unit (total, 14 units) separated by 9 and 48 days. Vriens et al. reported only 3 identical isolates among 27 MSSA isolates. During the same 5-month period, 17 MRSA clinical isolates (8 wound, 6 urine, 1 sputum, 1 blood, and 1 stool) were encountered from 10 nursing units. A total of 10 unique PFGE types were encountered that varied by at least 1 band (Table 2). The nursing home has 4 nursing buildings. All 4 profile L isolates occurred in the same building, 3 of which were from the same floor. Two of 4 profile A1 isolates were from the same unit, with a third isolate being from the same building. The 2 profile A13 isolates were from the same building. The mean band difference between the MRSA isolates was 5.9 ± 2.4, whereas the mean band difference between the MSSA isolates was 9.1 ± 2.5. The data were normally distributed. The MRSA isolates were significantly more genetically related than were the MSSA isolates ($P < .0001$). Our results are similar to those of Dominguez et al., who performed PFGE on 189 MRSA and 52 MSSA isolates in a 1,000-bed hospital in Barcelona, Spain. The 189 MRSA isolates fell into 11 to 19 PFGE patterns, whereas the 52 MSSA isolates fell into 33 PFGE patterns. These investigators also found greater genetic relatedness among MRSA versus MSSA isolates.[4]

We speculate that the closer genetic relatedness of our MRSA isolates versus our MSSA isolates provides evidence for greater transmission. Ward reported evidence of equivalent adhesion of MRSA and MSSA strains to nasal epithelial cells.[5] Bisognano et al. reported induction of fibronectin-binding proteins and increased adhesion of quinolone-resistant *S. aureus* by subinhibitory levels of ciprofloxacin.[6,7] All 17 MRSA isolates were ciprofloxacin resistant. Ten patients had received quinolones in the previous 90 days. None of 11 MSSA isolates was ciprofloxacin resistant and 2 of these patients had received a quinolone. We speculate that the use of antibiotics active against MSSA, but not MRSA, creates a selective advantage for MRSA survival and spread. Exposure to quinolones might facilitate adhesiveness of MRSA and destroy competing flora.[8]

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Paul J. Drinka, MD
Wisconsin Veterans Home
King, Wisconsin
Mary E. Stemper, MT(ASCP), MS
Marshfield Clinics Laboratory
Marshfield, Wisconsin
Cathy D. Gauerke, MT(ASCP)
Janice M. Miller, MT(ASCP)
Wisconsin Veterans Home
King, Wisconsin
Kurt D. Reed, MD
Marshfield Clinics Laboratory
Marshfield, Wisconsin

Is Nasal Carriage of Methicillin-Resistant *Staphylococcus aureus* More Prevalent Among Student Healthcare Workers?

To the Editor:

In the University Hospital of Saint-Etienne, an increase in the number of methicillin-resistant strains of *Staphylococcus aureus* was observed from 1997 (22% of all *S. aureus* strains) to 1999 (36%; 0.71 per 100 admissions). This increase was associated with outbreaks in different units, as previously described,[1,2] and the detection of methicillin-resistant *S. aureus* (MRSA) nasal carriage in up to 10% of healthcare workers (HCWs). In addition, some of the MRSA strains were shared by patients and colonized HCWs. In several of these outbreaks, approximately half of the student HCWs (nurses and practitioners) were found to be colonized with MRSA (P. Berthelot, MD, MPH, PhD, P. Fascia, MD, and F. Grattard, MD, PhD, personal communication, 1999).

To investigate this observation during a non-epidemic period, we performed a prospective epidemiologic estimation of the prevalence of methicillin-sensitive and methicillin-resistant strains of *S. aureus* among students of the University Hospital of Saint-Etienne (fellows, medical students, and nursing students) in February 2000. The study also sought to investigate the potential relationship between the prevalence of MRSA nasal carriage and the duration of work at the hospital.

A nasal screening and a questionnaire were offered to each student. Data recorded included gender, HCW category, number of years of hospital work, history of *S. aureus* infection, history of hospitalization in the past 5 years, other household members working in a healthcare institution, household members hospitalized in the past 5 years, sexual partner working in a healthcare institution, and sexual partner hospitalized in the past 5 years. A random sample of HCWs recruited from each of the 50 units of the hospital on a voluntary basis (1 practitioner, 2 nurses, 1 assistant nurse, and 1 cleaning agent per unit) served as a control group. All of the samples were rendered anonymous by the staff of the infection control unit. For both groups, the exclusion criteria were ongoing antibiotic treatment, an evolutive cutaneous infection, pregnancy, and refusal of the protocol.

A total of 561 HCWs participat-

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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Philippe Berthelot, MD, MPH, PhD
Infection Control Unit
Infectious Diseases Department
Florence Grattard, MD, PhD
Department of Microbiology
Pascal Fascia, MD
Isabelle Martin, MD
Franck Olivier Mallaval, MD
Infection Control Unit
Infectious Diseases Department
Alain Ros, MD
Bruno Pozzetto, MD, PhD
Department of Microbiology
Frederic Lucht, MD
Infection Control Unit
Infectious Diseases Department
University Hospital of Saint-Etienne
Saint-Etienne, France

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