

Group B *Streptococcus* Detection by Carrot Broth/CHROMagar Colorex GBS Agar vs. Conventional Colistin/Nalidixic Acid Agar/Group B Strep Broth Method

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Abstract:

Objective: To evaluate the efficiency of Group B *Streptococcus* detection using the combination of the Hardy Diagnostics StrepB Carrot Broth™ Kit (CB) and the CHROMagar Colorex Strep B Agar (COLOREX – Inverness Medical Canada). The yield and turn-around- times were compared to the conventional method of OXOID Columbia CNA with 5% Sheep Blood (CNA) and PML Microbiologicals Group B Strep Broth (GBSB).

Method: Dual vaginorectal swabs were collected for Group B *Streptococcus* screening. One swab was cultured on CNA/GBSB. The other swab was inoculated into the CB broth. All cultures were incubated at 35°C for 18 hours. The GBSB was subcultured to another CNA and incubated at 35°C for 18 hours. Prolex *Streptococcus* grouping (STREPGP) were performed on any suspicious growth on the CNA. Direct STREPGP were performed on all positive (orange colour) CB broths. All CB broths (orange and colourless) were subcultured to CNA and COLOREX and incubated at 35°C for 18 hours. STREPGP was performed on any suspicious growth on the subcultured CNA and the pink and blue colonies isolated from the COLOREX.

Results: Of the total number of samples tested (391), there were 92 GBS isolated by at least one culture method. CNA/GBSB detected 67 (72.8%) of the positives. CB alone detected 76 (82.6%) of the isolates. CB/CNA detected 89 (96.7%) of the GBS. CB/COLOREX isolated 90 (97.8%). There was one false positive detected from CB.

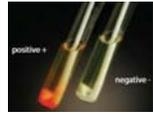
Conclusion: The conventional method of CNA/GBSB missed 27.2% of the isolates. Carrot Broth with either the CNA or Colorex Group B Agar produced a much higher yield (sensitivity of 96.7% and 97.8% respectively). Turnaround time for both of these methods was similar.

Introduction:

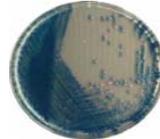
Many women carry Group B *Streptococcus* (*Streptococcus agalactiae*) in their vagina or large bowel. This organism may be transmitted to the neonate as it passes through the birth canal, resulting in potentially devastating systemic disease in the newborn. The Centre for Disease Control (CDC) recommends screening pregnant woman for Group B *Streptococcus* (GBS) carriage at 35-37 weeks gestation by culture of a vaginorectal swab using an enhancement broth. In an effort to improve the detection rate of GBS, a number of new formulations of broth and culture agar have been developed. This study examines the rate of detection using the Hardy Diagnostics StrepB Carrot Broth™ Kit (CB) and the CHROMagar Colorex Strep B Agar (COLOREX – Inverness Medical Canada).

Objective:

To evaluate the efficiency of Group B *Streptococcus* detection using the combination of the Hardy Diagnostics StrepB Carrot Broth™ Kit (CB) and the CHROMagar Colorex Strep B Agar (COLOREX – Inverness Medical Canada). The yield and turn-around- times were compared to the conventional method of OXOID Columbia Colistin/Nalidixic Acid with 5% Sheep Blood (CNA) and PML Microbiologicals Group B Strep Broth (GBSB). The cost differential between the different protocols was also examined.



Hardy Diagnostics StrepB Carrot Broth™



CHROMagar Colorex Strep B Agar

Method:

Dual vaginorectal swabs were collected through the obstetrics clinic from pregnant patients between 35 to 37 weeks of gestation for GBS screening. Both swabs were placed in one Amies transport medium prior to delivery to the laboratory. Figure 1 shows the work up algorithm of this study.

For each specimen, one swab was cultured initially onto CNA and GBSB (for the CNA/GBSB protocol). The other swab was inoculated into a CB broth (for the CB/CNA protocol and the CB/COLOREX protocol). All cultures were incubated at 35°C for 18 hours.

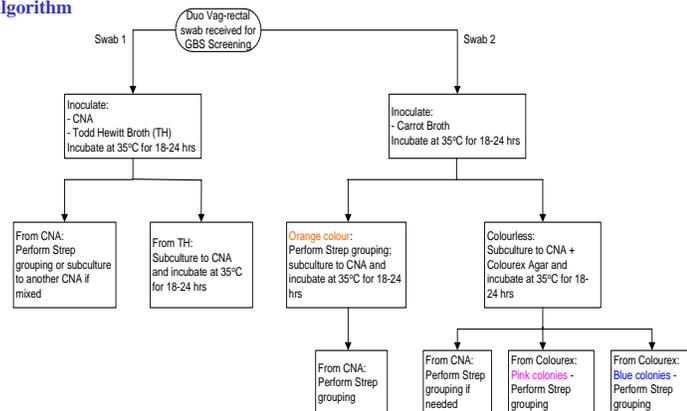
CNA/GBSB protocol:

Following incubation any suspicious colonies from the CNA were tested for Group B *Streptococcus* by bile esculin test (BE) and Prolex *Streptococcus* grouping (STREPGP). The GBSB was subcultured to another CNA and incubated at 35°C for 18 hours. BE test and STREPGP were performed on any suspicious growth on the subcultured CNA.

CB/CNA and CB/COLOREX protocols:

After 18 hours of incubation, direct STREPGP were performed on all positive (orange colour) CB broths. All CB broths (orange and colourless) were subcultured onto CNA and COLOREX and incubated at 35°C for 18 hours. BE and STREPGP was performed on any suspicious growth on the subcultured CNA and the pink and blue colonies isolated from the COLOREX.

Figure 1. Group B *Streptococcus* Detection by Carrot Broth and Colorex GBS Agar vs. Conventional Colistin/Nalidixic Acid with Group B Strep Broth Method – Work up algorithm



The cost of all the media and the subsequent work up materials used were recorded for the calculation of the average cost per test by each method.

Results:

Of the total 391 specimens examined, there were 92 GBS isolated by at least one culture protocol. The CNA/GBSB protocol detected 67 (72.8%) of the positives. There were 76 (82.6%) GBS isolated from the Carrot Broth (orange coloured CB), with three false positive tubes. The CB/CNA protocol detected 89 (96.7%) of GBS while the CB/COLOREX protocol yielded 90 (97.8%) of the GBS isolates.

Table 1. Result Summary

	Total	CNA/GBSBroth	Carrot Broth/CNA	Carrot Broth/COLOREX	Carrot Broth Only
No. of Specimens	391	391	391	391	391
GBS isolated	92	67	89	90	76
Negatives	299	324	302	301	315
Sensitivity		72.8%	96.7%	97.8%	82.6%
Specificity		100%	100%	100%	98.60%

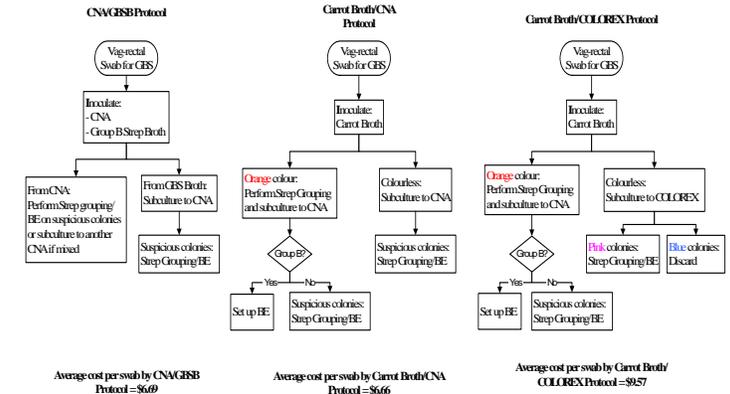
The turnaround times for all protocols were similar (reporting within 48 hours).

The average cost applicable for the different protocols are as follows:

Table 2. Average Group B *Streptococcus* Screen Cost Calculations (for positivity rate of 23.5%)

	Supplies Cost each	Labour Cost each	Total Average Cost each
CNA/GBS Broth Protocol	\$2.92	\$3.77	\$6.69
Carrot Broth/CNA Protocol	\$3.79	\$2.87	\$6.66
Carrot Broth/Colorex Protocol	\$6.01	\$3.56	\$9.57

Figure 2. Cost Calculations of Three Group B *Streptococcus* Screening Workflow Diagram



Discussion:

The conventional method of CNA/GBSB missed 27% of the isolates. The Carrot Broth enhances the isolation of GBS compared to the traditional GBS Broth. We achieved a higher yield of GBS from Carrot Broth with either the CNA or Colorex Group B Agar (sensitivity of 96.7% and 97.8% respectively) with no change in turnaround times.

The Carrot Broth is more costly than the GBS Broth. However, the chromogenic nature of the Carrot Broth readily indicates the possible presence of Group B *Streptococcus* and thus limits the number of *Streptococcus* grouping tests performed which in turn minimizes the cost impact of the Carrot Broth. At the positivity rate of our patient population of 23.5%, the average cost for processing each swab by either the Carrot Broth/CNA protocol or the conventional CNA/GBSB protocol is comparable. The Carrot Broth/Colorex combination costs the most of the three protocols. However, the yield of both the Carrot Broth/Colorex combination and Carrot Broth/CNA combination protocols appears to be comparable.