0–6.2
Assistant nurse	47	8 (17.0)	6.0–28.0	1 (2.1)	0–6.2
Cleaning agent	41	5 (12.2)	2.0–22.4	0 (0)	NA
Total	561	132 (23.5)	20.0–27.0	14 (2.5)	1.2–3.8

HCW = healthcare worker; MSSA = methicillin-susceptible *Staphylococcus aureus*; MRSA = methicillin-resistant *S. aureus*; CI_{95} = 95% confidence interval; NA = not applicable.

ed, including 333 students and 228 control subjects. Detailed results are presented in the table. The overall estimated prevalence of MRSA carriage was 2.5%, which was high when compared with the rate recorded for HCWs from countries displaying a low MRSA endemicity in hospitals.[3,4] Regarding the student population, no statistical association was found between nasal carriage of MRSA and any of the items listed above and recorded through the questionnaire. In addition, no significant statistical difference in the prevalence of either methicillin-susceptible *S. aureus* or MRSA nasal carriage was found between students and control subjects. This study, performed during a non-epidemic period, did not confirm the high prevalence of MRSA nasal carriage observed in students of our hospital during previous epidemic periods. The results displayed in the table indicate that the two populations with the higher prevalence of MRSA nasal carriage were practitioners and fellows. When these two categories were compared with the other HCWs, a trend toward a significant statistical difference was observed ($P = .07$ by Fisher's exact test). Actually, compliance with handwashing and hand antisepsis was shown to be poor in this population.[5] The latter observation suggests targeting physicians for audit of hygienic practices and information on hand antisepsis.

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Resistance to Penicillin and Erythromycin in Viridans Streptococcal Bloodstream Isolates From Cancer and Non-Cancer Patients Within 10 Years

To the Editor:

Penicillin resistance in *Streptococcus pneumoniae* and erythromycin resistance in *S. pyogenes* are important antimicrobial resistance problems in the general population in Europe. However, resistance to penicillin and erythromycin in viridans streptococci has been less extensively studied. Viridans streptococci in neutropenic patients may cause bacteremias with septic shock and acute respiratory distress syndrome, with a mortality rate of 25% to 40%.[1,2]

Therefore, prophylaxis with penicillin or a macrolide has been widely used in many hematology–oncology departments and, as a result, selection of erythromycin-resistant and penicillin-resistant mutants of viridans streptococci has become a major concern.[3] However, in other patient populations in the community, susceptibility profiles of viridans streptococci have not usually been reported[1-4] despite the fact that viridans streptococci can harbor erythromycin resistance genes from *S. pyogenes* and *S. pneumoniae*.[5-10]

We compared resistance to erythromycin and penicillin in bloodstream isolates from cancer and noncancer patient populations within the past 10 years in two large hospitals—a tertiary-care cancer center and a community county hospital. Strains of viridans streptococci were tested for resistance to penicillin, erythromycin, and 14 other antibiotics using the disk-diffusion method according to the guidelines of the National Committee for Clinical Laboratory Standards.[5] Resistance to penicillin was defined as a minimum inhibitory concentration of greater than 0.25 µg/mL. Resistance to erythromycin was defined as a minimum inhibitory concentration of greater than 0.5 µg/mL.

Two groups of viridans streptococcal strains were compared—those isolated from patients in a small community hospital (Nitra District Hospital) (Fig. 1) and those isolated

TABLE 1
PERCENTAGE OF STRAINS RESISTANT TO PENICILLIN AND ERYTHROMYCIN

	No. (%) of Resistant Strains										
	1991 (n = 136)	1992 (n = 140)	1993 (n = 130)	1994 (n = 112)	1995 (n = 135)	1996 (n = 55)	1997 (n = 68)	1998 (n = 60)	1999 (n = 54)	2000 (n = 20)	2001 (n = 20)
Penicillin	44 (30.1)	29 (20.5)	6 (4.5)	24 (21.5)	33 (35.5)	19 (18.5)	22 (32.0)	23 (35.6)	17 (32.0)	1 (6.0)	1 (5.0)
Erythromycin	12 (8.5)	7 (5.0)	10 (7.6)	11 (10.0)	12 (9.0)	5 (9.0)	7 (10.5)	6 (10.0)	4 (7.5)	1 (5.0)	0 (0.0)

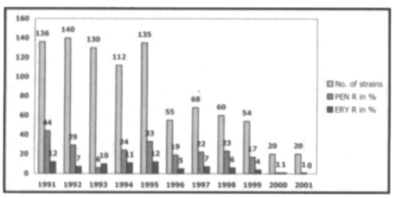

FIGURE 1. Incidence of viridans streptococci and resistance of viridans streptococci to penicillin and erythromycin in strains isolated from non-cancer patients in the community hospital. PEN R = penicillin resistance; ERY R = erythromycin resistance.

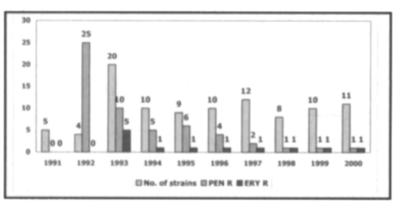

FIGURE 2. Resistance to erythromycin and penicillin in viridans streptococcal strains isolated from the cancer patients. PEN R = penicillin resistance; ERY R = erythromycin resistance.

TABLE 2
SUSCEPTIBILITY OF VIRIDANS STREPTOCOCCI TO ANTIBIOTICS

Country	Period	Penicillin Resistant	Erythromycin Resistant	No. of Isolates
United Kingdom[6]	1996–2000	15%	0%	607 (endocarditis blood cultures)
Netherlands[7]	1995–1999	5%	3.20%	342 (all isolates)
Argentina[8]	1990–1994	NA	2.60%	NA
Spain[9]	1994–1999	14.30%	17.70%	NA
France[10]	1988–1995	40%	NA	NA
Taiwan[11]	1998	64%	50%	NA
United States[12]	1996	56%	NA	NA
Slovakia[2,14]	1990–1997	24%	NA	78 (bacteremia in cancer patients only)
Canada[13]	1995–1997	28%	40%	418 (bacteremias)

NA = not applicable.

from cancer patients[2] in a cancer hospital (Fig. 2).

On comparison of the two groups (Figs. 1 and 2 and Table 1), the incidence of viridans streptococci isolated from both blood and nonsterile cultures in general county hospital was decreasing. Resistance to penicillin and erythromycin varied between 5% and 32% in 1991 to 2001; however, resistance to penicillin and erythromycin had been low (0% to 6%) within the past 2 years, and lower than in 1991 to 1999 (4.5% to 5.6% for penicillin and 7.5% to 10.5% for erythromycin; $P < .05$, t test). Resistance in isolates from cancer patients had also declined (Fig. 2). The prevalence of resistance had decreased from 50% for penicillin and 25% for erythromycin in 1993 to 12.5% in 1998 and 9% in 1999 for both erythromycin and penicillin ($P < .01$, t test).

The reason for the decrease in resistance for both penicillin and erythromycin was unclear. Perhaps the cessation of prophylaxis with azithromycin performed during 1993 to 1995 for leukemia patients and penicillin prophylaxis during 1991 to 1998 played some role in the decreased resistance among cancer patients.[4,5] However, we have no explanation for the decrease in resistance in the general hospital, where the overall consumption of beta-lactams and macrolides increased during 1990 to 1998. These rates were comparable to the community prevalence or the prevalence in general hospitals in the Netherlands and the United Kingdom, but much lower than those reported from the United States, Spain, Taiwan, France, or Canada (Table 2).[6-14]

There were no significant differences in the susceptibility of isolates from cancer patients versus patients in the general hospital for either drug. Trends toward increasing susceptibility to erythromycin and penicillin of viridans streptococci were observed in these two hospitals during 2000 to 2001 compared with during 1992 to 1996.

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