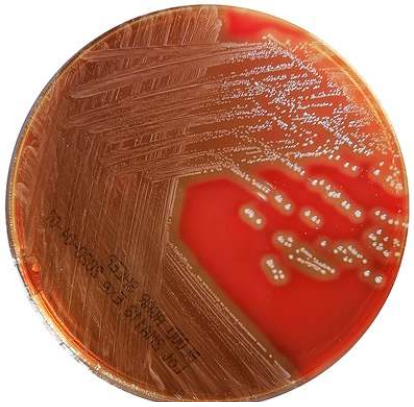
INSTRUCTIONS FOR USE

TRYPTIC SOY BLOOD AGAR BASE

Dehydrated culture medium



Tryptic Soy Blood Agar Base supplemented with sheep blood: *Streptococcus pyogenes*

1 - INTENDED USE

In vitro diagnostic. Non selective, general purpose medium to be used with defibrinated animal blood, for the isolation and cultivation of fastidious and non-fastidious microorganisms from clinical specimens and other materials and for determination of their haemolytic properties.

2 - COMPOSITION -TYPICAL FORMULA * (AFTER RECONSTITUTION WITH 1 L OF WATER)

Pancreatic digest of casein	14.5 g
Soy peptone	5.0 g
Sodium chloride	5.0 g
Agar	14.0 g
Growth factors	1.5 g

*the formula may be adjusted and/or supplemented to meet the required performances criteria.

3 - PRINCIPLE OF THE METHOD AND EXPLANATION OF THE PROCEDURE

The history of blood agar is uncertain. The inclusion of blood as a nutritive supplement in culture media may pre-date the use of agar[1]; in their 1903 Manual of Bacteriology, Muir and Ritchie[2] list its inclusion before they discuss “agar-agar” as a replacement for gelatine as a solidifying agent.[2] The term "blood agar", as we know it today, generally refers to an enriched base medium to which defibrinated mammalian blood has been added.

Tryptic Soy Blood Agar Base is a general purpose medium, to be used with defibrinated sheep blood, to grow fastidious and non-fastidious organisms and to differentiate bacteria based on their haemolytic properties.

Tryptic Soy Blood Agar Base is prepared with selected casein and soy peptones for providing carbon, nitrogen and trace elements for bacteria, for improving the haemolytic reactions and it is supplemented with growth factors to achieve a bigger and faster growth of fastidious microorganisms. Sodium chloride maintains the osmotic balance. The addition of animal blood enables the determination of bacterial haemolytic properties, as an useful tool for the orientation of bacterial identification.

Tryptic Soy Blood Agar Base supplemented with sheep blood is useful for performing the CAMP (Christie-Atkins-Munch-Petersen) test for presumptive identification of *Streptococcus agalactiae* and for use with optochin and bacitracin discs for presumptive identification of group A streptococci.

4- DIRECTIONS FOR MEDIUM PREPARATION

Suspend 40 g in 1000 mL of cold purified water. Heat to boiling with frequent agitation, sterilize by autoclaving at 121°C for 15 minutes. Cool to 47-50 °C, and add 5-7% of sterile defibrinated sheep or horse blood. Mix well and pour into sterile Petri dishes.

5 - PHYSICAL CHARACTERISTICS

Dehydrated medium appearance	pale yellow, fine, homogeneous, free-flowing powder
Solution appearance	pale yellow, limpid
Final pH at 20-25 °C	7.3 ± 0.2

6 - MATERIALS PROVIDED - PACKAGING

Product	Type	REF	Pack
Tryptic Soy Blood Agar Base ;	Dehydrated medium	4021512 4021514	500 g (12,5 L) 5 kg (125 L)

7 - MATERIALS REQUIRED BUT NOT PROVIDED

Animal blood, autoclave, water-bath, sterile loops and swabs, incubator and laboratory equipment as required, Petri dishes, Erlenmeyer flasks, ancillary culture media and reagents for the identification of the colonies.

8 - SPECIMENS

Tryptic Soy Blood Agar Base supplemented with sheep blood and poured in plates can be directly inoculated with many clinical specimens collected from various normally sterile and non sterile human sites. Refer to the quoted literature for specimens types, related to specific infections.[3-5] Blood Agar plates are not suitable for direct inoculation of blood samples Good laboratory practices for collection, transport and storage of the clinical specimens should be applied; consult appropriate references for further information.[3]

9- TEST PROCEDURE

Allow plates to come to room temperature and to dry the surface of the medium.

Inoculate and streak the specimen with a loop over the four quadrants of the plate to obtain well isolated colonies, ensuring that sections 1 and 4 do not overlap. Alternatively, if the material is being cultured directly from a swab, roll the swab over a small area of the surface at the edge; then streak from this inoculated area.

Incubate at 35-37°C in aerobic conditions with or without 5 -10% CO_2, and record the results after 18-24, 48 and if necessary, 72 hours.

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The user is responsible for choosing the appropriate incubation time, temperature and atmosphere depending on the processed specimen, the requirements of organisms to be recovered and the local applicable protocols.
CAMP test: a known haemolytic strain of *S. aureus* (ATCC 25923) is streaked in a straight line across the centre of the plate. Test inoculum is streaked in a straight line (2-3 cm in length) perpendicular to *S.aureus* streak but without touching it. A known Group B *Streptococcus* may also be streaked similarly as a positive control. Four-five test organisms may be tested per plate. The plate is incubated at 35-37°C for 18-24 hours.

10 - READING AND INTERPRETATION

After incubation, observe the bacterial growth and record the specific morphological, chromatic, haemolytic characteristics of the colonies.
By cultivation on sheep blood agar plates prepared with Tryptic Soy Blood Agar Base, bacteria can be differentiated based on their capacity to secrete haemolysins. The haemolysis will cause a clearing zone of the blood agar around the colonies. Bacteria can cause different types of haemolysis:

1. α-haemolysis: partial haemolysis of the red blood cells to produce a greenish-grey or brownish discoloration around the colonies.
2. β-haemolysis: complete haemolysis of red blood cells resulting in a clear zone around the colonies
3. γ or non-haemolysis: no haemolysis of red blood cells, no change of the medium under and surrounding the colonies.
4. α-prime haemolysis: a small zone of complete haemolysis that is surrounded by an area of partial lysis with green discoloration; this type of haemolysis is uncommon.

Here below are summarized the colonies characteristics of some microorganisms which can be isolated on blood agar sheep plates.[6]

- The colonies of Group A streptococci are surrounded by a well-defined zone of complete haemolysis, usually two or three times the diameter of the colony.
- The colonies of group B streptococci are surrounded by a much smaller zone of complete haemolysis and some strains do not lyse the blood at all.
- The appearance of surface or subsurface β-haemolytic group C and group G streptococcal colonies do not differ sufficiently from that of group A colonies to be of any value in identification.
- Group D streptococcal colonies are non haemolytic.
- Pneumococcal colonies, when the culture has been incubated in CO_2 incubators, are surrounded by a fairly large zone of α-haemolysis.
- The viridans streptococcal colonies may be surrounded by a small zone of α-haemolysis or have no zone of haemolysis; rarely they show an α-prime haemolysis.
- Staphylococci colonies are yellow or white with or without the β-haemolysis zone.
- *Listeria* colonies are surrounded by a small β-haemolytic zone.

Once colonies have grown on blood agar plates, user must differentiate potential pathogens requiring identification and antimicrobial testing from contaminants that represent member of normal microbiota.
CAMP Test (with sheep blood agar plates): a positive test for CAMP factor appears as “arrowhead” haemolysis between the junction of growth of *S.aureus* and Group B *Streptococcus*. There is no enhanced or “arrowhead” haemolysis if the test isolate is not Group B Streptococcus.

11 - USER QUALITY CONTROL

All manufactured lots of the product are released for sale after the Quality Control has been performed to check the compliance with the specifications. However, the end user can perform its own Quality Control in accordance with the local applicable regulations, in compliance with accreditation requirements and the experience of the Laboratory. Here below are listed some test strains useful for the quality control.[7]

CONTROL STRAINS			INCUBATION T°/ T / ATM	EXPECTED RESULTS
S. pyogenes	ATCC	19615	35-37°C / 18-24H / A or CO_2	good growth, beta haemolysis
S. pneumoniae	ATCC	6305	35-37°C / 18-24H / A or CO_2	good growth, alpha haemolysis
S. aureus	ATCC	25923	35-37°C / 18-24H / A or CO_2	good growth
E. coli	ATCC	25922	35-37°C / 18-24H / A or CO_2	good growth

A: aerobic incubation; ATCC is a trademark of American Type Culture Collection

12 - PERFORMANCES CHARACTERISTICS

Prior to release for sale a representative sample of all lots of dehydrated Tryptic Soy Agar Blood Agar Base, supplemented with defibrinated sheep blood and un-supplemented, is tested for productivity and haemolytic model by comparing the results with a previously approved Reference Batch.
Productivity on blood sheep supplemented medium is tested by semi-quantitative ecometric technique with the following strains: *S.pyogenes* ATCC 19615, *S. pneumoniae* ATCC 6305, *S.agalactiae* ATCC 12386, *S.aureus* ATCC 25923. After incubation at 35-37°C for 18-24 hours the types of haemolysis and the amount of growth is evaluated and recorded. All strains show a good growth comparable with the Reference Batch, with typical haemolytic models.
Productivity on un-supplemented medium is tested by semi-quantitative ecometric technique with the following strains: *E.faecalis* ATCC 19433, *S.epidermidis* ATCC 12228 and *C.albicans* ATCC 18804. After incubation at 35-37°C for 18-24 hours the amount of growth is evaluated and recorded. All strains show a good growth, comparable with the Reference Batch.
CAMP test is performed with *S.aureus* ATCC 25923 and *S.agalactiae* ATCC 12386. After incubation at 35-37°C for 18-24 hours an arrowhead haemolysis of the test strain *S.agalactiae* is observed.

13 - LIMITATIONS OF THE METHOD

- Depending on the specimens analyzed and the microorganisms being tested for, it is recommended for the examination of clinical specimens to use also additional media such us selective media and Chocolate Agar.
- The growth and type of haemolysis depends on the metabolic requirements of organisms; it is possible that some strains do not grow and/or can demonstrate haemolytic models other than expected.
- *Haemophilus influenzae*, which requires both factor X and factor V, will not grow on this medium supplemented with sheep blood[8]; *Neisseria*, *Mycobacterium*, *Bordetella* and other microorganisms with highly specific nutritional requirements do not grow adequately; for the detection of these organisms specific culture media should be used.

- Even if the microbial colonies on the plates are differentiated on the basis of their morphological, chromatic, haemolytic characteristics, it is recommended that biochemical, immunological, molecular, or mass spectrometry testing be performed on isolates from pure culture for complete identification. If relevant, perform antimicrobial susceptibility testing.
- This culture medium is intended as an aid in the diagnosis of infectious disease; the interpretation of the results must be made considering the patient's clinical history, the origin of the sample and the results of other diagnostic tests.

14 - PRECAUTIONS AND WARNINGS

- This product is a qualitative *in vitro* diagnostic, for professional use only; it is to be used by adequately trained and qualified laboratory personnel, observing approved biohazard precautions and aseptic techniques.
- Dehydrated media must be handled with suitable protection. Before use, consult the Safety Data Sheet.
- Apply Good Manufacturing Practice in the production process of prepared media.
- This culture medium contains raw materials of animal origin. The *ante* and *post mortem* controls of the animals and those during the production and distribution cycle of the raw materials, cannot completely guarantee that this product doesn't contain any transmissible pathogen. Therefore, it is recommended that the culture medium be treated as potentially infectious, and handled observing the usual specific precautions: do not ingest, inhale, or allow to come into contact with skin, eyes, mucous membranes. Download the TSE Statement from the website www.biolifeitaliana.it, describing the measures implemented by Biolife Italiana for the risk reduction linked to infectious animal diseases.
- All laboratory specimens should be considered infectious.
- The laboratory area must be controlled to avoid contaminants such as culture medium or microbial agents.
- Sterilize all biohazard waste before disposal. Dispose the unused medium and the sterilized media inoculated with samples or microbial strains in accordance with current local legislation.
- Do not use the culture medium as active ingredient for pharmaceutical preparations or as production material intended for human and animal consumption.
- The Certificates of Analysis and the Safety Data Sheet of the product are available on the website www.biolifeitaliana.it.
- Notify Biolife Italiana Srl (complaint@biolifeitaliana.it) and the relevant Authorities of any serious incident occurring in connection with the use of the *in vitro* diagnostic.
- The information provided in this document has been defined to the best of our knowledge and ability and represents a guideline for the proper use of the product but without obligation or liability. In all cases existing local laws, regulations and standard procedures must be observed for the examination of samples collected from human and animal organic districts, for environmental samples and for products intended for human or animal consumption. Our information does not relieve our customers from their responsibility for checking the suitability of our product for the intended purpose.

15 - STORAGE CONDITIONS AND SHELF LIFE

Upon receipt, store at +10°C /+30°C away from direct light in a dry place. If properly stored, it may be used up to the expiration date. Do not use beyond this date. Avoid opening the bottle in humid places. After use, the container must be tightly closed. Discard the product if the container and/or the cap are damaged, or if the container is not well closed, or in case of evident deterioration of the powder (colour changes, hardening, large lumps).
The user is responsible for the manufacturing and quality control processes of prepared media and for the validation of the shelf life of the finished products, according to the type (plates/tubes/bottles), the added supplement and the storage method (temperature and packaging).

16 - REFERENCES

1. Buxton T. Blood agar plates and hemolysis protocols. ASMScience, 2005
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4. Vandepitte J, Verhaegen J, Engbaek K, Rohner P, Piot P, Heuck CC. Basic laboratory procedures in clinical bacteriology. 2nd ed. 2003; Geneve: World Health Organization.
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8. Nye KJ, Fallon D, Gee B, Messer S, Warren RE, Andrews N. A comparison of blood Agar supplemented with NAD with plain blood agar and chocolated blood agar in the isolation of Streptococcus pneumoniae and Haemophilus Influenzae from sputum. Bacterial Methods Evaluation Group J Med Microbiol 48 (12), 1111-1114 Dec 1999

TABLE OF APPLICABLE SYMBOLS

REF o REF Catalogue number	LOT Batch code	IVD *In vitro* Diagnostic Medical Device	Manufacturer	Use by
Temperature limitation	Contents sufficient for <n> tests	Consult Instructions for Use	Keep away from direct light	Store in a dry place

REVISION HISTORY

Version	Description of changes	Date
Revision 1	Updated layout and content	2020/05
Revision 2	Update of "precautions and warnings" and "storage conditions and shelf life"	2022/03
Revision 3	Removal of obsolete classification	2023/04

Note: minor typographical, grammatical, and formatting changes are not included in the revision history.

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