Possible Relationship between *Staphylococcus aureus* Colonizing the Respiratory Tract and Rectum and *S. aureus* Isolated in a Geriatric Hospital Environment

**Key words:** Methicillin-resistant *Staphylococcus aureus* (MRSA), rectal bacterial flora, genotype, pulsed-field gel electrophoresis (PFGE) type

*Staphylococcus aureus*, especially methicillin-resistant *S. aureus* (MRSA), is an important nosocomial pathogen. In particular, MRSA is of great concern in both hospitals and nursing homes (1–3). Previous studies showed that the types of *S. aureus* in the hospital environment infrequently matched those colonizing inpatients (1). However, little information, including molecular analysis, is available regarding the relationship between colonization and *S. aureus* environmental contamination in long-term care (LTC) institutions. In this study, we performed a 12-week prospective culture survey to investigate the possible relationship between *S. aureus* types colonizing the respiratory tract and rectum, and *S. aureus* types isolated from the hospital environment.

The setting was an 8-bed room for the seriously ill patients in a geriatric LTC ward (180 beds) of Aino Memorial Hospital. The average length of hospital stay was 110 days. Ten patients (1 male and 9 females; mean age, 81.4 years) were admitted to the room between September and December 1996. Informed consent was obtained from either the patient or their families. Infection control measures included hand washing and disinfection of the upper respiratory tract...
and decubitus ulcers using povidone iodine. During the study period, 3 patients died of noninfectious diseases. In 8 patients, methicillin-susceptible S. aureus and MRSA were isolated. Culture specimens were prepared from simultaneously obtained swabs from the nasal cavity, pharynx, and rectum. Sputum samples were collected by sterilized suction tubes. Culture samples from the environment of the investigated room were obtained by swabs from the floor surface (area, 100 cm²) before ward cleaning and by agar plates placed for 3 hours in 6 places throughout the room (one in each corner, one in the center and one in the entrance). Sampling was performed at two-week intervals at a specific time (8–11 AM) on the surveillance days (Days 1 to 7).

We compared the types of 40 strains (21 from patients, and 19 from the hospital environment) of the isolated S. aureus by using pulsed-field gel electrophoresis (PFGE) type, and susceptibility to oxacillin. MRSA comprised 23 (57.5%) of 40 strains of S. aureus. The DNA was digested with 10 U of Smal. The band types were compared according to the criteria for bacterial strain typing (4).

The 40 strains of S. aureus were analyzed by PFGE and the resulting genomic types are shown in Fig. 1A, B. The genomic types were classified into 6 types (A to F), with 21 subtypes (A1-2, B1-13, C1-3, D1, E1, F1). Interestingly, of the 6 types, 2 types (B, C) were found in both the patients and the hospital environment. Of the 21 subtypes, 2 subtypes (B2, C1) were simultaneously found in both the patients and the environment. Of 22 type B strains, 21 (95.5%) were MRSA. Furthermore, 8 MRSA strains (6 from patients, 2 from the environment) exhibited subtype B2. Of 13 type C strains (2 from a single patient, 11 from the hospital environment), all were susceptible to oxacillin. Our results indicated that there were clear links between S. aureus colonizing the respiratory tract and rectum and S. aureus isolated in the environment.

The precise source of S. aureus in the environment of the investigated room was not identified in our study but it could be from a direct/indirect contamination by persistent or intermittent carrier patients, staff, or shedding from the ventilation grilles (5).

In conclusion, S. aureus isolated from the respiratory tract and rectum of bedridden patients might contaminate the geriatric hospital environment through various routes. Conversely, S. aureus isolated from hospital environment might be an intermittent source of S. aureus colonized in such patients.

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