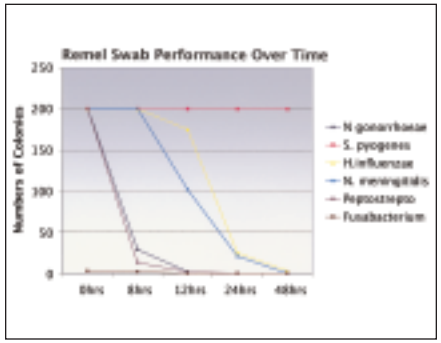
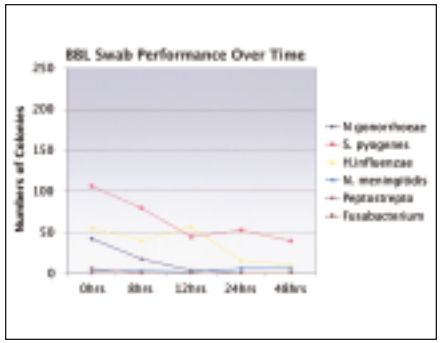
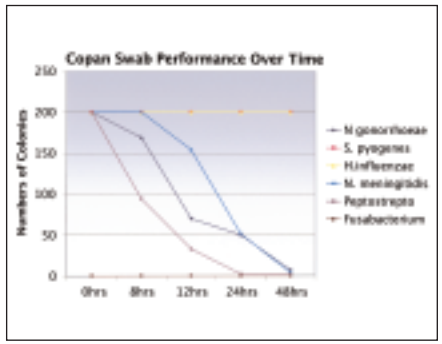
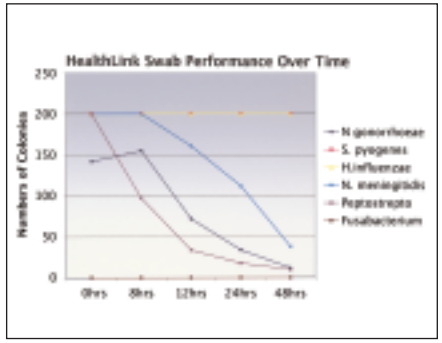
10^5 CFU/ml

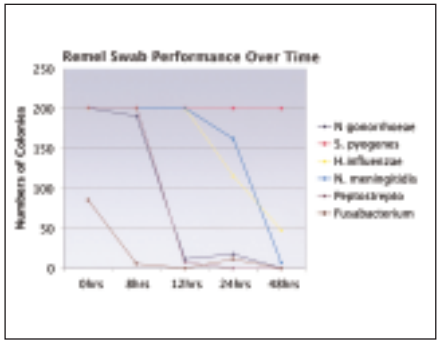


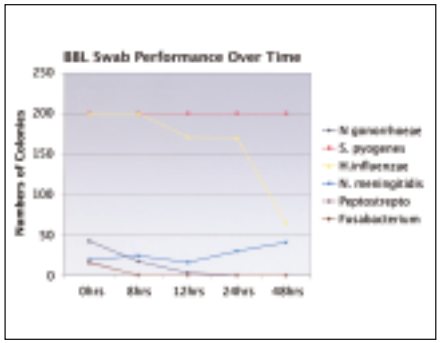


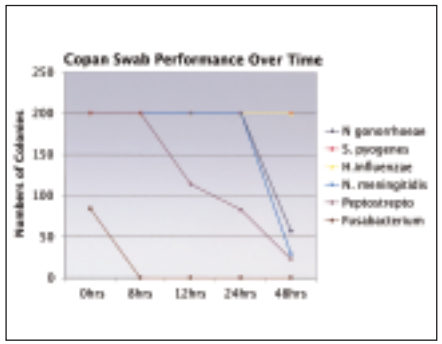


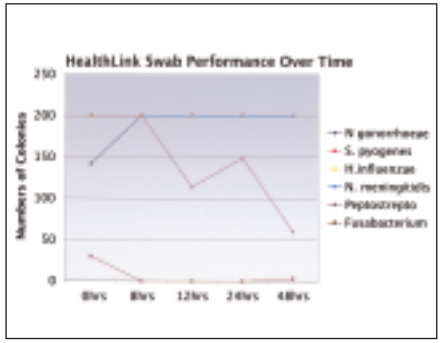


10^6 CFU/ml









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Evaluation of Four Swab Transport Systems:

Recovery of clinically relevant organisms after variable incubation times.

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Abstract

Consistently the clinical Microbiology Laboratory is under criticism for not recovering the suspected organisms from clinical samples. Keeping in mind that specimen collection technique is the key to recovery we tested four swab transport systems:

- Remel BactiSwab®
- BD BBL™ CultureSwab™ Plus
- Copan Venturi Transport Swab
- HealthLink Transporter™

The following fastidious bacteria were used:

- *Neisseria gonorrhoeae*
- *Streptococcus pyogenes*
- *Haemophilus influenzae*
- *Neisseria meningitidis*
- *Peptostreptococcus anaerobius*
- *Fusobacterium nucleatum*

The organisms were tested in duplicate at each point. The swabs were immersed into 10^5 and 10^6 CFU/ml bacterial dilutions and stored at room temperature (24ºC) for 0, 8, 12, 24 and 48 hours prior to standard planting on routine isolation media. Recovery was determined by growth of colonies in the four quadrants of the plate. The average of duplicate values was determined. As expected, recovery depended upon the type of bacterium, the transport system, the concentration, and the time of transport. Although all swabs were effective in maintaining viability of tested organisms, statistically over time, organisms lose their viability. Neisseria gonorrhoeae, Neisseria meningitidis, Haemophilus influenzae and Streptococcus pyogenes seemed to do better when planted on isolation media within 8-12 hours, as for the anaerobes recovery seems better if planted before 8 hours. Although collection systems are important it may be more important to emphasize specimen collection for recovery of suspected organisms from clinical samples.

Introduction

The object of this study was to compare the recovery of viable bacteria in the following swabs at ambient temperature over time. Since specimens are collected and transported to the laboratory at greater time interval than what is recommended we looked at 4 collection and transport swabs over time to enable us to make a good selection on our collection and transport swab. The four swabs are: Remel BactiSwab, (Remel, Lenexa, Kansas), BD BBL CultureSwab Plus, (Becton Dickinson and Company, Sparks MD). Copan Venturi Transport Swab and HealthLink Transporter Swab, (Copan, Corona, California).

Methods

A total of 6 fastidious organisms were included in this study (Table 1). Isolates were subcultured a minimum of 3 times prior to testing to ensure strain purity and stability. An original suspension of a McFarland 0.5 standard (1.5 x 10^8 cfu/ml) was made. From the 0.5 McFarland sample, 10^6 cfu/ml, 10^5 cfu/ml and 10^3 cfu/ml dilutions were made. Each swab tested was placed in a 1ml suspension of the sample dilution and allowed to absorb for at least 1 minute. Excess moisture was expressed before the swab was placed back into its transport device. The swabs were allowed to incubate for 10 minutes at ambient temperature for the zero time count. The swabs were then streaked onto 5% Sheep Blood and Chocolate agar plates and anaerobes were plated on anaerobic blood agar. This was repeated for 8, 12, 24 and 48 hours intervals. Each organism and swab was tested in duplicate. Evaluation of the growth on the plates was based colony counts.

Table 1.

Isolates included in this Study

Neisseria gonorrhoeae	ATCC® 43069
Streptococcus pyogenes	ATCC® 19615
Haemophilus influenzae	ATCC® 10211
Neisseria meningitidis	ATCC® 13090
Peptostreptococcus anaerobius	ATCC® 27337
Fusibacterium nucleatum	ATCC® 25586

Results

■ With the exception of anaerobes, the fastidious organisms were recovered at time zero to 12 hours.

■ After 12 hours there is a decrease in the amount of organisms recovered.

■ There is a significant decrease in the number of colonies recovered over time when a lower organism concentration was used.

■ Remel BactiSwab, performed well for all organisms tested, except anaerobes, up to 24 hours and beyond.

■ BD BBL CultureSwab Plus did not perform well with Neisseria, or the anaerobes.

■ Copan Venturi Transport Swab, performed well with all organisms tested with the exception of Fusobacterium up to 24 hours and beyond 24 hours.

■ HealthLink Transporter Swab, performed as well with all organisms tested with the exception of Fusobacterium up to 24 hours and beyond 24 hours.

■ The Copan, BD, and HealthLink swabs are all manufactured by Copan, yet there is quite a bit of variation in the viability of all tested organisms between these 3 swab types, especially between the BBL swab and the Copan and HealthLink swabs.

Discussion

It is reassuring to know that the swab transport systems on the market perform well In today's clinical microbiology laboratory setting with the most of the aerobic organisms. Although we would like to use one swab for both aerobes and anaerobes I would conclude that when anaerobes are suspected as culprits of infection that we use an anaerobic transport system, but that anaerobes can be recovered in these routine transport swab systems. Numerous studies have been done comparing swab transport systems in recent years, and with no standard method of evaluating swabs, it is difficult to draw general conclusions. I would propose that a standard protocol be developed for the evaluation of culture swabs so that we can truly compare swabs.

I am still of the opinion that many variables are involved in the collection and transport of clinical microbiology specimens. Many considerations must be taken into account in the selection of a swab transport system(s). It cannot be taken for granted that organisms behave in the manner in which they are described in our reference books.

10^5 CFU/ml

Inoculum size CFU/ml		0hrs	8hrs	12hrs	24hrs	48hrs
Remel 1 x 10^5	*N gonorrhoeae*	200	29	2	0	0
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	175	25	3
	N. meningitidis	200	200	102	21	0
	Peptostreptococcus	200	13	2	0	0
	Fusabacterium	3	2	0	0	0
BD 1 X 10^5	*N. gonorrhoeae*	42	17	3	0	0
	S. pyogenes	106	79	44	52	39
	H. influenzae	55	40	56	15	9
	N. meningitidis	3	2	1	5	5
	Peptostreptococcus	0	0	0	0	0
	Fusabacterium	5	0	0	0	0
Copan 1 X 10^5	*N. gonorrhoeae*	200	169	70	50	7
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	200	200	200
	N. meningitidis	200	200	154	51	4
	Peptostreptococcus	200	94	33	2	1
	Fusabacterium	0	0	0	0	0
HealthLink 1 X 10^5	*N gonorrhoeae*	142	155	72	34	12
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	200	200	200
	N. meningitidis	200	200	161	112	38
	Peptostreptococcus	200	97	34	18	10
	Fusabacterium	0	0	0	0	0

10^6 CFU/ml

Inoculum size CFU/ml		0hrs	8hrs	12hrs	24hrs	48hrs
Remel 1 x 10^6	*N. gonorrhoeae*	200	190	12	18	0
	S. pyogenes	200	200	200	200	200
	H. influenzae	200	200	200	116	48
	N. meningitidis	200	200	200	162	7
	Peptostreptococcus	200	200	8	0	0
	Fusabacterium	85	6	0	12	0
BD 1 X 10^6	*N gonorrhoeae*	42	17	3	0	0
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	171	170	65
	N. meningitidis	19	24	16	30	41
	Peptostreptococcus	15	0	0	0	0
	Fusabacterium	16	0	0	0	0
Copan 1 X 10^6	*N. gonorrhoeae*	200	200	200	200	57
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	200	200	200
	N. meningitidis	200	200	200	200	29
	Peptostreptococcus	200	200	114	83	23
	Fusabacterium	84	0	0	0	0
HealthLink 1 X 10^6	*N gonorrhoeae*	142	200	200	200	200
	S. pyogenes	200	200	200	200	200
	H.influenzae	200	200	200	200	200
	N. meningitidis	200	200	200	200	200
	Peptostreptococcus	200	200	114	149	60
	Fusabacterium	30	0	0	0	3