

COMPARISON OF BACTERIAL RECOVERY RATES OF FOUR COMMERCIAL SWAB TRANSPORT SYSTEMS

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ABSTRACT

We evaluated four commercial bacterial transport systems for their ability to sustain bacterial viability over a 24 hour period at room temperature. Swabs from Copan with Liquid Amies (COP; Copan Diagnostics, Inc.), Culturette EZ II (EZ; Becton Dickinson Microbiology), Difco Culture Swab with Liquid Stuart (DIF; DIFCO Laboratories), and Starswab with modified Stuart (STAR; Starplex Scientific) were tested using strains of *Staphylococcus aureus* (SA), Group B streptococcus (GBS), Group A streptococcus (GAS), *Streptococcus pneumoniae* (SP), *Neisseria gonorrhoeae* (GC), *Haemophilus influenzae* (HI), *Pseudomonas aeruginosa* (PA), *Escherichia coli* (EC), *Bacteroides fragilis* group (BF), and *Prevotella corporis* (PC). Swabs were inoculated with 100 ul of a 1:100 saline dilution of a 0.5 McFarland standard of each organism, except for EZ swabs which were immersed in the suspension for 20 sec. At 0 hr, 4 hr, 8 hr, and 24 hr, swabs were inoculated directly onto the entire surface of 5% sheep blood agar plates. After 48 hr of incubation the percentage recovery rate for each swab was determined as compared to the 0 hr sample. SA survived well on all swabs, with 80-100% recovery at 24 hr. For GBS, recovery rates at 4 hr were 75% DIF, 80% STAR, 94% COP, and 96% EZ; at 8 hr, 57% DIF, 60% STAR, 70% EZ, and 100% COP; and at 24 hr, 12% STAR, 40% COP, 49% DIF, and 57% EZ. For GAS, recovery rates at 4hr were 78% DIF, 79% STAR, 88% COP, and 100% EZ; at 8 hr, 61% STAR, 77% DIF, 88% EZ, and 100% COP; and at 24 hr, 5% STAR, 42% EZ, 45% DIF, and 53% COP. For SP, recovery rates at 4 hr were 38% STAR, 47% DIF, 53% COP, and 65% EZ; at 8 hr, 17% STAR, 23% DIF, 31% EZ, and 34% COP; and at 24hr, <1% STAR, 3% EZ, 3% DIF, and 8% COP. For GC recovery rates at 4 hr were 0% STAR, 15% DIF, 38% COP, and 51% EZ; at 8 hr 0% STAR, 11% DIF, 19% EZ, and 27% COP; and at 24 hr, 0% STAR, 0% EZ, 1% DIF, and 2% COP. For HI recovery rates at 4 hr were 15% STAR, 35% DIF, 41% EZ, and 70% COP; at 8 hr, <1% STAR, 10% EZ, 44% DIF, and 53% COP; and at 24 hour, 0% STAR, 0% EZ, 12% DIF, and 36% COP. For PA recovery rates at 4 hr were 40% STAR, 44% COP, 48% DIF, and 63% EZ; at 8 hr, 26% STAR, 39% DIF, 46% COP and 53% EZ; and at 24 hr, 17% STAR, 35% EZ, 110% DIF and 146% COP. For EC recovery rates at 4 hr were 72% DIF, 73% STAR, 75% COP, 113% EZ; at 8 hr, 72% STAR, 119% EZ, 175% DIF, and 250% COP; and at 24 hr, 63% STAR, 75% EZ and 350% (COP, DIF). For BF recovery rates were 95-100% at 4 hr and 8 hr. At 24 hr recovery rates were 28% STAR, 95% DIF, 100% COP and 100% EZ. For PC recovery rates at 4 hr were 0% STAR, 2-5% DIF, EZ to 35% COP; at 8 hr, 0% (DIF, STAR), 5% EZ, to 25% COP; and at 24 hr, 0% (DIF, EZ, STAR) to 5% COP. Overall, STAR demonstrated consistently lower recovery rates than the other transport systems.

INTRODUCTION

With the increase in the number of centralized laboratories, microbiology specimens are more frequently being transported from hospitals and clinics to an off-site laboratory for processing. This results in longer transport times, making the bacterial transport system a major factor in the quality of microbiology culture results. Culture Swabs, although not always the optimal means of collecting a quality specimen, are relied on for various specimens including throat, nasopharyngeal, ear, genital, and wounds. The ideal transport system maintains the viability of bacteria in the specimen without promoting bacterial multiplication. However, fastidious organisms such as *Neisseria gonorrhoeae*, *Streptococcus pneumoniae*, and *Haemophilus influenzae* may survive for only a matter of hours after specimens are placed in swab transport systems; whereas, others such as *Pseudomonas* species and enterics may proliferate during transport. The purpose of this study was to evaluate four commercial bacterial transport systems for their ability to sustain bacterial viability over a 24-hour period at room temperature for a variety of organisms.

MATERIALS AND METHODS

Four commercial bacterial transport systems were evaluated:

Copan Venturi Transystem (COP) - Copan Diagnostics, Inc.:

A rayon-tipped swab on a plastic shaft. The plastic transport tube contains a polyurethane sponge impregnated with Liquid Amies transport medium without charcoal.

Culture Swab Transport System (DIF) - Difco Laboratories:

A rayon-tipped swab on a plastic shaft. The plastic transport tube contains a polyurethane sponge impregnated with Liquid Stuart's medium modified.

Culturette EZ (EZ) - Becton Dickinson Microbiology Systems:

A polyurethane-tipped swab on a plastic shaft. The plastic transport tube does not contain a transport medium.

Starswab Culture Collection and Transport System (STAR)

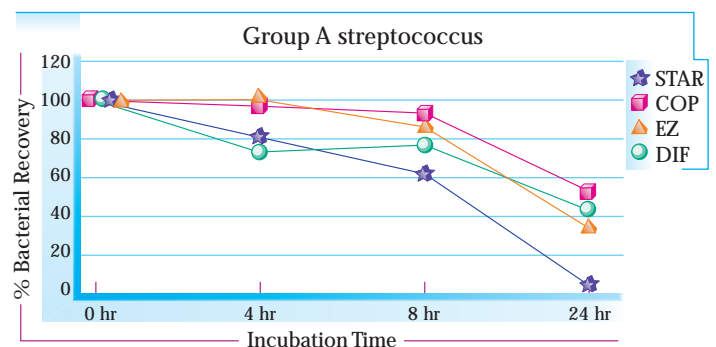
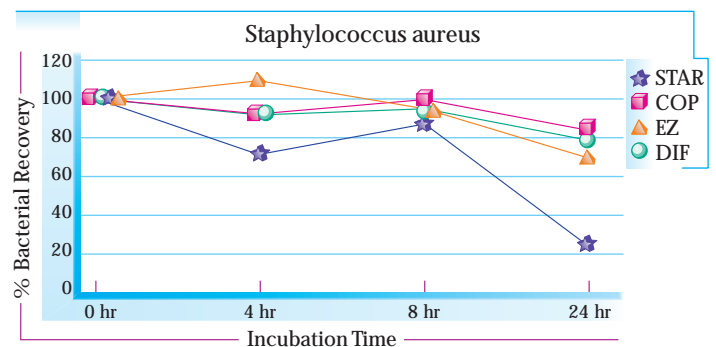
- Starplex Scientific: A rayon-tipped swab on a plastic shaft.

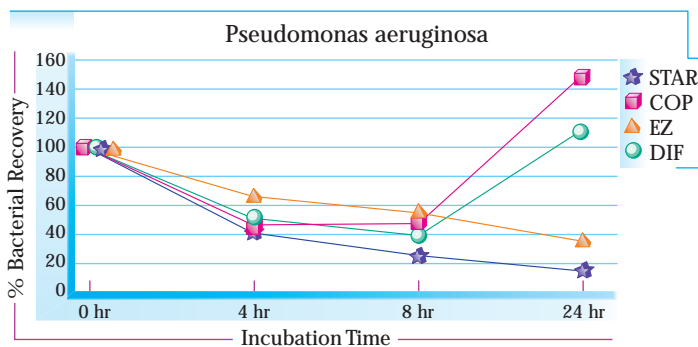
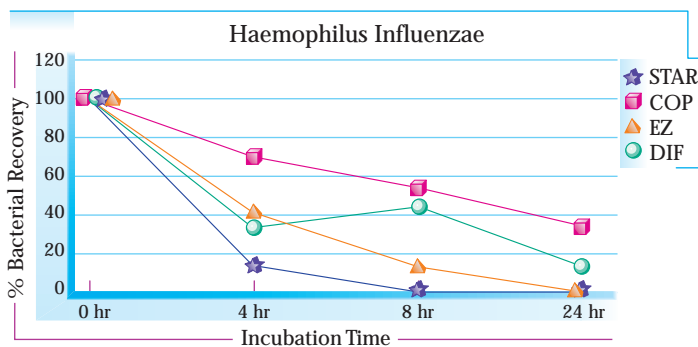
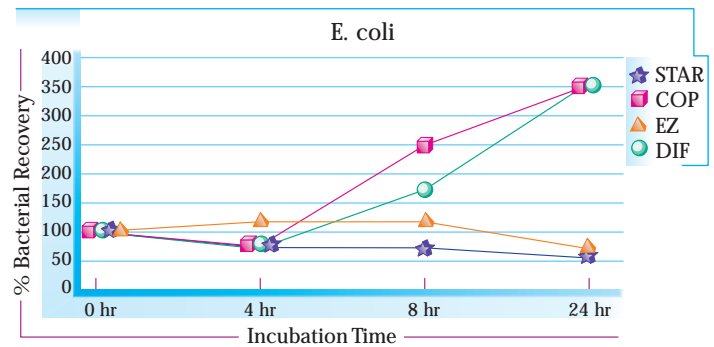
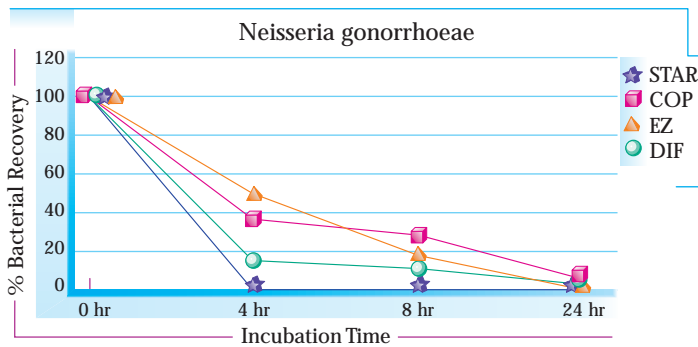
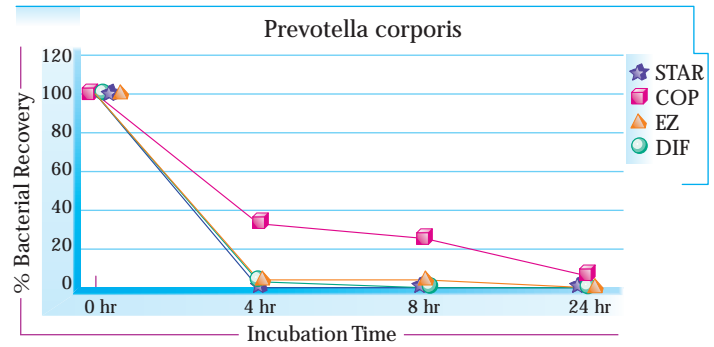
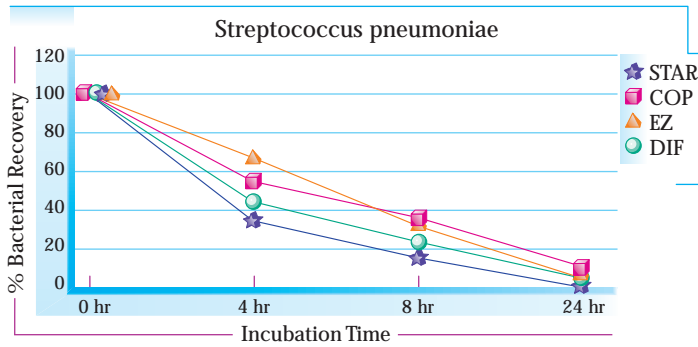
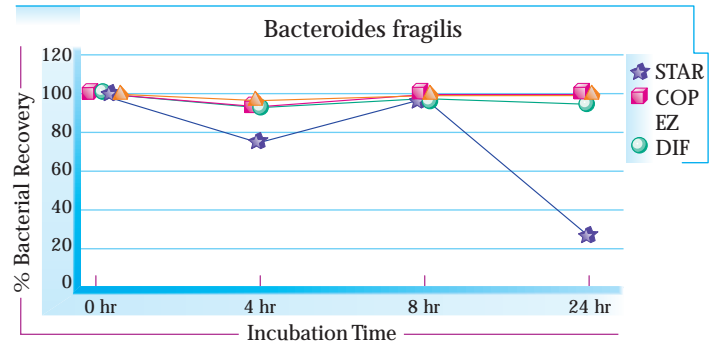
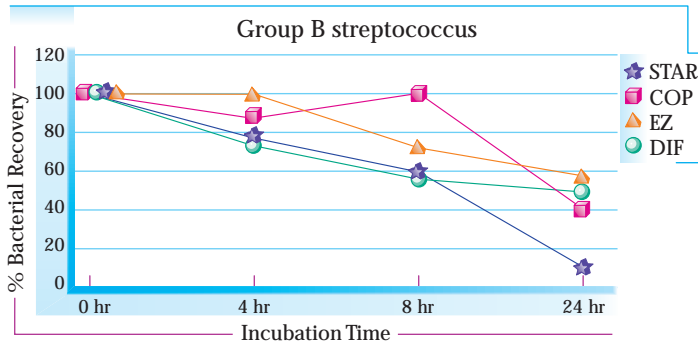
The plastic transport tube contains a cellulose sponge impregnated with Liquid Stuart's medium modified.

Organisms Used In The Study:

<i>Staphylococcus aureus</i>	(3 strains)	<i>Haemophilus influenzae</i>	(3 strains)
Group A streptococcus	(3 strains)	<i>Pseudomonas aeruginosa</i>	(3 strains)
Group B streptococcus	(3 strains)	<i>Bacteroides fragilis</i> group	(2 strains)
<i>Streptococcus pneumoniae</i>	(3 strains)	<i>Prevotella corporis</i>	(1 strain)
<i>Neisseria gonorrhoeae</i>	(3 strains)	<i>Escherichia coli</i>	(1 strain)

Swabs were inoculated with 100 ul of a 1:100 saline dilution of a 0.5 McFarland standard of each organism, except for EZ swabs, which were immersed in the suspension for 20 seconds. The swabs were maintained at room temperature. At 0 hr, 4 hr, 8 hr, and 24 hr, two swabs of each organism were inoculated directly onto the entire surface of 5% sheep blood agar or chocolate agar plates. After 24-48 hr of incubation colony counts were performed, or if there were too many colonies to count, the recovery rate was estimated. The recovery rate for each swab was determined as compared to the average of the 0 hr samples. The average recovery rate was calculated for each strain of each species at each time period. The average recovery rate for each species was calculated and graphed.





SUMMARY

STAR demonstrated consistently lower bacterial recovery rates than the other transport systems. Previous studies have suggested that this is due to toxicity of the cellulose sponge used in this system.

COP and DIF were able to maintain a stable bacterial recovery rate over a 24 hr period for only *S. aureus* and *B. fragilis* group.

EZ was able to maintain a stable bacterial recovery rate over a 24 hr period for only *S. aureus*, *B. fragilis* group, and *E. coli*.

Fastidious organisms such as *S. pneumoniae*, *H. influenzae*, and *N. gonorrhoeae* were not recovered, or had very low recovery rates at 24 hours with all transport systems.

Bacterial recovery rates for *P. aeruginosa* and *E. coli* increased between 8 hr and 24 hour of incubation with COP and EZ. This suggests that these transport systems supported growth of these organisms.

Although *B. fragilis* group isolates survived well in COP, DIF, and EZ, these transport systems are not recommended for anaerobes as demonstrated by the poor recovery rates for *P. corporis*.