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Comparison of Copan ESwab™ and Starplex Starswab II™ for the Detection of Methicillin-Resistant *Staphylococcus aureus* from Nasal and Perianal Specimens

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Abstract

Background: Admission screening is an integral part of the control of methicillin-resistant *Staphylococcus aureus* (MRSA). Appropriate specimen collection and transport is essential for the success of a screening program. This study was undertaken to evaluate the effectiveness of, and to determine the best processing procedure for Copan Elution Swabs (ES, Copan Diagnostics Inc., Corona, CA). ES uses a flocculated swab and a liquid transport medium. Results of three different procedures using ES were compared with our routine specimen collection method, which uses Starswab II (SS) with clear semisolid Amies medium (Starplex Scientific Inc. Etobicoke, Ontario Canada).

Methods: Nasal and perianal specimens were collected using ES and SS. Pairs of SS swabs were inoculated onto a single MRSA*Select* chromogenic plate. One plate per specimen was inoculated with 50 µL of neat Eswab transport medium (N-ES). The remaining transport medium was centrifuged. After removal of all but 100 µL of liquid, 50 µL (C-ES) was used to inoculate a chromogenic plate. To the remainder of the ES medium, 1 mL of selective broth was added. After overnight incubation chromogenic plates were inoculated with 50 µL of the concentrated ES medium (B-ES). Pairs of SS swabs from MRSA-positive patients by any method were taken out and planted onto two separate chromogenic plates. Identity of MRSA isolates was confirmed by an in-house PCR method.

Results: A total of 870 specimens from 363 patients were processed. 90 specimens were positive for MRSA. None of the methods was successful in detecting all MRSA-positive specimens. SS identified 74/90 (82.2%) of MRSA-positive specimens. N-ES and C-ES correctly recognized 79/90 (87.7%) of such specimens; B-ES was most sensitive and detected MRSA in 83/90 (92.2%) of MRSA-positive specimens.

Conclusion: Copan Elution Swabs were slightly more sensitive than Starplex II swabs in detecting MRSA carriage. Centrifugation, as used in this study did not enhance the sensitivity of Eswabs. Broth enrichment increased sensitivity, however turn-around time was delayed by a day, it was more labor intensive and the gain in sensitivity was quite modest.

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) has emerged as the predominant nosocomial Gram-positive pathogen worldwide and is common among *S. aureus* isolated in both hospitals and the community. The recent data from National Nosocomial Infection Surveillance (NNIS) System (collects data from more than 300 acute care hospitals) show that the proportion of patients with hospital-acquired MRSA infections in intensive care units reached almost 60% by the end of 2003. This represents an increase of 11% compared with the mean rate of resistance during 1998- 2002. Similarly, the SENTRY study reported a steady increase in methicillin resistance among nosocomial and community-acquired *S. aureus* isolated in the three year period between January 1, 1997 and December 31, 1999. For nosocomial strains, the rate of methicillin resistance increased from 34% to 45%, while for community-acquired strains, it increased from 22% to 28%. Another confounding factor is the emergence of reduced susceptibility to vancomycin among MRSA.

Patient to patient and staff to patient transmission of MRSA is well documented. The bedrock of transmission prevention is hand hygiene. In addition to hand hygiene, the Center for Disease Control and Prevention's Hospital Infection Control Practices Advisory Committee recommends the use of contact precautions to prevent the spread of MRSA. Since many patients colonized with MRSA are asymptomatic and may remain unrecognized, the Society for Healthcare Epidemiology of America has recommended an active surveillance for colonization for antibiotic-resistant organisms including MRSA.

Success of MRSA surveillance is dependent upon accurate and rapid identification of MRSA carriers. Swabs used to collect specimens are made from cotton, rayon, dacron or alginate. Ideally, swabs should be able to absorb sample material and release it easily. Unfortunately in regular swabs, 70% to 82% of sample material stays trapped in the tightly knit fiber matrix. Recently, Copan Diagnostic Inc. marketed nylon flocked swabs. These swabs display unique fluid dynamics. Strong capillary action absorbs the sample where it stays close to the surface and is easily released (70% to 80%).

Objectives:

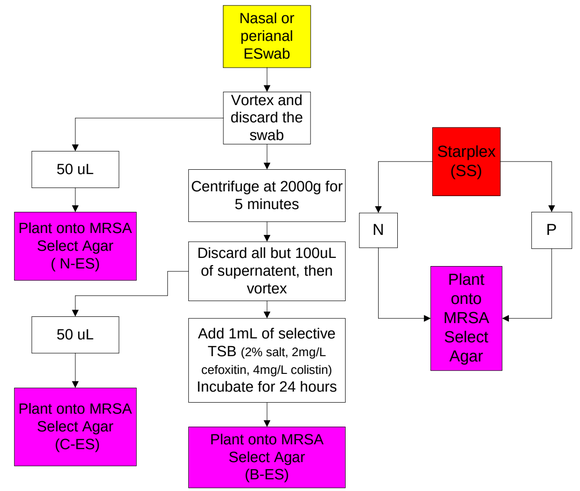
a) To study if the use of flocked swabs will enhance the detection of MRSA from nasal and perianal specimens collected for MRSA screening.

b) To determine the best procedure for processing Copan Elution swabs.

Methods

Patients admitted to two adult Intensive Care Units (ICU) and vascular surgery units were included in the study. Two sets of nasal and perianal swabs were collected and screened for nasal and perianal MRSA colonization. One set was collected using routine StarSwab II (SS) with clear semisolid Amies medium and the other set using Copan Elution Swabs (ES) transported in 500 µL liquid Amies transport medium.

Separate MRSA*Select* (Bio-Rad Laboratories) agar plates were used to inoculate nasal and perianal specimens collected using ES. SS nasal and perianal samples were initially planted onto one MRSA*Select* plate. If MRSA grew by any method, the nasal and perianal SS were reinoculated onto separate MRSA*Select* plates next day. All plates and enrichment broth were incubated at 35º C. MRSA*Select* plates were read after 24 hours of incubation. The identity of suspected MRSA colonies was confirmed by an in-house PCR method which detects the *mecA* and *nuc* genes in addition to a conserved sequence of 16S ribosomal DNA (internal control).



Results

The study included 870 specimens from 363 patients. Thirty-nine patients were colonized with MRSA (a total of 90 specimens). 22 (56.4%) of MRSA-positive patients carried the organism both at nasal and perianal sites, 12 (30.7%) were only nasally and 5 (12.8%) only perianally colonized. SS detected MRSA from 74/90 (82.2%), N-ES and C-ES from 79 (87.7%), and B-ES from 83 (92.2%) specimens. SS, N-ES and C-ES identified 34/39 (87.1%) of MRSA-positive patients. B-ES failed to identify only 2 MRSA-positive patients (92.3%).

Table 1. MRSA colonization by site and overall.

	Nasal n=49 No. (%)	**Perianal** n=41 No. (%)	**Overall** n=90 No. (%)
SS	43 (87.7)	31 (75.6)	74 (82.2)
N-ES	43 (87.7)	36 (87.8)	79 (87.8)
C-ES	43 (87.7)	36 (87.8)	79 (87.8)
B-ES	45 (91.8)	38 (92.6)	83 (92.2)

Discussion

•**Overall:** N-ES and C-ES were not significantly different from SS for the detection of MRSA. However, B-ES (92.2%) detected significantly more MRSA compared to SS (82.2%), p-value 0.04.

•**Perianal:** N-ES, C-ES and B-ES detected more MRSA colonization from perianal specimens than SS. However, only B-ES did so significantly (p-value 0.03). We hypothesize that the number of MRSA organisms present in the perianal area is less than the microbial load in the anterior nares and the ES were better at releasing even these small numbers of organisms onto the inoculation media.

•B-ES was the most sensitive procedure for the detection of MRSA colonization in patients. However, this procedure was more labor intensive and delayed the results by one day due to the overnight incubation step.

•The rise in MRSA nosocomial rates is leading to increased patient surveillance. These clinical factors are directly impacting the capacities of clinical microbiology laboratories to handle the significant additional workload. There has been development of front-end automation for clinical microbiology laboratories and this may be an environment where the Copan ESwab system finds its niche.