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COMPARISON OF SIX SELECTIVE MEDIA FOR RECOVERING *SALMONELLA*

YS LIM MSc*, M JEGATHESAN MBBS, MRCPath** AND MY ONG***

Summary

Six selective media, namely xylose lysine desoxycholate agar (XLD), desoxycholate citrate agar (DCA), desoxycholate citrate lactose saccharose agar (DCLS), ***Salmonella – Shigella*** agar (SS), bismuth sulphiteagar (BS)and brilliant green agar (BG), were compared for recovering ***Salmonella*** from pure cultures using the pour plate method. BS agar was superior to allthe other agars in supporting growth of all the five ***Salmonella*** serotypes studied. Except for ***S. blockley,*** BG agar appeared next in superiority to BS agar. The three other media, namely XLD agar, DCA agar and DCLS agar, showed comparable recoveries. SS agar, however, was somewhat inhibitory to these organisms.

INTRODUCTION

Many selective agars have been recommended for the isolation of ***Salmonella.*** Ideally, such agars should possess minimum degree of inhibition of this genus and maximum bacteriostatic action on others. The use of several agars in the detection and isolation of ***Salmonella*** increases the amount of labour and cost. Therefore, it would be advantageous if a single agar could be used for this purpose.

Selective media for ***Salmonella*** vary greatly in providing satisfactory conditions for the growth of its many serotypes. Some of these media tend to inhibit the growth of certain strains while other media support luxuriant growth of other serotypes. Such an observation has been documented.[1,2]

The present study was undertaken to evaluate six commonly used plating media for the recovery of five ***Salmonella*** serotypes from pure cultures using the pour plate method.

MATERIALS AND METHODS

Cultures: The ***Salmonella*** serotypes selected for this study consisted of ***Salmonella paratyphi*** A, ***S. typhimurium, S. blockley, S. typhi*** and ***S. weltevreden.*** They were isolated from clinical specimens in this laboratory.

Media: The six selective media used in this study were xylose lysine desoxycholate agar (XLD; Oxoid), desoxycholate citrate agar (DCA; prepared according to the manufacturer's directions), desoxycholate citrate lactose saccharose agar (DCLS; Difco), ***Salmonella – Shigella*** agar (SS; Difco), bismuth sulphite agar (BS; Difco), and brilliant green agar (BG; Difco).

Recovery study: An *l* &hour broth culture of a single serotype of ***Salmonella*** was diluted 1:1,000,000 in saline. The pour plate method of enumeration was employed, using 0.1 ml of the above dilution. The agar was melted and cooled to 46°C in a water bath before use. All the plates were incubated at 37°C and colonies counted with the aid of a colony counter (Gallenkamp) after 48 and 72 h. Colony counts were transformed into $\log_{10}$ values.

The procedure was repeated for each of the organisms included in this study.

RESULTS

The mean colony counts on the selective agars are shown in Table 1. BS agar supported more luxuriant growth of all these organisms than did any of the other media tested. Except for ***S. blockley,*** the other serotypes of ***Salmonella*** grew rather satisfactorily on BG agar. Recovery of ***Salmonella*** organisms was about equal when they were grown on XLD and DCA agars. ***S. blockley, S. typhi*** and ***S. weltevreden*** grew quite well on DCLS agar, as compared with ***S. paratyphi*** A and ***S typhimurium.*** SS agar, however, was somewhat inhibitory to all of these organisms.

***Bacteriologist, Institute for Medical Research, Kuala Lumpur (Address for reprint requests).**
****Senior Bacteriologist, Institute for Medical Research, Kuala Lumpur.**
*****Medical Laboratory Technologist, Institute for Medical Research. Kuala Lumpur.**

TABLE 1
COMPARISON OF COLONY COUNTS* ON VARIOUS AGARS USING POUR PLATE METHOD

Mean log_{10} colony count/ml on

Organism	Xylose lysine desoxycholate	Desoxycholate citrate	Desoxycholate citrate lactose sucrose	*Salmonella-Shigella*	Bismuth sulphite	Brilliant green
Salmonella paratyphi A	8.68 (8.40–8.88)**	8.69 (8.52–8.81)	[illegible] (8.04–8.64)	8.44 (8.30–8.72)	8.87 (8.71–9.01)	8.72 (8.52–8.97)
S. typhimurium	9.35 (8.90–9.63)	9.21 (8.78–9.49)	9.05 (8.88–9.30)	8.65 (7.90–8.85)	9.52 (8.93–9.87)	9.44 (8.87–9.69)
S. blockley	10.10 (9.53–10.29)	10.11 (9.80–10.37)	9.90 (9.57–10.23)	9.56 (9.39–9.85)	10.23 (9.79–10.48)	9.59 (9.45–9.74)
S. typhi	9.43 (8.90–9.62)	9.43 (8.70–9.67)	9.65 (9.15–9.88)	9.36 (9.08–9.61)	9.96 (9.57–10.14)	9.76 (9.44–10.07)
S. weltevreden	10.01 (9.81–10.34)	9.81 (9.68–10.04)	9.80 (9.71–10.14)	9.61 (9.21–10.06)	10.13 (10.02–10.43)	10.04 (9.76–10.38)

* Counts reported are means of ten plates

** Figures in parenthesis give the range of colony count/ml

DISCUSSION

The results, as shown in Table 1, indicate that the six agars varied in providing satisfactory conditions for the reproduction of the various *Salmonella* serotypes studied. BS agar appeared to be more superior in recovering *Salmonella* than the other agars tested. On the contrary, SS agar consistently inhibited the growth of these bacteria to a certain extent. In a study conducted by Gabis and Silliker[3] to detect *Salmonella* from dried foods and feed ingredients, it was shown that BS agar was consistently better than either BG agar or SS agar, and BG agar was more productive than SS agar. Other investigators working on *Salmonella* have also found BS agar to be superior[4] and SS agar to exhibit lower counts.[5] Our results compare favourably with these findings.

In our study, BG agar was next in superiority to BS agar, except for *S. blockley* where the growth was not as luxuriant as that observed on other agars. When studying the ability of BG, SS, DCLS and BS agars to support the growth of several serotypes of *Salmonella,* Banwart and Ayres[1] found BG agar to be the best. Similarly, Yamamoto *et al*[6] observed that selenite-cystine enrichment with subsequent plating to BG agar gave the most favourable results as compared to BS agar and SS agar in recovering *S. typhimurium* from turkeys. Taylor *et al*[5] described BG agar as the plating medium of choice for *Salmonella* when comparing the efficiency of seven selective agars.

From our data, it can be seen that only very slight variations in the recovery of *Salmonella* was obtained when the three other media, namely XLD agar, DCA agar and DCLS agar were used. These media, unlike BS agar and BG agar, are less selective and inhibitory in isolating *Salmonella* from samples containing mixed flora.

In BS agar, bismuth sulphite acts together with brilliant green as a selective agent. *Salmonella* colonies grown on this medium show a black zone of sulphide staining as well as a metallic sheen which make them very easily recognised. On BG agar, *Salmonella* gives distinguished pink colonies surrounded by bright red medium. Colonies on XLD agar are red in colour with black centres. The colonial characteristics of *Salmonella* on SS, DCA and DCLS agars are identical. They are all non-lactose fermenters forming colourless colonies against a pale pink background of the media; and closely simulate those of the other enteric organisms.

Our findings suggest that BS agar is the plating medium of choice for detecting *Salmonella* because of its ability in supporting excellent growth of these bacteria and the ease in recognition of the colonies. Other media, if considered for use, should not be employed singly so that better chance of isolation will be ensured.

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