

**INSTRUCTIONS FOR USE****IUT MEDIUM****Ready-to-use tubes**

IUT Medium: from the left: *M. kansasii* and uninoculated tube

**1 - INTENDED USE**

*In vitro* diagnostic device. For the cultivation and isolation of *Mycobacterium* species, especially *M. tuberculosis*.

**2 - COMPOSITION -TYPICAL FORMULA \***

Magnesium sulphate	0.24 g
Magnesium citrate	0.60 g
Monopotassium phosphate	2.50 g
L-asparagine	3.60 g
Malachite green	0.40 g
Glycerol	12.00 mL
Distilled water	600 mL
Homogenized whole eggs	1000 mL

\*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 medium originally described by Löwenstein in 1931<sup>1</sup> contained congo red and malachite green to limit the growth of unwanted bacteria. In 1932 Jensen<sup>2</sup>, modified the medium by suppressing the congo red, modifying the concentration of magnesium citrate and potassium phosphate and increasing malachite green concentration. Today it is generally accepted that the use of an egg-based medium in combination with a liquid medium is essential for good laboratory practice in the isolation of mycobacteria;<sup>3</sup>

IUT Medium differs from Lowenstein-Jensen Medium since it does not contain potato flour/starch. This medium has been recommended by the International Union against Tuberculosis for the Diagnosis of Mycobacterial Infections.<sup>4</sup> IUT Medium has been reported by LaPlaca et al.<sup>5</sup> to provide a higher rate of positive isolates.

In IUT Medium, during the cooking process, the egg albumin coagulates thus providing a solid surface for bacterial growth. The concentration of malachite green is selected to maximize the growth of mycobacteria while inhibiting other microorganisms. L-asparagine is a source of nitrogen and vitamins. Monopotassium phosphate and magnesium sulphate enhance organism growth and act as buffers. Egg suspension provides fatty acids and proteins required for the metabolism of mycobacteria. Glycerol is a carbon source and is favourable to the growth of the human type tubercle bacillus while being unfavourable to the bovine type.

**4 - PHYSICAL CHARACTERISTICS**

Medium appearance	green, opaque slanted medium
Final pH at 20-25°C	Not applicable

**5 - MATERIALS PROVIDED - PACKAGING**

Product	Type	REF	Pack
IUT Medium	Ready-to-use tubes	551634	20 glass tubes with slanted medium, 18 x145 mm, flat bottom, aluminium screw-cap. Packaging: cardboard box

**6 - MATERIALS REQUIRED BUT NOT PROVIDED**

Sterile loops and swabs, incubator and laboratory equipment as required, controlled atmosphere generators and jars, ancillary culture media and reagents for the identification of the colonies.

**7 - SPECIMENS**

Specimens submitted for mycobacterial culture fall into two categories:

1- specimens normally contaminated with resident flora: the majority originates from respiratory tract, including sputum, tracheal and bronchial aspirates, and bronchoalveolar lavage specimens; other commonly submitted specimens types include urine, gastric aspirates, tissues, biopsy specimens.

2- specimens from normally sterile sites such as pleural and pericardial aspirates.

Contaminated specimens require a decontamination step before culture to reduce the likelihood of overgrowth by organisms other than mycobacteria. Specimens from normally sterile sites should be concentrated by centrifugation. Consult appropriate references for the applicable techniques<sup>3,6</sup> Collect specimens before antimicrobial therapy where possible. Good laboratory practices for collection, transport and storage of the specimens should be applied.<sup>3,6</sup>

**8 - TEST PROCEDURE**

Remove any condensation water present at the bottom of the slope and inoculate the surface of the slope with 0.2 mL (3-5 drops) of decontaminated and/or concentrated specimen.

Briefly angle slopes to allow the specimen to inoculate the entire surface. Ensure that the caps are tightly closed.

Incubate at 35 to 37°C for 6-8 weeks, extending to 12 weeks if necessary. 5-10% CO<sub>2</sub> in air stimulates the growth of mycobacteria in primary isolation cultures. It is necessary to incubate under CO<sub>2</sub> with loosening the caps to promote the circulation of carbon dioxide, for only the first 7 to 10 days after inoculation, subsequently cultures can be removed to ambient air incubators if space is limited and incubated with the caps tightly screwed to prevent dehydration of the medium.<sup>3</sup>





Specimens with positive smears that are culture negative should be held for an additional 4 weeks. The same should be done for culture negative specimens that were positive for mycobacteria by nucleic acid-based amplification assays.<sup>3</sup>

The cultures should be examined within 2 to 5 days after inoculation to permit early detection of rapidly growing mycobacteria. Young cultures (up to 4 weeks of age) should be examined twice a week, whereas older cultures could be examined at weekly intervals.<sup>3</sup>

For samples obtained from surface sites, such as skin, or when the clinician suspects the presence of particular mycobacterial species (*M.marinum*, *M.ulcerans*, *M.chelonae*, or *M.haemophilum*), it is recommended to inoculate two sets of media, one of which incubated at 35-37°C and one at a lower temperature (30-32°C).

Consult appropriate references for the detailed procedures about the treatment, inoculation and incubation of clinical specimens.<sup>3,6</sup>

### 9 - READING AND INTERPRETATION

After incubation, observe the bacterial growth and record the specific morphological and chromatic characteristics of the colonies.

*M.tuberculosis* appears as granular, rough, dry colonies; *M.kansasii* appears as smooth to rough photochromogenic colonies; *M.gordonae* appears as smooth yellow-orange colonies; *M.avium* appears as smooth, colourless colonies; *M.smegmatis* appears as wrinkled, creamy white colonies.<sup>7</sup>

Confirm the presence of Acid-Fast Bacilli in positive cultures with the Ziehl-Nielsen or auramine-phenol stain.<sup>6</sup>

### 10 - 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 testing 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.<sup>8</sup>

CONTROL STRAINS	INCUBATION T° / T / ATM	EXPECTED RESULTS
<i>M.tuberculosis</i> H37Ra ATCC 25177	35-37°C / <21 days / CO <sub>2</sub>	growth
<i>M.kansasii</i> Group I ATCC 12478	35-37°C / <21 days / CO <sub>2</sub>	growth
<i>M.intracellulare</i> Group III ATCC 13950	35-37°C / <21 days / CO <sub>2</sub> growth	growth
<i>M.fortuitum</i> Group IV ATCC 6841	35-37°C / <21 days / CO <sub>2</sub>	growth

ATCC is a trademark of American Type Culture Collection

### 11 - PERFORMANCES CHARACTERISTICS

Prior to release for sale a representative sample of all lots of ready-to-use tubes of IUT Medium and of the raw material used for the production of prepared tubes (dehydrated IUT Medium REF 401634) is tested for productivity by comparing the results with a previously approved Reference Batch.

Productivity is tested by inoculating IUT Medium slopes with pure culture of the following target strains: *M.tuberculosis* H37Ra ATCC 25177, *M.kansasii* Group I ATCC 12478, *M.intracellulare* Group III ATCC 13950, *M.fortuitum* Group IV ATCC 6841. The mycobacteria cultures are incubated at 35-37°C in a 5-10% CO<sub>2</sub> atmosphere and the extend of growth and the colonies' characteristic are recorded after 5, 14, 21 days. All target strains grow with typical colonies before 21 days of incubation.

### 12 - LIMITATIONS OF THE METHOD

- To shorten the isolation time as much as possible and to obtain a faster identification, the combination of a solid medium and a liquid medium is strongly recommended. The latter allows to reduce the incubation time and egg-based media allow the growth of some strains of *M. tuberculosis* complex and some non-tuberculous species that are unable to develop in liquid media.<sup>6</sup>
- It should be noted that if there is not enough specimen volume for PCR and culture, then only culture should be done. All samples, even if PCR positive, should be submitted for culture.<sup>6</sup>
- M.bovis* grows poorly, or not at all on IUT Medium.<sup>10</sup> For isolation and cultivation of *M.bovis*, the medium without glycerol and supplemented with sodium pyruvate should be used.
- M.leprae* and *M.genavense* fail to grow on IUT Medium.<sup>3,10</sup>
- A negative culture does not exclude an ongoing mycobacterial infection. There are several factors that can be responsible for negative cultures even in the presence of an infection: un-representative sample, mycobacteria destroyed during digestion and decontamination of the sample, presence of contaminants that mask or inhibit the growth of mycobacteria, inadequate incubation conditions.
- False positive cultures may result from mislabelling, specimen switching during handling, specimen carryover, contaminated reagents, or cross-contamination between cultures tubes.<sup>3</sup>
- IUT Medium contains malachite green and is photosensitive and should not be exposed to light during storage.<sup>10</sup>
- IUT Medium may display some variation in the light-green colour throughout the tube. This doesn't interfere with the growth of mycobacteria; however, colour changes showing bright yellow or dark blue zones may indicate contamination.<sup>10</sup>
- The presence of yellow granules due to the lipid part of the egg, does not interfere with the performance of the medium.
- It is recommended that suitable identification and susceptibility tests be performed on isolates. For the detailed procedures consult appropriate references.<sup>3,6,11</sup>
- This culture medium is intended as an aid in the diagnosis of infectious diseases; 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.

### 13 - 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.
- This product is not classified as dangerous according to current European legislation.
- 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 these products do not contain any transmissible pathogen. Therefore, it is recommended that the ready-to-use tubes 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](http://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.





- Each tube is for single use only.
- Be careful when opening screw cap tubes to prevent injury due to breakage of glass.
- Ready-to-use tubes of IUT Medium are not to be considered a "sterile product" as they are not subject to terminal sterilization, but a product with controlled bio contamination, within the limits of defined specifications reported on the Quality Control Certificate.
- Sterilize all biohazard waste before disposal. Dispose the unused medium and the tubes inoculated with samples or microbial strains in accordance with current local legislation.
- The Certificates of Analysis and the Safety Data Sheet are available on the website [www.biolifeitaliana.it](http://www.biolifeitaliana.it).
- Notify Biolife Italiana Srl ([complaint@biolifeitaliana.it](mailto:complaint@biolifeitaliana.it)) and the relevant Authorities of any serious incident occurring in connection with the use of the *in vitro* diagnostics.
- 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.

#### 14 - STORAGE CONDITIONS AND SHELF LIFE

Upon receipt, store tubes in their original pack at 2-8°C away from direct light. If properly stored, the tubes may be used up to the expiration date. Do not use the tubes beyond this date. After opening the box, the tubes can be used up to the expiration date. Opened tubes must be used immediately. Before use, check the integrity of the screw cap. Do not use tubes with signs of deterioration (e.g. microbial contamination, atypical colour).

#### 15 – REFERENCES

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11. Warshauer DM, Salfinger M, Desmond E, Grace Lin SY. *Mycobaterium tuberculosis* complex. In Carrol KC, Pfaller MA et al. editors. Manual of clinical microbiology, 12th ed. Washington, DC: American Society for Microbiology; 2019.

#### TABLE OF APPLICABLE SYMBOLS

REF or REF Catalogue number	LOT Batch code	IVD In vitro Diagnostic Medical Device	Manufacturer	Do not reuse	Recyclable pack This side up
Temperature limitation	Content sufficient for <n> tests	Consult Instructions for Use	Use by	Keep away from direct light	Fragile

#### REVISION HISTORY

Version	Description of changes	Date
Instructions for Use (IFU) - Revision 1	Updated layout and content in compliance with IVDR 2017/74	2021/02
Revision 2	Removal of obsolete classification	2023/04

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

