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High Frequency of Yeast Carriage on Hands of Hospital Personnel

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The hands of 36 nurses and 21 nonnursing hospital employees were tested by culture with a modification of the broth wash technique. Seventy-five percent of the nurses and 81% of the nonnurses were found to harbor yeasts on their hands; 58% of nurses and 38% of nonnurses were carrying *Candida* spp.

During an investigation of funguria in our nursing home care unit (NHCU), 75% of 28 nurses were found to harbor yeasts on their hands (9). Since previous studies, which were summarized by Odds (7), reported rates of yeast carriage on hands and fingers of patients and healthy subjects ranging from 0 to 17%, we were quite surprised. Accordingly, we designed the present study to examine the frequency of yeast carriage on the hands of nurses working in three separate hospital units and to compare the frequency of yeast carriage in the nurses with that in nonnursing personnel working in nonclinical areas of our medical center.

Of the 36 nurses who participated in this study, 12 worked in the NHCU, 12 worked in either the medical or surgical intensive care unit, and 12 worked in the outpatient clinics. Of the 21 nonnursing personnel who also participated, 7 each were from our personnel, supply, and fiscal departments. A short questionnaire regarding hand washing practices was administered to all participants. Without any preparation of the hands, cultures were obtained by using the standard broth bag technique (5, 6). Both hands of all participants were placed in 20 ml of brain heart infusion broth contained in a plastic bag. Broth specimens were then transferred to sterile plastic cups. When the specimens arrived in the laboratory, gentamicin and vancomycin were added to yield a final concentration of 50 μg/ml. The cups were incubated for 6 days at 30°C, and 0.1-ml aliquots were subcultured to Bromcresol Green and Inhibitory Mold agar plates (PML Microbiologicals, Tualatin, Oreg.) on days 1 and 6. Control cultures of medium-containing bags (no handwashing and no antibiotics) were performed simultaneously. No yeasts were recovered from the control cultures.

Yeasts recovered were identified with MicroScan Rapid Yeast Identification panels (Baxter Healthcare Corporation, West Sacremento, Calif.) (4). The Rapid Yeast Identification panels, containing 96 microdilution wells with 27 dehydrated substrates, were inoculated with a yeast suspension calibrated against a MicroScan turbidity standard and incubated at 37°C for 4 h in the MicroScan Walkaway system. After addition of sodium hydroxide or peptidase reagent to appropriate substrate wells, plates were analyzed for enzyme activity as determined by color changes. Test results were digitized and compared to a computerized database to generate a list of probable species. Identifications were accepted when the percent probability exceeded 85%.

Overall, 75% of the nurses were found to harbor yeasts on their hands; 58% were intensive care unit nurses, 75% were outpatient clinic nurses, and 92% were NHCU nurses (Table 1). The hand cultures of five (83%) of six male nurses and 22 (73%) of 30 female nurses were positive for yeasts. Five of the nurses carried two species of yeasts, and 22 carried only one. Fifty-eight percent of the nurses had a *Candida* sp. on their hands; 11 had *Candida parapsilosis*, 8 had *C. albicans*, 2 had *C. lusitaniae*, and 1 had *C. guillermondi*. Other yeasts recovered from nurses included *Rhodotorula* sp. (from six persons) *Torulopsis candida* (from one), *Sporobolomyces* sp. (from one), *Trichosporon beigelii* (from one), and *Saccharomyces cerevisiae* (from one).

Eighty-one percent of the nonnursing participants harbored yeasts on their hands: 71% of the participants in the personnel department, 71% of those in the fiscal department, and 100% of those in the supply department. The hand cultures of five (100%) of five male participants and 12 (75%) of 16 female participants were positive for yeasts. Two individuals carried two yeast species, and 15 carried only one. Thirty-eight percent of the nonnursing participants harbored a *Candida* sp. on their hands; six had *C. parapsilosis*, 3 had *C. albicans*. *Rhodotorula* sp. was isolated from nine individuals, and an unidentifiable yeast was isolated from one. None of the differences between nurses and nonnurses were statistically significant, a somewhat unexpected finding in light of the differences in hand washing practices disclosed by the questionnaire.

Questionnaire results indicated that 92% of the nurses and only 28% of the nonnurses had washed their hands one or more times at work that day prior to participating in the study. Most of the nurses had washed their hands three, four, or more times, whereas none of the nonnurses had washed more than once or twice. Similarly, 50 and 78% of the nurses but none of the nonnurses had worn gloves and had direct patient contact, respectively, prior to participating in the study. About half of the nurses who had worn gloves had already used more than three pairs that day prior to participating in the study. In contrast, most of the nonnursing personnel had not worn gloves during the preceding week. On the morning of the study, hand lotion had been used by 40% of nurses and 43% of nonnurses. Lastly, about 20% of nurses, but none of the nonnurses, reported having eczema or other problems with the

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TABLE 1. Hand carriage of yeasts by hospital personnel

Group and subgroup (no. of persons)	No. (%) with:	
	Any yeast	*Candida* sp.
Nurses (36)	27 (75)	21 (58)
ICU[a] (12)	7 (58)	4 (33)
OPC[b] (12)	9 (75)	8 (66)
NHCU (12)	11 (92)	9 (75)
Nonnurses (21)	17 (81)	8 (38)
Personnel (7)	5 (71)	3 (43)
Fiscal (7)	5 (71)	2 (28)
Supply (7)	7 (100)	3 (43)

[a] ICU, intensive care unit.
[b] OPC, outpatient clinic.

skin of their hands. Neither hand washing practice, glove use, hand lotion use, nor eczema had any association with yeast carriage.

The results of this study indicate that hospital personnel in a variety of clinical and nonclinical settings frequently carry pathogenic yeasts on their hands. The discrepancy between our results and data previously reported probably reflects methodological differences and not unusual characteristics of our study participants. Swab techniques, which were used in the four studies summarized by Odds (7), may be insensitive, yielding yeasts only when large numbers are present. Other investigators using the broth wash technique have reported higher yields of yeasts (1, 2, 8). For example, Horn and colleagues retrieved yeasts from 27% of nonmedical subjects, from 28% of nurses and physicians working in dermatology, and from 54% of nurses and physicians working on an oncology ward (2). *Rhodotorula* sp. and *C. parapsilosis* were the isolates most frequently recovered. The higher yields in the present study probably derived not only from use of the broth wash technique but also from addition of antibiotics to the broth, the 6-day incubation time, and use of selective media for recovery of yeasts. These methodological features were adopted from the study reported by Isenberg and associates (3), which linked an outbreak of *C. tropicalis* wound infections following cardiac surgery to a colonized scrub nurse. Transmission of yeasts by hand carriers has also figured prominently in two reports of nosocomial *C. albicans* outbreaks and in our own NHCU funguria investigation (1, 8, 9). If transient carriage of small numbers of yeasts on the hands of health care workers can lead to cross infection and if methods like those employed in the present study are indeed more sensitive, then these methods may facilitate the detection and recognition of nosocomial yeast transmission.

In summary, these data indicate that yeast carriage on the hands of hospital personnel is more common than previously realized. They also suggest that sensitive culture techniques, such as the methods employed in this study, combined with newer, more precise genotypic fungal typing systems, may be useful in unravelling the mysteries of yeast transmission in hospitals.

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