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Controlled Evaluation of Bactec Peds Plus/F and Bactec Lytic/10 Anaerobic/F Media for Isolation of Salmonella enterica Serovars Typhi and Paratyphi A from Blood

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We compared anaerobic lytic (AL) and pediatric aerobic resin-containing (Peds Plus/F) blood culture media for the isolation of Salmonella enterica serotype Typhi or Paratyphi A from children. The yields from AL and Peds Plus/F media were the same with equal volumes of blood, but recovery was faster from AL medium than Peds Plus/F medium (10.7 and 16.4 h, respectively) (P < 0.001).
Typhi or Paratyphi A from either bottle or both, since *Salmonella* bacteria are always pathogenic when recovered from blood. *Salmonella* isolates were identified biochemically and were typed with specific antisera (2). Statistical analyses were performed with STATA 9 statistical software; McNemar’s modified chi-square test was used to assess yield and the Wilcoxon matched-pairs signed-rank test for time to detection.

Of 817 paired blood cultures submitted from 817 patients over 12 months, 46 (5.6%) grew pathogens (39 *S. enterica* serotype Typhi and 7 *S. enterica* serotype Paratyphi A) and 36 (4.4%) grew contaminants (including coagulase-negative staphylococci and gram-positive rods). No isolates of *Streptococcus pneumoniae* or *Haemophilus influenzae* were found. The two media were comparable for the recovery of *S. enterica* serotypes Typhi and Paratyphi A (Table 1). The median volume of blood cultured in the PP and AL bottles was 1.86 ml (intraquartile range, 1.53 to 2.33) and 1.96 ml (intraquartile range, 1.67 to 2.45), respectively. All isolates were recovered within <5 ml of blood (maximum of 4.90 ml in the PP and 4.12 ml in the AL), so Table 1 represents comparable volumes within 50%. If only sets that are within 20% are considered to be equal volumes, 17 isolates grew in both bottles and 2 each in PP or AL only. When recovered from both bottles, the median times to detection of *S. enterica* serotype Typhi and *S. enterica* serotype Paratyphi A were 16.4 h (interquartile range, 11.8 to 22 h) for PP and 10.7 h (interquartile range, 8.8 to 16 h) for AL, respectively (P < 0.001). Of the 10 patients who had both bone marrow and blood cultures, 2 had *S. enterica* serotype Typhi isolated only from bone marrow and not from blood in either PP or AL bottles; the other 8 were negative. Multi-drug (ampicillin, chloramphenicol, and co-trimoxazole) resistance was found in 15 of 39 (38.5%) isolates of *Salmonella enterica* serotype Typhi and none of the 7 isolates of *S. enterica* serotype Paratyphi A. All isolates were susceptible to ceftriaxone and ciprofloxacin by current CLSI interpretive criteria (3), although resistance to nalidixic acid was found in 18 (46.2%) *S. enterica* serotype Typhi isolates and 2 (28.6%) *S. enterica* serotype Paratyphi A isolates.

In conclusion, we found that *S. enterica* serotypes Typhi and Paratyphi A were the most frequent isolates from blood in Pakistani children with suspected enteric fever, which suggests that our clinical criteria for enrollment were specific for enteric fever in this population. We found that the AL bottle was not superior to PP for the recovery of *S. enterica* serotypes Typhi and Paratyphi A, although it achieved results faster. Because we enriched our sample with those suspected clinically to have enteric fever and enrolled at two hospitals during 12 months, our sample size for *S. enterica* serotype Typhi was larger than is usually reported for any one organism in a study designed to compare two different media (15). One must choose a medium formulation based on the total spectrum of pediatric bloodstream pathogens in a population. Since the anaerobic lytic medium and other lytic media that contain saponin have been shown to have reduced recovery of *S. pneumoniae* (4), and pneumococci do cause pediatric bacteremia in Pakistan (8), we conclude that PP would be a better overall choice for the evaluation of pediatric bacteremia in Pakistan, as it is in North America.

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**REFERENCES**


**TABLE 1. Comparative yields of *Salmonella* from PP and AL blood culture bottles**

<table>
<thead>
<tr>
<th><em>Salmonella enterica</em> serovar</th>
<th>No. of isolates detected by:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Both bottles</td>
<td>PP bottles only</td>
<td>AL bottles only</td>
</tr>
<tr>
<td>Typhi</td>
<td>30</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Paratyphi A</td>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Both</td>
<td>36</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

*NS, not significant (P > 0.05).*