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Publication Only

Diagnostics, other than Molecular: Diagnostic/laboratory methods (other than molecular)

Comparative evaluation of two swab-based transport systems for the recovery of aerobic and anaerobic bacteria

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Objective: Recovery of viable bacteria from clinical specimens is the principal goal of culture-based techniques in clinical microbiology laboratory. Several limitations of swab-based transport systems exist among which the minuscule volume (0.05-0.1 ml) of entrapped specimens is among the most critical one. However, due to the ease of use and non-invasiveness, swabs are among the most frequently received specimens in the laboratory. The aim of the present study was to compare two swab-based transport systems, namely (i) MWE Sigma Transwab with polyurethane foam-tipped swab and liquid transport medium and (ii) MEUS conventional cotton-tipped swab with Amies gel transport medium for the recovery of aerobic and anaerobic bacteria and to determine the optimal time/temperature of transport for each swab system.

Methods: Standard inoculum of overnight culture of ATCC control strains (n=14) was prepared in accordance to the CLSI M40-A standard resulting in the final amount of inoculating bacteria of approximately 10⁶ CFUs/swab. Swabs were held at room temperature (21-25 °C) and at 4 °C for 15 minutes (time zero), 24h and 48h, before being inoculated on the appropriate aerobic or anaerobic agar plate using 0.1 ml of liquid transport medium for MWE Sigma Transwabs and four-quadrant technique for MEUS conventional cotton swabs. Total recovery of viable bacteria was expressed with a decimal logarithm of recovered CFUs for MWE Sigma Transwabs and semi-quantitatively (1+, 2+, 3+, 4+) for MEUS conventional cotton swabs. Mean values of recovered bacteria were compared for statistical significance using paired sample t-test.

Results: Mean values of recovered bacteria at room temperature were 4.36 (time zero), 3.57 (24h) and 3.00 (48h) for MWE Sigma Transwabs and 2.36 (time zero), 0.91 (24h) and 0.71 (48h) for MEUS conventional cotton swabs. Recoveries at 4 °C were 4.36 (time zero), 4.29 (24h) and 4.14 (48h) for MWE Sigma Transwabs and 2.36 (time zero), 1.79 (24h) and 1.36 (48h) for MEUS conventional cotton swabs. The recovery decrease was statistically significant for all pairwise comparisons except for the MWE Sigma Transwabs transported at 4 °C. Recovery of majority of anaerobes and *N. gonorrhoeae* in conventional transport system was inadequate at room temperature even after 24h. *P. aeruginosa* overgrowth was detected in liquid-based transport systems at room temperature. All tested bacteria retained viability at 4 °C using MWE Sigma Transwabs after 48h.

Conclusion: Viability of transported bacteria declines overtime. Several bacterial groups and species (i.e. anaerobes, *N. gonorrhoeae* and *S. pneumoniae*) are very susceptible to transport at room temperature and culture results for these organisms can be false negative even after 24h. Transport at 4 °C significantly improves bacterial recovery. Novel foam-tipped liquid-based swabs cumulatively performed better than the conventional cotton-tipped agar-based swabs at 24h and 48h both for refrigerated and room temperature transport.