Xylose-Lysine Deoxycholate Agar (XLD Agar) Plate

**Intended use**
Recommended for the isolation and enumeration of *Salmonella Typhi* and other *Salmonella* species.

**Composition**

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Gms / Litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yeast extract</td>
<td>3.000</td>
</tr>
<tr>
<td>L-Lysine</td>
<td>5.000</td>
</tr>
<tr>
<td>Lactose</td>
<td>7.500</td>
</tr>
<tr>
<td>Sucrose</td>
<td>7.500</td>
</tr>
<tr>
<td>Xylose</td>
<td>3.500</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>5.000</td>
</tr>
<tr>
<td>Sodium deoxycholate</td>
<td>2.500</td>
</tr>
<tr>
<td>Sodium thiosulphate</td>
<td>6.800</td>
</tr>
<tr>
<td>Ferric ammonium citrate</td>
<td>0.800</td>
</tr>
<tr>
<td>Phenol red</td>
<td>0.080</td>
</tr>
<tr>
<td>Agar</td>
<td>15.000</td>
</tr>
<tr>
<td>Final pH (at 25°C)</td>
<td>7.4±0.2</td>
</tr>
</tbody>
</table>

**Formula adjusted, standardized to suit performance parameters**

**Directions**
Either streak, inoculate or surface spread the test inoculum (50-100 CFU) aseptically on the plate.

Note: Slight precipitation in the medium may occur, which is inherent property of the medium, and does not affect the performance of the medium.

**Principle And Interpretation**
XLD Agar has been recommended for the identification of *Enterobacteriaceae* (3) and for the microbiological testing. XLD Agar was formulated by Taylor (13-17) for the isolation and differentiation of enteric pathogens including *Salmonella Typhi* from other *Salmonella* species of foods, water and dairy products (2,12,20,21). XLD Agar exhibits increased selectivity and sensitivity as compared to other plating media e.g. SS Agar (M108), EMB Agar (M022) and Bismuth Sulphite Agar (M027) (14,16,18, and 4,9,11,19). The media formulation does not allow the overgrowth of other organisms over *Salmonella* and *Shigella* (7). Samples suspected of containing enteric pathogens, along with other mixed flora, are initially enriched in Modified Semisolid RV Medium Base (M1482) (1).

The medium contains yeast extract, which provides nitrogen and vitamins required for growth. Though the sugars xylose, lactose and sucrose provide sources of fermentable carbohydrates, xylose is mainly incorporated into the medium since it is not fermented by Shigellae but practically by all enterics. This helps in the differentiation of *Shigella* species. Sodium chloride maintains the osmotic balance of the medium. Lysine is included to differentiate the *Salmonella* group from the non-pathogens. Salmonellae rapidly ferment xylose and exhaust the supply. Subsequently lysine is decarboxylated by the enzyme lysine decarboxylase to form amines with reversion to an alkaline pH that mimics the *Shigella* reaction. However, to prevent this reaction by lysine-positive coliforms, lactose and sucrose are added to produce acid in excess. Degradation of xylose, lactose and sucrose to acid causes phenol red indicator to change its colour to yellow. Bacteria that decarboxylate lysine to cadaverine can be recognized by the appearance of a red colouration around the colonies due to an increase in pH. These reactions can proceed simultaneously or successively, and this may cause the pH indicator to exhibit various shades of colour or it may change its colour from yellow to red on prolonged incubation. To add to the differentiating ability of the formulation, an H$_2$S indicator system, consisting of sodium thiosulphate and ferric ammonium citrate, is included for the visualization of hydrogen sulphide produced, resulting in the formation of colonies with black centers. The non-pathogenic H$_2$S producers do not decarboxylate lysine; therefore, the acid reaction produced by them prevents the blackening of the colonies (13).
XLD Agar is both selective and differential medium. It utilizes sodium deoxycholate as the selective agent and therefore it is inhibitory to gram-positive microorganisms.

**Type of specimen**
Clinical samples - Blood, faeces; Food and dairy samples; water samples.

**Specimen Collection and Handling**
For clinical samples follow appropriate techniques for handling specimens as per established guidelines (6,8).
For food and dairy samples, follow appropriate techniques for sample collection and processing as per guidelines (12,20).
For water samples, follow appropriate techniques for sample collection, processing as per guidelines and local standards (15).
After use, contaminated materials must be sterilized by autoclaving before discarding.

**Warning and Precautions**
In Vitro diagnostic Use. Read the label before opening the pack. Wear protective gloves/protective clothing/eye protection/ face protection. Follow good microbiological lab practices while handling specimens and culture. Standard precautions as per established guidelines should be followed while handling clinical specimens. Safety guidelines may be referred in individual safety data sheets.

**Limitations**
1. Slight precipitation in the medium may occur, which is inherent property of the medium, and does not affect the performance of the medium.
2. Some *Proteus* strains may give red to yellow colouration with most colonies developing black centers, giving rise to false positive reactions.
3. Non-enterics like *Pseudomonas* and *Providencia* may exhibit red colonies.
4. *S. Paratyphi A, S.Choleraesuis, S. Pullorum and S. Gallinarum* may form red colonies without H2S, thus resembling *Shigella* species.
5. Individual organisms differ in their growth requirement and may show variable growth patterns on the medium.
6. Each lot of the medium has been tested for the organisms specified on the COA. It is recommended to users to validate the medium for any specific microorganism other than mentioned in the COA based on the user’s unique requirement.
7. It is recommended to store the plates at 24-30°C to avoid minimum condensation.

**Performance and Evaluation**
Performance of the medium is expected when used as per the direction on the label within the expiry period when stored at recommended temperature.

**Quality Control**

**Appearance**
Sterile Xylose-Lysine Deoxycholate Agar (XLD Agar) in 90 mm disposable plates.

**Colour of medium**
Red coloured medium

**Quantity of medium**
25 ml of medium in 90 mm disposable plates.

**pH**
7.20-7.60

**Sterility Test**
Passes release criteria

**Cultural Response**
Cultural response was observed after an incubation at 35-37°C for 18-72 hours. Recovery rate is considered as 100% for bacteria growth on Soyabean Casein Digest Agar.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Inoculum (CFU)</th>
<th>Growth</th>
<th>Recovery</th>
<th>Colour of Colony</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Salmonella</em> Typhimurium ATCC 14028 (00031*)</td>
<td>50 -100</td>
<td>luxuriant</td>
<td>&gt;=50 %</td>
<td>red with black centres</td>
</tr>
</tbody>
</table>

Please refer disclaimer Overleaf.
<table>
<thead>
<tr>
<th>Organism</th>
<th>Dilution Range</th>
<th>Outcome</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Salmonella Abony NCTC</em> 6017 (00029*)</td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red with black centres</td>
</tr>
<tr>
<td><em>Escherichia coli ATCC 8739 (00012</em>)*</td>
<td>50 -100</td>
<td>fair</td>
<td>20 -30 %</td>
<td>yellow</td>
</tr>
<tr>
<td><em>Escherichia coli ATCC 25922 (00013</em>)*</td>
<td>50 -100</td>
<td>fair</td>
<td>20 -30 %</td>
<td>yellow</td>
</tr>
<tr>
<td><em>Escherichia coli NCTC 9002 50 -100</em></td>
<td>fair</td>
<td>20 -30 %</td>
<td>yellow</td>
<td></td>
</tr>
<tr>
<td><em>Proteus vulgaris ATCC 13315</em></td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>grey with black centres</td>
</tr>
<tr>
<td><em>Salmonella Paratyphi A ATCC 9150</em></td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red</td>
</tr>
<tr>
<td><em>Salmonella Paratyphi B ATCC 8759</em></td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red with black centres</td>
</tr>
<tr>
<td><em>Salmonella Enteritidis ATCC 50 -100</em></td>
<td>13076 (00030*)*</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red with black centres</td>
</tr>
<tr>
<td><em>Salmonella Typhi ATCC 6539</em></td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red with black centres</td>
</tr>
<tr>
<td><em>Shigella dysenteriae ATCC 13313</em></td>
<td>50 -100</td>
<td>good-luxuriant</td>
<td>&gt;=50 %</td>
<td>red</td>
</tr>
<tr>
<td><em>Shigella flexneri ATCC 12022 (00126</em>)*</td>
<td>50 -100</td>
<td>fair-good</td>
<td>30 -40 %</td>
<td>red</td>
</tr>
<tr>
<td><em>Shigella sonnei ATCC 25931 50 -100</em></td>
<td>fair-good</td>
<td>30 -40 %</td>
<td>red</td>
<td></td>
</tr>
<tr>
<td><em># Klebsiella aerogenes ATCC 13048</em></td>
<td>50 -100</td>
<td>fair</td>
<td>20 -30 %</td>
<td>yellow</td>
</tr>
<tr>
<td><em>Enterobacter cloacae ATCC 13047 (00083</em>)*</td>
<td>50 -100</td>
<td>fair</td>
<td>20 -30 %</td>
<td>yellow</td>
</tr>
<tr>
<td><em>Staphylococcus aureus subsp. aureus ATCC 25923 (00034</em>)*</td>
<td>&gt;=10⁴</td>
<td>inhibited</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus aureus subsp. aureus ATCC 26538 (00032</em>)*</td>
<td>&gt;=10⁴</td>
<td>inhibited</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td><em>Enterococcus faecalis ATCC 29212 (00087</em>)*</td>
<td>&gt;=10⁴</td>
<td>inhibited</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

Key: (*) Corresponding WDCM numbers.

**Storage and Shelf Life**
On receipt store between 20-30°C Use before expiry date on the label. Product performance is best if used within stated expiry period.

**Disposal**
User must ensure safe disposal by autoclaving and/or incineration of used or unusable preparations of this product. Follow established laboratory procedures in disposing of infectious materials and material that comes into contact with clinical sample must be decontaminated and disposed of in accordance with current laboratory techniques (6,8).

**Reference**

*Please refer disclaimer Overleaf.*

In vitro diagnostic medical device

CE Marking

Storage temperature

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