

# Influence of Storage Conditions on the Performance of Swab Transport Devices as Determined by the Quality Control Guidelines of NCCLS Standard M40

**B. J. Heiter\* and P. P. Bourbeau; Geisinger Medical Center, Danville, PA**

## ABSTRACT

Most studies that have been performed to evaluate swab performance have been conducted with relatively newly produced product. The purpose of this study was to evaluate the performance of swab transport devices that had been stored for prolonged periods of time under varying conditions. We tested 6 different swab transport devices: BD CultureSwab with liquid Stuart's (BD-LS); BD CultureSwab Plus gel with Amies (BD-GA); Starplex with liquid Stuart's (SP-LS); Starplex gel with Amies (SP-GA); NexGen BD CultureSwab with liquid Stuart's (NG-LS); and NexGen BD CultureSwab Plus gel with Amies (NG-GA). All of the swab transport devices utilized have rayon swabs, and none included charcoal. Swabs were stored for 9 months at 3 temperatures: refrigerated (mean temp 5.2°C, range 4.3 to 9.6°C); laboratory (mean temp. 19.6°C, range 15.1 to 23.3°C); and warehouse (mean temp. 25.7°C, range 17.7 to 36.4°C). In addition, for each temperature, some swabs were maintained in the outer (foil) packaging while the remainder were stored in open (foil) packaging, providing a greater opportunity for potential desiccation and perhaps better simulating real life usage of the product.

Two of the QC organisms specified in NCCLS Standard M 40, *St. pneumoniae* ATCC 6305 and *H. influenzae* ATCC 10211, were tested utilizing the swab elution method of M-40. Swabs were inoculated in triplicate for each variable/swab combination that was assessed and held at 4-8°C for 48 hours prior to testing. Colony counts from swabs held for 48 hours were compared with colony counts for the same swabs at time 0. Using the M-40 standard, all swab/variable combinations for both organisms achieved acceptable results. Neither the temperature of storage nor whether the swabs were stored in open or closed outer foil packaging yielded any significant differences in results. Overall, gel based swabs had a higher percentage of recovery than swabs with liquid media. The NG-GA had the best overall recovery for the swabs tested. In conclusion, neither the temperature of storage nor the conditions of storage had any significant impact on the performance of these swab transport devices for these organisms under the conditions that were tested.

## MATERIALS AND METHODS

- Six types of swab transport devices were obtained from the manufacturers: (see Table).
- Samples of each swab type were stored for approximately 9 months at one of three temperature ranges; refrigerated (mean temp 5.2°C, range 4.3 to 9.6°C); laboratory (mean temp. 19.6°C, range 15.1 to 23.3°C); and warehouse (mean temp. 25.7°C, range 17.7 to 36.4°C). For each temperature range, some swabs of each type were maintained in the outer foil packs while the remaining foil packs were opened.
- Two of the QC organisms specified in NCCLS Standard M-40, *St. pneumoniae* ATCC 6305 and *H. influenzae* ATCC 10211, were tested utilizing the swab elution method of M-40. Swabs were inoculated in triplicate for each variable/swab combination that was assessed and held at 4-8°C for 48 hours prior to testing. Colony counts from swabs held for 48 hours were compared with colony counts for the same swabs at time 0.

### Swabs used in Study

BD CultureSwab with liquid Stuarts	BD-LS
BD CultureSwabPlus gel with Amies	BD-GA
Nexgen BD CultureSwab with liquid Stuarts	NG-LS
NexGen BD CultureSwab Plus gel with Amies	NG-GA
Starplex with liquid Stuarts	SP-LS
Starplex gel with Amies	SP-GA

BD-LS, BD-GA, NG-LA, and NG-GA manufactured for Becton Dickinson Microbiology Systems by Copan Diagnostics.

SP-LS and SP-GA manufactured by Starplex

## RESULTS

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- Using the M-40 standard, all swab/variable combinations for both organisms achieved acceptable results.
- Neither the location (temperature) of storage nor whether the packaging was opened or closed had any significant effect on the results.
- For *H. influenzae* ATCC 10211, the ranks of recovery from greatest to least by swab type were as follows: NG-GA, SP-GL, BD-GL, SP-LS, NG-LS, BD-LS.
  - NG-GA was significantly higher than SP-LS (26% higher recovery,  $p=0.048$ )
  - NG-GA was significantly higher than NG-LS (27% higher recovery,  $p=0.031$ )
  - NG-GA was significantly higher than BD-LS (35% higher recovery,  $p=0.001$ )
  - SP-GL was significantly higher than BD-LS (27% higher recovery,  $p=0.031$ )
- For *St. pneumoniae* ATCC 6305, the ranks of recovery from greatest to least by swab type were as follows: NG-GA, BD-GL, NG-LS, SP-GL, BD-LS, SP-LS.
  - NG-GA was significantly higher than BD-GL (41% higher recovery rate,  $p=0.002$ )
  - NG-GA was significantly higher than NG-LS (42% higher recovery rate,  $p=0.002$ )
  - NG-GA was significantly higher than SP-GL (44% higher recovery rate,  $p=0.001$ )
  - NG-GA was significantly higher than BD-LS (68% higher recovery rate,  $p=0.001$ )
  - NG-GA was significantly higher than SP-LS (85% higher recovery rate,  $p=0.001$ )
  - BD-GL was significantly higher than SP-LS (44% higher recovery rate,  $p=0.001$ )
  - NG-LS was significantly higher than SP-LS (44% higher recovery rate,  $p=0.001$ )
  - SP-GL was significantly higher than SP-LS (42% higher recovery rate,  $p=0.002$ )

## SUMMARY

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- Under the conditions utilized in this study, neither the conditions of storage (temp.) nor whether the packaging was open or closed affected product performance.
- Under the conditions utilized in this study, all swab devices satisfied the performance characteristics of NCCLS standard M-40.
- Overall, swabs with gel had a higher recovery than swabs with liquid media.
- Overall, NG-GA outperformed all of the other products tested.