

Effect of Transport Time on the Recovery of Selected Aerobic Bacteria from Two Commercial Swab Systems: Fisherbrand Liquid Transport Swab (Fisher Healthcare, Houston, TX) and Starplex Starswab II (Etobicoke, Ontario, Canada)

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ABSTRACT

Two swab systems, Fisherbrand and Starswab II transport swabs were evaluated to determine the effect of transport time (0, 24, and 48 hours) on the recovery of clinically significant aerobic bacteria: *Neisseria gonorrhoeae* ATCC 43069, *Haemophilus influenzae* ATCC 10211, *Streptococcus pyogenes* ATCC 19615, *Neisseria meningitidis* ATCC13090, *Streptococcus pneumoniae* ATCC 6305, *Pseudomonas aeruginosa* ATCC 27853, and *Enterococcus faecalis* ATCC 51299. Triplicate sets of each organism/device/time point were inoculated with 100 l of bacterial suspensions at a concentration of 1.5×10^6 CFU/mL and placed in swab transport medium. Swabs were held at room temperature for 0, 24, and 48 hours prior to processing. At each time point, swabs were vortexed in 1 mL of sterile saline. Serial 10-fold dilutions were made and 100 l of each dilution were plated in duplicate to trypticase soy agar with 5% sheep blood. Duplicate colony counts were determined for each serial dilution and the results averaged. The recovery rate at 24 and 48 hours was determined as the percentage of growth compared to recovery at time zero. The Fisherbrand swab maintained viability of all seven organisms at all time points. The recovery rate was dramatically reduced (<5%) for *H. influenzae*, *N. gonorrhoeae*, and *S. pneumoniae* at 48 hours. The Starplex swab maintained viability of 6/7 organisms at 24 hours and 5/7 organisms at 48 hours. *Neisseria gonorrhoeae* did not survive on the Starplex swab at 24 or 24 hours. *Haemophilus influenzae* did not survive at 48 hours. Timely transport and processing is crucial to recovery of bacteria from clinical specimens. The Fisherbrand swab is a suitable choice for the recovery of organisms. However, a delay in the processing of swabs significantly affects recovery of fastidious organisms.

INTRODUCTION

Proper collection and transport of specimens to the laboratory is crucial to accurate diagnosis and timely treatment. The recovery of organisms from clinical specimens is dependent upon several variables. Specimen collection, transport media, transport time and temperature have the greatest impact on recovery of clinically significant organisms.

The purpose of the this study was to determine the effect of transport time on the recovery of clinically significant aerobic bacteria using two swab transport systems, Fisherbrand and Starswab II.



Fisherbrand Liquid



Starswab II

MATERIALS AND METHODS

Test strains: *Neisseria gonorrhoeae* ATCC 43069, *Haemophilus influenzae* ATCC 10211, *Streptococcus pyogenes* ATCC 19615, *Neisseria meningitidis* ATCC13090, *Streptococcus pneumoniae* ATCC 6305, *Pseudomonas aeruginosa* ATCC 27853, and *Enterococcus faecalis* ATCC 51299.

Media and supplies

Sterile saline, Fisherbrand® Liquid Stuart Transport Swab (Fisher HealthCare, Houston, TX), Starplex Starswab II (Etobicoke, Ontario, Canada), Trypticase Soy Agar with 5% sheep blood (BBL, Cockeysville, MD), Chocolate II Agar (BBL, Cockeysville, MD).

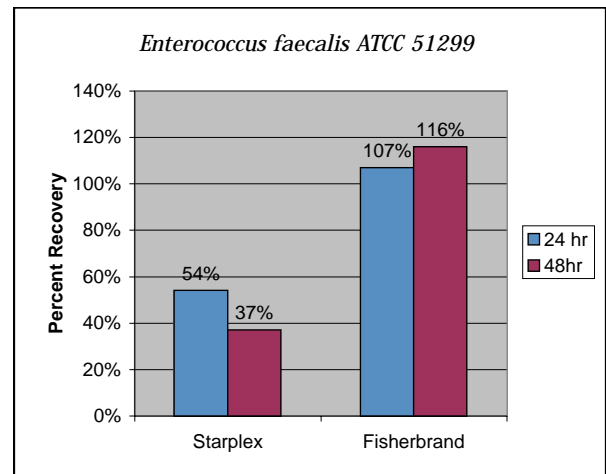
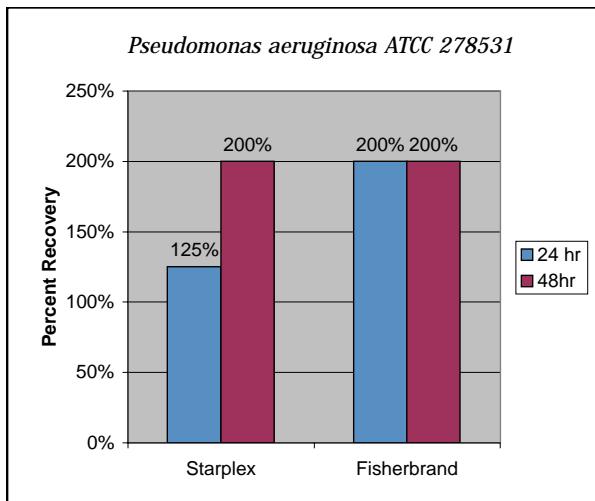
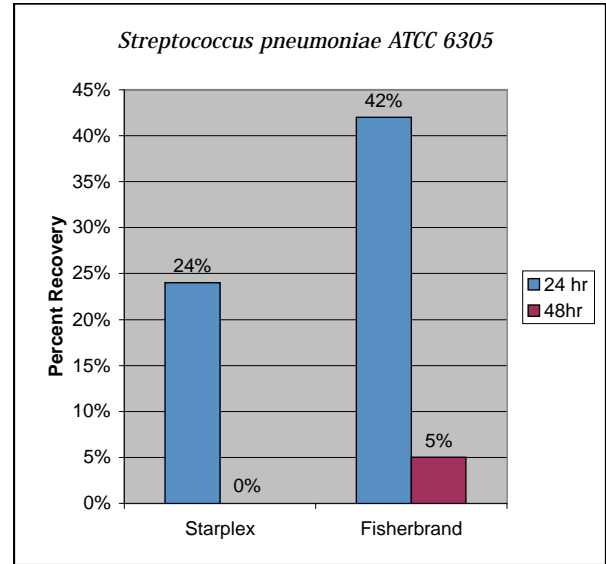
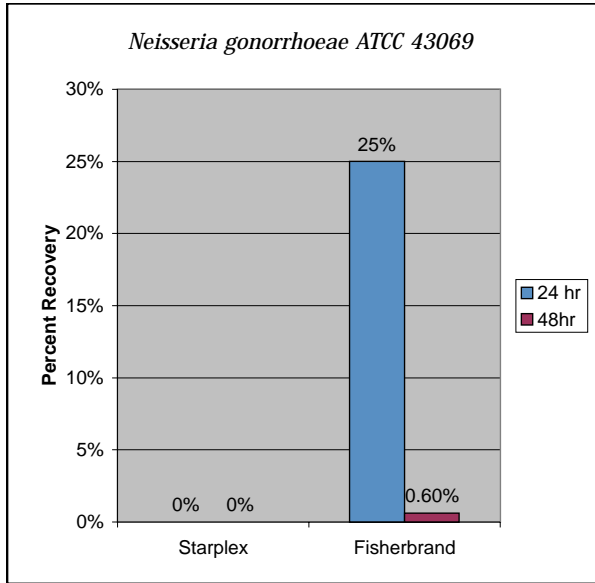
Procedure

1. Each test organism was reconstituted from lyophilized ATCC cultures and subcultured to trypticase soy agar with 5% sheep blood or chocolate agar.
2. A fresh, 18-hour culture of each bacterial strain was used to prepare inoculum suspensions. A 0.5 McFarland Standard (1.5×10^8 CFU/mL) suspension was prepared, in saline, on each bacterium. This suspension was further diluted in 1mL of sterile saline to obtain a working suspension of organism at 10^7 . This suspension was used to inoculate each swab.
2. Each swab brand was tested in triplicate, for each organism, at each time point of 0, 24, and 48 hours. One hundred microliters of the diluted inoculum suspension was seeded directly onto each test swab. The inoculated test swab was placed in its transport carrier and held at room temperature (20-22°C) until the designated processing time.
3. The 0 hour swabs were immediately removed from the transport carrier and placed in 1 mL of sterile saline. Tubes were vortexed for 30 seconds. Excess liquid was expressed from swabs and the swabs were subsequently discarded.
4. One hundred microliters of each vortexed suspension were removed and serially diluted to create 10^{-1} and 10^{-2} dilutions. Plate counts were performed in duplicate by removing 100l of each suspension and transferring to appropriate media.
5. All plates were incubated at 37°C, 5-7% CO₂ for 24-48 hours prior to performing colony counts.
6. The average of the duplicate plates is the final result.
7. The percent recovery at 24 and 48 hours was obtained by comparison of the colony counts at 24 and 48 hours to the colony counts at time zero.

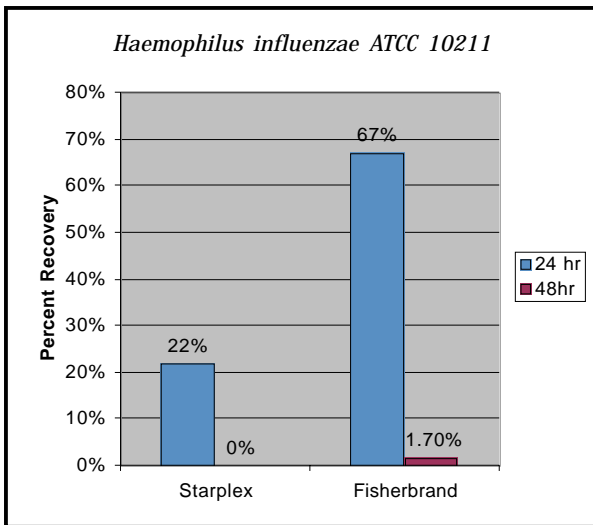
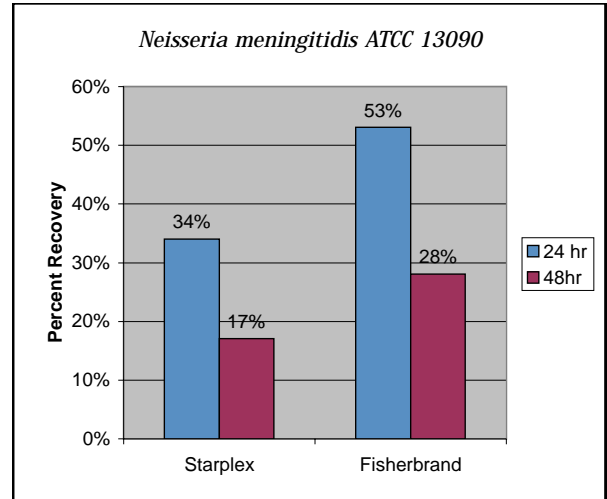
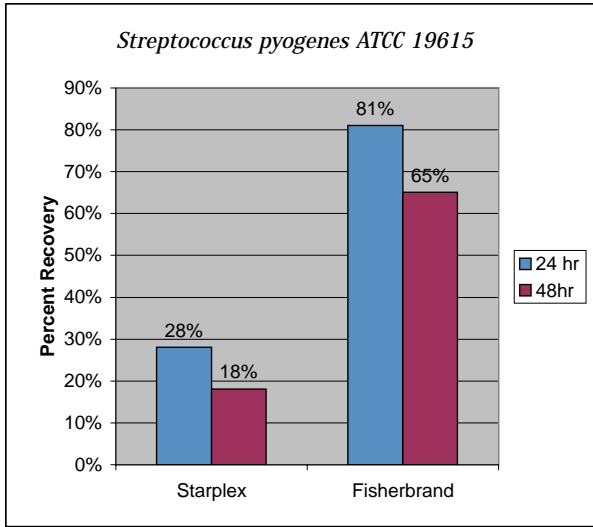
RESULTS

The graphs illustrate the effect of storage/transport time on organism recovery. After 24 hours, the Fisherbrand swab yielded significantly higher recovery rates for *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Neisseria meningitidis*, *Streptococcus pyogenes*, and *Enterococcus faecalis* than the Starplex swab. *Neisseria gonorrhoeae* was not recovered on the Starplex swab at 24 or 48 hours. The percent recovery of *Enterococcus faecalis* and *Pseudomonas aeruginosa* increased to greater than 100% as compared to time zero after 48 hours, suggesting overgrowth.

CHARTED RESULTS



CHARTED RESULTS (continued)



CONCLUSIONS

1. Swabs are not recommended for collection of microbiological specimens. However, they are often submitted due to ease of collection.
2. Delay in specimen processing significantly decreases the recovery of fastidious organisms.
3. Overgrowth of nonfastidious organisms may occur when transport devices are held at ambient temperature for a prolonged period of time.
4. The Fisherbrand swab is a suitable collection/transport device for recovery of fastidious organisms. Although percent recovery was significantly decreased, viable organisms were recovered after 24 and 48 hours at room temperature.

ACKNOWLEDGEMENTS

Copan Diagnostics, Inc. • Corona, CA