

Comparison of the BD MAX™ Enteric Bacterial Panel* to routine culture methods for the detection of *Campylobacter*, Shiga toxin-producing *E. coli*, *Salmonella*, and *Shigella* in preserved stool specimens

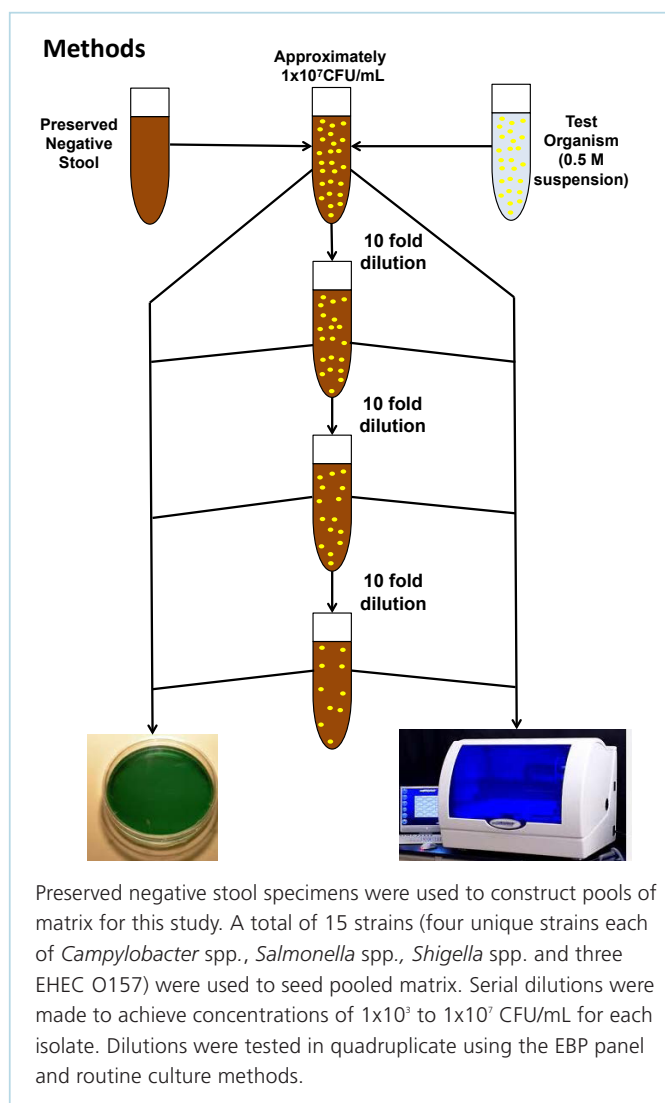
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INTRODUCTION

Enteric illness affects millions of individuals annually in the United States. Culture methods for identification of enteric pathogens are time consuming, labor intensive, and can be relatively insensitive. We evaluated the BD MAX™ Enteric Bacterial Panel (EBP) (BD Diagnostics, Quebec, Canada) for the detection of *Salmonella* spp., *Shigella* spp., Shiga toxin-producing *E. coli*, and *Campylobacter coli* and *jejuni* in preserved stool specimens.

METHODS



*BD MAX™ Enteric Bacterial Panel is not available for sale in the U.S.

Figure 1. *Campylobacter* Data

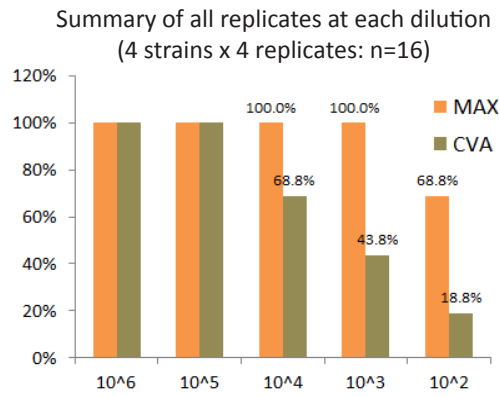


Table 1. *Campylobacter* Data

Strain	Dilution	MAX Results (pos/total)	Culture Results (Campy Blood Agar)
Strain 1	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	1/4
	10 ³	4/4	0/4
	10 ²	3/4	0/4
Strain 2	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	3/4
	10 ³	4/4	3/4
	10 ²	1/4	0/4
Strain 3	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	4/4
	10 ³	4/4	4/4
	10 ²	3/4	3/4
Strain 4	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	3/4
	10 ³	4/4	0/4
	10 ²	4/4	0/4

Figure 2. STEC O157 Data

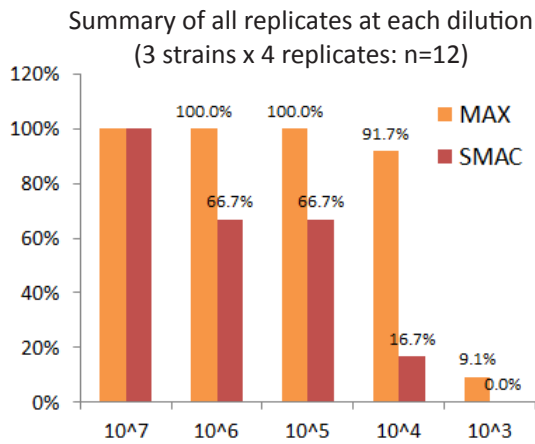


Table 2. STEC Data

Strain	Dilution	MAX Results (pos/total)	Culture Results (SMAC)
Strain 1	10 ⁷	4/4	4/4
	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	1/4
	10 ³	0/4	0/4
Strain 2	10 ⁷	4/4	4/4
	10 ⁶	4/4	0/4
	10 ⁵	4/4	0/4
	10 ⁴	4/4	0/4
	10 ³	0/3	0/4
Strain 3	10 ⁷	4/4	4/4
	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	3/4	1/4
	10 ³	1/4	0/4

Figure 3. *Salmonella* Data

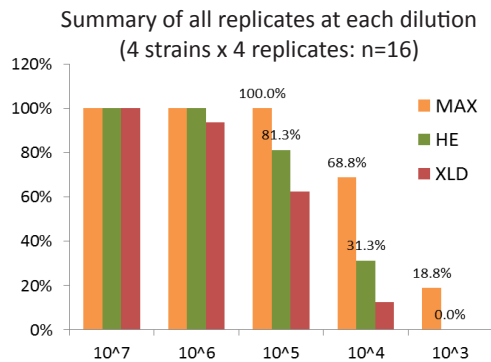
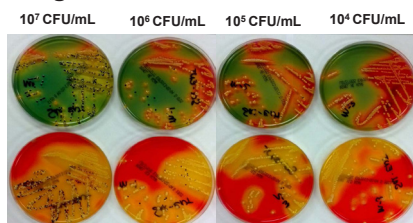


Table 3. *Salmonella* Data

Strain	Dilution	MAX Results (pos/total)	Culture Results (HE)	Culture Results (XLD)
Strain 1	10 ⁷	4/4	4/4	4/4
	10 ⁶	4/4	4/4	4/4
	10 ⁵	4/4	2/4	2/4
	10 ⁴	3/4	0/4	1/4
	10 ³	2/4	0/4	0/4
Strain 2	10 ⁷	4/4	4/4	4/4
	10 ⁶	4/4	4/4	4/4
	10 ⁵	4/4	4/4	4/4
	10 ⁴	3/4	0/4	0/4
	10 ³	1/4	0/4	0/4
Strain 3	10 ⁷	4/4	4/4	4/4
	10 ⁶	4/4	4/4	4/4
	10 ⁵	4/4	4/4	4/4
	10 ⁴	1/4	3/4	1/4
	10 ³	0/4	0/4	0/4
Strain 4	10 ⁷	4/4	4/4	4/4
	10 ⁶	4/4	4/4	3/4
	10 ⁵	4/4	3/4	0/4
	10 ⁴	4/4	2/4	0/4
	10 ³	0/4	0/4	0/4

Image 3.



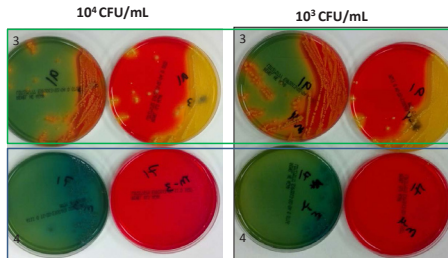
Culture lacks specificity (Image 3). H₂S producing colonies require confirmatory testing to distinguish *Salmonella* from normal flora (*Citrobacter*, *Proteus*, *Providencia*, etc.)

Figure 4. Shigella Data

Summary of all replicates at each dilution
(4 strains x 4 replicates: n=16)



Image 4.



Sensitivity of culture was limited by the amount of background flora (image 4). In specimens containing a low burden of pathogen, background flora could obscure colonies of interest and result in reduced sensitivity. Sensitivity of BD MAX Enteric Bacterial Panel was not effected by background flora.

Table 4. Shigella Data

	MAX Results (pos/total)	Culture Results (HE)	Culture Results (XLD)
Strain 1	10 ⁷	4/4	4/4
	10 ⁶	4/4	4/4
	10 ⁵	4/4	3/4
	10 ⁴	4/4	0/4
Strain 2	10 ⁷	4/4	4/4
	10 ⁶	4/4	3/4
	10 ⁵	4/4	3/4
	10 ⁴	4/4	0/4
Strain 3	10 ⁷	4/4	4/4
	10 ⁶	4/4	3/4
	10 ⁵	4/4	0/4
	10 ⁴	4/4	1/4
Strain 4	10 ⁷	4/4	4/4
	10 ⁶	4/4	4/4
	10 ⁵	4/4	4/4
	10 ⁴	4/4	4/4

Table 5. Summary of BD MAX Sensitivity Compared to Culture

Prepared Stool Samples	10 ⁷ CFU/mL		10 ⁶ CFU/mL		10 ⁵ CFU/mL		10 ⁴ CFU/mL		10 ³ CFU/mL	
	MAX	Culture	MAX	Culture	MAX	Culture	MAX	Culture	MAX	Culture
<i>Campylobacter coli</i> and <i>jejuni</i>	100%	100%	100%	100%	100%	100%	100%	68.8%	100%	43.8%
Shiga toxin-producing <i>E. coli</i>	100%	100%	100%	66.7%	100%	66.7%	91.7%	16.7%	9.1%	0%
<i>Salmonella</i>	100%	100%	100%	100%	100%	81.3%	68.8%	31.3%	18.8%	0%
<i>Shigella</i>	100%	100%	100%	100%	100%	75%	100%	37.5%	81%	25%

CONCLUSIONS

- The BD MAX™ Enteric Bacterial Panel (EBP) exhibited 100% sensitivity at 10⁵ CFU/mL for each tested organism.
- Culture methods required ancillary testing to confirm identification, particularly when trying to distinguish *Salmonella* from H₂S producing normal flora.
- Limit of detection of culture influenced by background stool flora. Limit of detection of BD MAX independent of background stool flora.
- The EBP was more sensitive than culture methods for the detection of enteric pathogens in stool and was able to reliably detect *Salmonella*, *Shigella*, *Campylobacter coli* and *jejuni*, and Shiga toxin-producing *E. coli* at concentrations 1 to 3 log 10 lower than routine culture methods.

Acknowledgement: This study was supported by BD Diagnostics (Sparks, MD).

Disclaimer: BD MAX™ Enteric Bacterial Panel is not available for sale in the U.S.