Introduction and purpose

Methicillin-resistant *Staphylococcus aureus* (MRSA) represents a harmless colonisation in two thirds of hospitalised patients but causes infection in one third of the patients.\(^1\) Invasive MRSA infections count for 1,000 hospital admissions at UH Leuven. MRSA infections lead to a higher morbidity, mortality, a longer hospital stay and increased hospital costs compared with methicillin-susceptible *S. aureus* infections.\(^1,2\) This warrants the ‘search and destroy’ policy for MRSA apart from standard infection control measures in UH Leuven.\(^3\) This policy implicates active screening for MRSA followed by isolation and decontamination in case of carriership or isolation and treatment in case of infection.\(^4\) A high sensitivity of the swab system used for MRSA screening in theory could be related to the cost benefits of preventing hospital-acquired MRSA infections. Copan recently launched a new flocked swab system. This Copan flocked swab system supplied with liquid Amies medium (Eswab\(^\text{TM}\)) is getting established in a growing number of hospitals. The aim of this study was to compare the performance of the MRSA Eswab\(^\text{TM}\) collection kit with that of the traditional dry swab (Copan) system in terms of Gram staining, total bacterial recovery capacity and MRSA detection.

Methods

Swabs from 70 patients hospitalised at the UH Leuven (Geriatric Medicine, Internal Medicine, Intensive Care Unit Burn Wounds). Nose and perineum were sampled both with two conventional Copan dry swabs and with the MRSA Eswab\(^\text{TM}\) collection kit. Eswab\(^\text{TM}\) and dry swab were alternate used first.

Gram stains

- Dry swab: rolling swab on a slide (Figure 1)
- Eswab\(^\text{TM}\): a drop of the vortexed Amies medium on a slide (Figure 2)

Heat fixation of smears

Gram staining with a Mirastainer\(^\text{®}\) (Merck KGaA)

Recovery capacity

Quantitative swab elution method according to CLSI M40-A\(^1\) recommendations.

The dry swabs were vortexed in 1 mL sterile physiologic saline. Three serial 10-fold dilutions were prepared from each swab medium (saline/Amies). From each dilution, 50 μl was plated with the spiral plater (Spiral Biotech, autoplate 4000) on mannitol-salt agar and MRSA chromogenic agar plate. Plates were incubated at 36°C for 48 hours.

For bacterial counts, the IUL Countermat Flash 4.2 automatic reader system was used.

Statistics: paired t-test and McNemar chi square (GraphPad Prism 4)

Table 1: Gram stain with Eswab\(^\text{TM}\) and dry swab

<table>
<thead>
<tr>
<th>Gram stain</th>
<th>Higher bacterial load/1000X field</th>
<th>Higher No. bacterial morphotypes</th>
<th>More epithelial cells/1000X field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eswab</td>
<td>47/70 (67%)</td>
<td>36/70 (51%)</td>
<td>4/24 (17%)</td>
</tr>
<tr>
<td>Dry swab</td>
<td>5/70 (7%)</td>
<td>6/70 (9%)</td>
<td>3/24 (13%)</td>
</tr>
</tbody>
</table>

Fig. 2

Table 2: Eswab versus dry swab MRSA results

<table>
<thead>
<tr>
<th>MRSA screening result</th>
<th>Dry swab positive</th>
<th>Dry swab negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eswab positive</td>
<td>40</td>
<td>3</td>
</tr>
<tr>
<td>Eswab negative</td>
<td>1</td>
<td>26</td>
</tr>
</tbody>
</table>

Results

Gram stains from the Eswab\(^\text{TM}\) were superior in quality to those from the dry swab system: more bacteria per field, more bacterial morphotypes, and more epithelial cells were noticed on the Eswab\(^\text{TM}\) slide (Graph). This was significantly higher than the recovery with the dry swab (paired t-test of log-transformed data, p<0.01).

The total recovery capacity (CFU/mL) on average was 0.35 log higher with the Eswab\(^\text{TM}\) (Graph). This was significantly higher than the recovery with the dry swab. These savings originate mainly in the avoidance of extended length of hospital stay due to MRSA infection.

Conclusion

Gram stains performed with Eswab\(^\text{TM}\) (Copan) have a better quality than those prepared from the conventional dry Copan swab.

We found a higher recovery capacity of the Eswab\(^\text{TM}\) system compared with the conventional dry swab (Copan) system. This entails a higher chance of detecting MRSA with Eswab\(^\text{TM}\), which was confirmed in this preliminary study. A more extensive study should corroborate this hypothesis. Implementation of the Eswab\(^\text{TM}\) will require a cost-benefit analysis. The extra costs of the Eswab\(^\text{TM}\) should be evaluated against the hospital savings of detecting more MRSA carriers. These savings originate mainly in the avoidance of extended length of hospital stay due to MRSA infection.

Moreover, the liquid based Eswab\(^\text{TM}\) system allows multiple tests (culture, PCR) to be performed with one sample.

References

- Ferrarini et al. Lancet Infect Dis 2008;8:655-65
- Vanka R et al. CMLS 2010 Report No: MRSA, volume 2, Number 18