



## Survival of Fastidious Bacteria on Specimen Collection Swabs Stored at Room Temperature

J.M. Campos, L. Ruthman, and M. Tshimanga  
Children's National Medical Center, Washington, D.C.

### ABSTRACT

**Purpose:** To compare survival of an ATCC strain and two clinical isolates of *Neisseria gonorrhoeae* (NG), *N meningitidis* (NM), *Streptococcus pneumoniae* (SPN), *S pyogenes* (SPY), and *Haemophilus influenzae* (HI) on swabs from three manufacturers stored at room temperature for increasing lengths of time.

**Method:** We tested the new Becton Dickinson (BD) Liquid Stuart CultureSwab with rayon applicator against similar Starplex (S) and Copan (C) swabs. Triplicate sets of swabs were inoculated with 100 mL of five serial ten-fold saline dilutions of each isolate and then placed into the corresponding manufacturer's modified Stuart's transport medium. Viable counts of bacteria in the swabs were determined after 0, 6, 24, and 48 hours of storage at room temperature.

**Results:** The results revealed comparable survival for all five pathogens on the BD and C swabs. Survival was considerably poorer on the S swabs – viable counts often were an order of magnitude lower than on the BD and C swabs

**Conclusion:** We conclude that the swabs manufactured by BD and C were superior to those manufactured by S in promoting survival of fastidious pathogens during storage at room temperature.

### INTRODUCTION

The pre-analytical phase of laboratory testing is increasingly recognized as the source of most problems that compromise the accuracy and clinical utility of test results. Microbiology cultures are no exception. The care with which specimen collection sites are selected and the techniques with which specimens are obtained have been addressed by numerous studies with an eye toward improving culture yields. Few studies, however, have investigated the effect on specimens of different transport systems.

The culture swab is perhaps the most widely used vehicle for transport of specimens. A common perception is that microorganisms survive equally well on swabs of similar composition from different commercial sources. Likewise, the viability of microorganisms stored in the same-named specimen transport media from different manufacturers often is assumed to be identical.

The purpose of our study was to compare the survival of several fastidious bacteria maintained at room temperature for varying periods of time on similar culture swabs from three manufacturers.

### MATERIALS AND METHODS

#### CULTURE SWABS

The following swabs were evaluated during the study:

BBL™ CultureSwab™ with liquid modified Stuart's transport medium (Becton Dickinson Microbiology Systems, Sparks, MD) (swab manufactured by Copan)

CULTURETTE™ with liquid modified Stuart's transport medium (Becton Dickinson Microbiology Systems, Sparks, MD)

STARswab™ with liquid modified Stuart's transport medium (Starplex Scientific, Etobicoke, Ontario, Canada)

#### STUDY STRAINS

The following stock culture strains were used in the study:

*Haemophilus influenzae* ATCC 35540

*Neisseria gonorrhoeae* ATCC 19424

*Neisseria meningitidis* ATCC 13077

*Streptococcus pneumoniae* ATCC 27336

*Streptococcus pyogenes* ATCC 19615

In addition, two recent clinical isolates of each of the bacteria listed above were included in the study.

#### CULTURE SWABS

The following swabs were evaluated during the study:

BBL™ CultureSwab™ with liquid modified Stuart's transport medium (Becton Dickinson Microbiology Systems, Sparks, MD) (swab manufactured by Copan)

CULTURETTE™ with liquid modified Stuart's transport medium (Becton Dickinson Microbiology Systems, Sparks, MD)

STARswab™ with liquid modified Stuart's transport medium (Starplex Scientific, Etobicoke, Ontario, Canada)

## PROCEDURE

1. Test organism suspensions that matched a McFarland 0.5 turbidity standard were prepared in 0.85% sterile saline from 18 hour cultures growing on 5% sheep blood, chocolate, or GC-LECT agar media.
2. 100 mL samples of each suspension were applied to four sets of three swabs, with each set labeled as 0, 6, 24, or 48 hours, respectively.
3. Each swab was placed into the corresponding manufacturer's modified Stuart's transport medium and stored at room temperature for the labeled number of hours.
4. Upon passage of the designated number of hours, each swab was placed into a tube containing 1 mL of 0.85% sterile saline and vortexed vigorously.
5. Five serial ten-fold dilutions of the vortexed suspensions were prepared in 0.85% sterile saline.
6. 100 mL samples of each dilution were inoculated in duplicate to appropriate culture media using the spread plate technique.
7. Culture media were incubated in an appropriate atmosphere for 48 hours prior to enumeration of colonies.

## RESULTS

Overall, the swabs manufactured by Becton Dickinson and Copan were superior to the Starplex swab in promoting survival during room temperature storage of the fastidious bacteria utilized in this study (Figures 1-15). For all of the bacteria, except *S pyogenes*, the Starplex swab was unable to maintain detectable viability of the test organisms for longer than six hours.

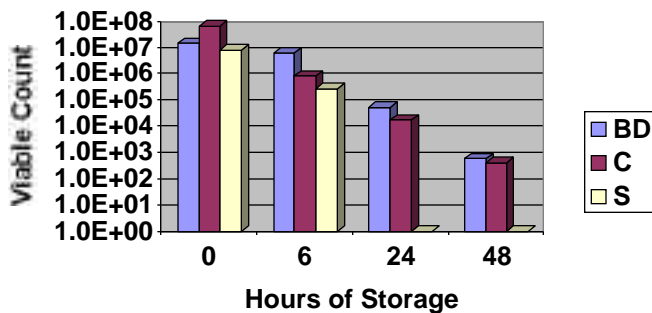
The Copan swab was clearly superior to the others with respect to the three *N meningitidis* strains tested. It was the only swab that yielded viable bacteria after 24 hours storage at room temperature. Although all three swabs maintained viable *S pyogenes* for the entire 48 hours of the study period, the Copan swab demonstrated at least 100-fold higher counts for the three strains tested compared to the other two swabs.

## DISCUSSION

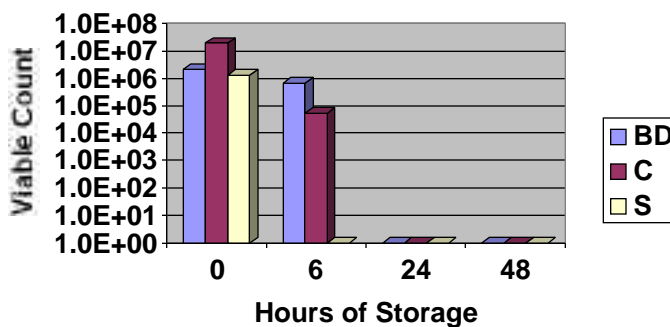
The current study demonstrated the superiority of culture collection swabs manufactured by Becton Dickinson and Copan over a comparable product from Starplex Scientific, at least in terms of enabling survival of fastidious bacteria stored at room temperature.

Survival of microorganisms in specimens stored at room temperature has become increasingly important with the growing trend toward consolidation of microbiology laboratory services. Our data reflected only minor differences between the three manufacturer's swabs over the first six hours of storage. However, major differences were observed for storage over longer periods. Laboratories engaged in outreach programs that require several hours delay between specimen collection and laboratory processing may wish to pay heed to the findings of this study.

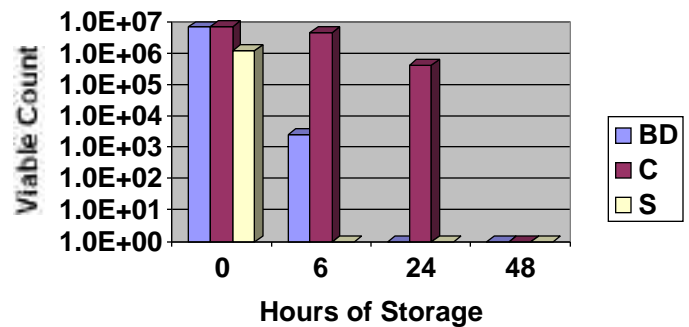
**Figure 1 - *Haemophilus influenzae* ATCC 35540**



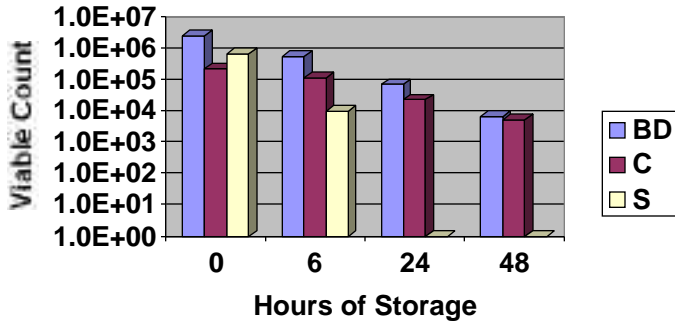
**Figure 2 - *Neisseria gonorrhoeae* ATCC 19424**



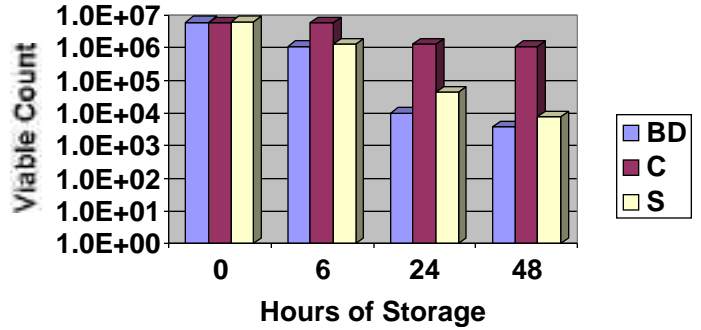
**Figure 3 - *Neisseria meningitidis* ATCC 13077**



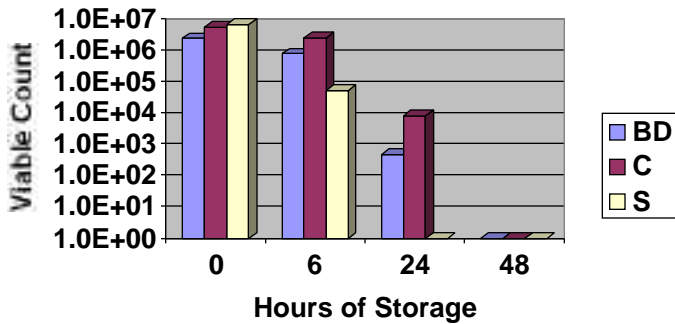
**Figure 4 - *Streptococcus pneumoniae* ATCC 27366**



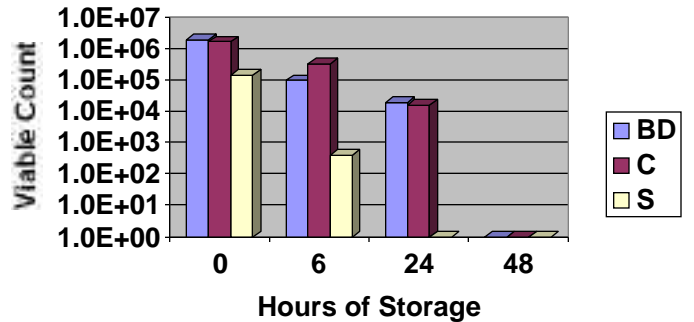
**Figure 5 - *Streptococcus pyogenes* ATCC 19615**



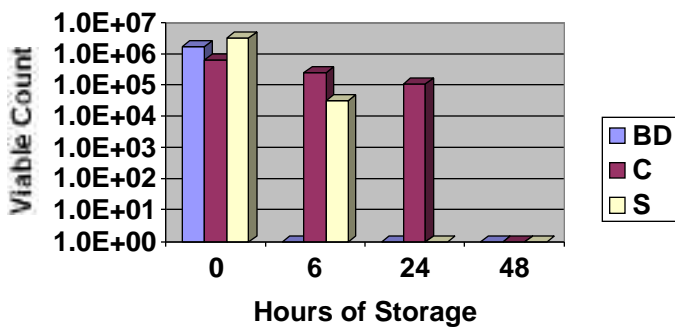
**Figure 6 - *Haemophilus influenzae* Patient Strain #1**



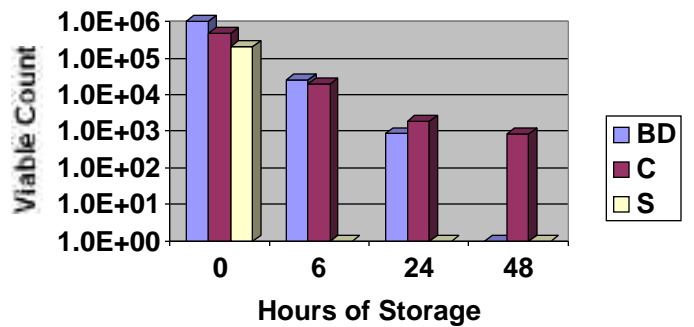
**Figure 7 - *Neisseria gonorrhoeae* Patient Strain #1**



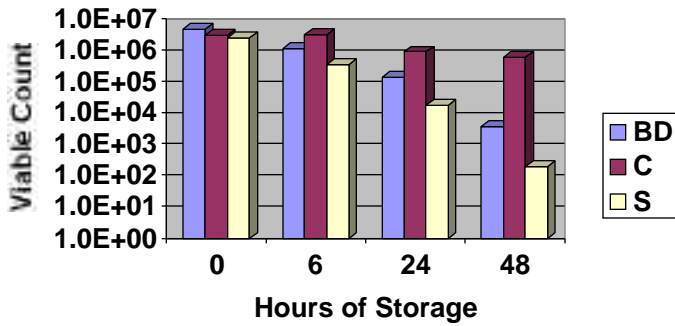
**Figure 8 - *Neisseria meningitidis* Patient Strain #1**



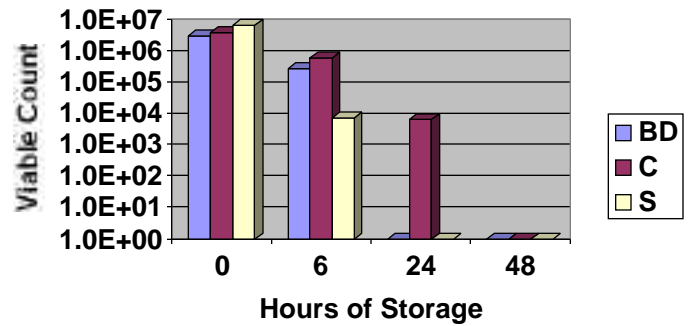
**Figure 9 - *Streptococcus pneumoniae* Patient Strain #1**



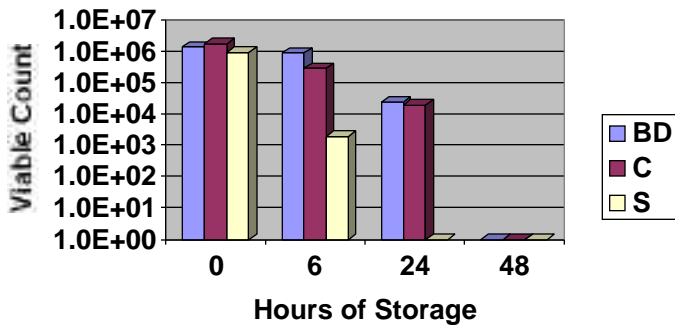
**Figure 10 - *Streptococcus pyogenes* Patient Strain #1**



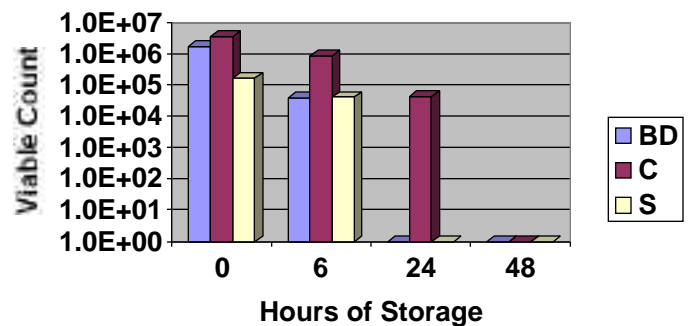
**Figure 11 - *Haemophilus influenzae* Patient Strain #2**



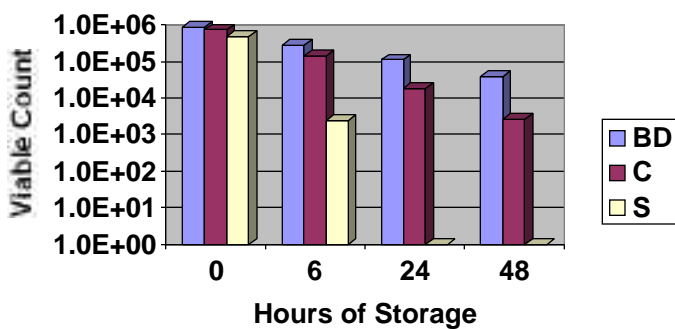
**Figure 12 - *Neisseria gonorrhoeae* Patient Strain #2**



**Figure 13 - *Neisseria meningitidis* Patient Strain #2**



**Figure 14 - *Streptococcus pneumoniae* Patient Strain #2**



**Figure 15 - *Streptococcus pyogenes* Patient Strain #2**

