Identification of Bile Tolerant Gram-Negative Bacteria in Medical Marijuana Products
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1.0. Scope and Application
   1.1. This method, NYS DOH LEB-606, describes methods for detecting and identifying Bile Tolerant Gram-Negative bacteria (ELAP ID 9987) in medical marijuana samples as required in Title 10 (Health), Subpart 55-2.15 and Chapter XIII, Section 1004.14 of the official Compilation of Codes, Rules, and Regulations, of the State of New York. It is used as a follow-up to NYS DOH LEB-604 section 9.3 or section 9.7 (after verification of growth), and applies to sample enrichments showing growth in Enterobacteria Enrichment Broth Mossel at 30-35°C.
   1.2. Protocols for the identification of these organisms in samples of medical marijuana products can be found in the NYS DOH LEB-600 series. See Medical Marijuana Microbial Testing Plan flowcharts.

2.0. Summary of the Method
   2.1. Medical marijuana samples showing growth in Enterobacteria Enrichment Broth Mossel are subcultured onto Violet Red Bile Glucose Agar plates and incubated at 30-35°C for 18-24 hours. Bacterial colonies are transferred to Trypticase Soy Agar plates and identified using API® 20E identification strips. Samples producing bacterial colonies on Violet Red Bile Glucose Agar that are identified as Enterobacteriaceae (including *Klebsiella* spp.), aeromonads or pseudomonads are reported as positive.

3.0. Definitions
   3.1. BTGN stands for Bile Tolerant Gram-Negative organisms, which are defined as bacteria that grow on VRBGA plates under growth conditions prescribed herein. Examples include members of the Enterobacteriaceae (including *Klebsiella* spp.), aeromonads and pseudomonads.
   3.2. TSA stands for Trypticase Soy Agar
   3.3. TSAB stands for Trypticase Soy Agar with 5% sheep blood
   3.4. EEBM stands for Enterobacteria Enrichment Broth Mossel
   3.5. VRBGA stands for Violet Red Bile Glucose Agar

4.0. Health and Safety Warnings
   4.1. Microbiological analyses involve the culturing of potentially pathogenic organisms.
   4.2. All microbiologically contaminated materials, including media, shall be autoclaved after use.
   4.3. Laboratory equipment and benches shall be disinfected using either Envirocide®, 10% bleach, or 70% ethanol before and after use.
   4.4. Mouth pipetting is prohibited.
   4.5. All accidents, particularly those which may result in infection, shall be reported according to laboratory specific policies and procedures.
   4.6. Laboratory safety procedures shall be followed at all times. Regulations required by federal, state and local government agencies shall be implemented and followed.
4.7. The analyst must be familiar with any possible hazards from the reagents and standards used for sample preparation and analysis.

4.8. Always follow guidelines listed in safety data sheets (SDS) for proper storage, handling, and disposal of samples, solvents, reagents, and standards. SDSs are located within the laboratory. These guidelines must be made available to all personnel involved in microbiological analyses.

4.9. Appropriate lab coat, safety glasses and gloves must be worn when performing standard or sample preparations, working on instrumentation, disposing of waste, and cleaning laboratory equipment.

5.0. Shipping Conditions, Receiving, Preservation and Storage

5.1. Sample Shipping Conditions

5.1.1. The medical marijuana products from the Registered Organizations (ROs) are shipped as per manufacturer’s specifications and must adhere to all regulatory requirements.

5.2. Sample Receipt

5.2.1. Medical marijuana products from the RO are received, verified and documented ensuring that method, regulatory and Accreditation Body requirements are met.

5.3. Method Holding Times

5.3.1. This procedure is initiated upon completion of the Microbial Presence/Absence Test for Medical Marijuana Samples method (see NYS DOH LEB-604).

5.4. Preservation

5.4.1. Presence-Absence test aliquots that are presumptive positive for BTGN are stored refrigerated until it has been determined that they are not needed for additional microbiological evaluation.

5.5. Storage

5.5.1. If storage is required prior to analysis, isolates or archived plates are stored refrigerated until it has been determined that they are not needed for additional microbiological evaluation.

6.0. Interferences

6.1. Some components of medical marijuana products, e.g., ethanol, may inhibit the growth of microorganisms.
7.0. Apparatus and Materials

7.1. Equipment

7.1.1. Incubator, set at 30.0-35.0°C
7.1.2. Automatic pipettors and sterile aerosol-resistant micropipette tips
7.1.3. Sharpie or equivalent
7.1.4. Disposable sterile inoculating loops, 10µL
7.1.5. Disposable sterile inoculum spreader, or equivalent
7.1.6. Biosafety cabinet with HEPA filter

7.2. Reagents and Chemicals

7.2.1. VRBGA plates, 15 x 100mm, ordered from a commercial vendor. Ensure that the formulation is in agreement with that specified by USP.
7.2.2. TSA plates, 15 x 100mm, ordered from a commercial vendor. Ensure that the formulation is in agreement with that specified by USP.
7.2.3. TSAB plates, 15 x 100mm, ordered from a commercial vendor. Ensure that the formulation is in agreement with that specified by USP.
7.2.4. Disinfectants such as Envirocide® (Fisher Scientific cat. no. 19898220), 10% Bleach, and/or 70% ethanol.

7.3. Forms

7.3.1. Bile Tolerant Gram-Negative Identification Result Sheet (e.g., LEB-RS-606A).
7.3.2. API® 20E Identification Results Sheet
7.3.3. Walk-In Temperature Record
7.3.4. Cold Room Temperature Record
7.3.5. Refrigerator Temperature Record

8.0. Quality Control/Assurance

8.1. Method Detection Limits

8.1.1. Method Detection Limits are product-specific and are determined in accordance with relevant standards, regulations and Accreditation Body requirements.

8.2. Calibration and Standardization

8.2.1. Incubator temperatures shall be observed and recorded twice daily, separated by at least 4 hours.
8.2.1.1. Temperature of the 30.0-35.0°C walk-in is recorded.
8.2.1.1.1. If the incubator temperature does not stay within 30.0-35.0°C, laboratory-specific correction actions are followed. Analytical results may be invalidated if the incubator temperature exceeds 35.0°C, at the discretion of the laboratory.
8.2.2. Temperatures of the cold room and refrigerators are observed and recorded twice daily.
8.2.2.1. If the cold room or refrigerator does not stay within 1.0-8.0°C, laboratory-specific correction actions are followed.

8.2.2.2. The optimum temperature range for a cold room or refrigerator is 1.0-4.0°C.

8.2.2.3. If the cold room or refrigerator was in a defrost cycle at the time that the temperature was recorded, and the temperature does not reach 8.0°C, re-testing of media is not required.

8.2.2.4. Media may be re-tested for quality, depending on the number of degrees and the amount of time that the cold room or refrigerator temperature was out of compliance, at the discretion of the laboratory.

8.2.3. Max/min temperatures are recorded when twice-daily temperature measurements are not possible, such as on holidays and weekends.

8.2.4. Thermometers must be verified as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.

8.2.5. The volumetric accuracy of automatic pipettors and serological pipettes is determined as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.

8.2.6. The intensity and efficacy of the UV light in the biosafety cabinet is determined as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.

8.2.7. Biosafety cabinets are certified annually.

8.3. Quality Control

8.3.1. Comparative recovery and sterility between lots of VREBG, TSA, and TSAB will be determined as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.

8.3.2. Agar plates can be used for up to 2 weeks after the preparation date if stored refrigerated in plastic bags and in the dark.

8.3.2.1. Agar plates can be used after 2 weeks storage if ongoing QC demonstrates no loss in selectivity or growth promotion.

8.3.2.2. Analyses must be completed prior to the expiration date of the media and analyses must not be initiated on the day media expires.

8.3.3. Liquid media shall be stored in tightly-capped bottles in the dark at 4°C for up to 3 months from the date of preparation.

8.3.3.1. Liquid media can be used after 3 months storage if ongoing QC demonstrates no loss in selectivity or growth promotion.

8.3.3.2. Analyses must be completed prior to the expiration date of the media and analyses must not be initiated on the day media expires.

8.3.4. Sterility of disposable loops and spreaders is determined as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.
8.3.5. The use test for reagent water is performed annually, when cartridges are changed, or repairs are made to the deionized water systems.

8.4. Corrective/Preventive Actions
8.4.1. The laboratory will initiate non-conformances and/or corrective/preventive actions in accordance with laboratory-specific procedures and as prescribed by the Accreditation Body and in accordance with relevant regulations and standards.

9.0. Procedure
9.1. General
9.1.1. Aseptic technique is used for all procedures.
9.1.1.1. Aseptic technique can be found in a general microbiology textbook or on-line.
9.1.2. All work surfaces are disinfected prior to subculturing and colony identification.
9.1.3. Subculturing and colony identification are performed in a different location than sample preparation and initial sample analyses to prevent cross-contamination of incoming products.
9.1.4. All organisms isolated from turbid EEBM enriched sample must be identified regardless of if they are a regulated organism.

9.2. Subculture
9.2.1. For each turbid EEBM sample enrichment produced according to NYS DOH LEB-604 section 9.3, and confirmed to have growth, remove three VRBGA plates from the cold room and warm to room temperature while drying in the biological safety cabinet.
9.2.2. Use an inoculating loop to streak the sample from the turbid EEBM onto two VRBGA plates for colony isolation.
9.2.3. Use a separate inoculating loop to streak the matrix spike from the corresponding turbid EEBM onto one VRBGA plate for colony isolation.
9.2.3.1. If there isn’t a corresponding matrix spike, streak an isolated colony of *K. pneumoniae* ATCC 13883 from the monthly transfer plates (prepared according to lab-specific procedures) as a positive control.
9.2.4. Once the VRBGA plates have dried, invert and incubate at 30.0-35.0°C for 18-24 hours.
9.2.4.1. Do not stack the plates more than four high.
9.2.5. After incubation, record the results for the sample VRBGA plates as “Y” for growth-positive (bacterial colonies are present) or “N” for negative (bacterial colonies are absent) in the “VRBGA Sample Result” section of the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).
9.2.5.1. If there is growth on VRBGA, proceed to 9.3.
9.2.5.2. If there isn’t any growth on the VRBGA plates, the sample is negative for the presence of BTGN bacteria.
9.2.5.3. If the turbidity in the EEBM was confirmed as growth in NYS DOH LEB-604 section 9.7, but there was no growth on the VRBGA plates, proceed to 9.4 to identify any organisms isolated on nonselective agar plates from NYS DOH LEB-604 section 9.7.

9.2.6. After incubation, record the results of either the matrix spike or positive control VRBGA plate as “Y” for growth-positive (bacterial colonies are present) or “N” for negative (bacterial colonies are absent) in the “VRBGA M.S./P.C. Result” section of the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

9.2.6.1. If the sample result is negative on VRBGA, it is not necessary to identify colonies on either the matrix spike or positive control plate that show morphology typical of *K. pneumoniae* ATCC 13883.

9.2.6.1.1. Typical *K. pneumoniae* ATCC 13883 appears as shiny purple/pink colonies.

9.2.6.2. If the matrix spike result is negative on VRBGA, turbidity in the EEBM may have been caused by matrix characteristics. The test results are valid if the positive and negative controls for aerobic plate counts and mold plate counts meet QC criteria (see NYS DOH LEB-605).

9.2.6.3. If the matrix spike result is negative on VRBGA, and the positive and negative controls for aerobic plate counts and mold plate counts do not meet QC criteria (see NYS DOH LEB-605), results are considered invalid and the analyses must be repeated.

9.2.6.3.1. Additional testing using USP methods designed to decrease inhibitory effects of product that could result in growth in matrix spike samples may be undertaken using archived samples, at the discretion of the laboratory.

9.2.6.4. If a positive control is analyzed instead of a matrix spike, and the results are negative, the results are considered invalid and analyses must be repeated.

9.3. **Colony Identification**

9.3.1. Select one or more well-isolated colonies having distinct morphologies from the growth-positive sample and matrix spike/positive control VRBGA plates and record the sample sources and colony morphologies on the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

9.3.1.1. If growth is confluent on any of the VRBGA plates, re-streak for isolation of individual colonies and proceed with 9.3.1.
9.3.2. For each colony being identified, remove one TSA plate from the cold room and warm to room temperature while drying.

9.3.3. Streak well-isolated colonies from the growth-positive sample VRBGA plates onto TSA plates for colony isolation.

9.3.3.1. Bacterial colonies can be selected from either of the two VRBGA sample plates.

9.3.4. Select a well-isolated colony showing characteristics typical of *K. pneumoniae* ATCC 13883 from either the matrix spike or positive control VRBGA plate and streak onto a TSA plate that has been warmed to room temperature and dried in a biological safety cabinet.

9.3.4.1. Record the sample source and colony morphology on the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

9.3.4.2. If growth is confluent on the VRBGA plate, re-streak for isolation of individual colonies and proceed with 9.3.4.

9.3.5. Once the TSA plates have dried, invert and incubate at 30.0-35.0°C for 18-24 hours.

9.3.5.1. Do not stack more than four high.

9.3.6. After incubation, use the growth on the TSA plates to perform a Gram stain following the instructions in NYS DOH LEB-613.

9.3.7. Record the results of the Gram stain on the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

9.3.8. If the organisms are **not** gram-negative rods proceed to 9.4.

9.3.8.1. API® 20E test kits are unable to accurately identify organisms that are not gram-negative rods.

9.3.9. If the organisms are gram-negative rods, use the growth on the TSA plates to proceed with the API® Identification Test Strip method to identify the organisms using the API® 20E Test Strips.

9.3.9.1. Attach all API® 20E Identification Results sheets to the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

9.3.10. If the API® 20E Identification Test kits fail to identify the isolate proceed to 9.4.

9.4. **Identification of Non-Target Organisms**

9.4.1. The identification of non-regulated bacterial contaminants is required.

9.4.2. In cases where there is growth of a non-regulated analyte(s), consultation with the NYS Medical Marijuana Program is required.
10.0. Data Acquisition, Reduction, Analysis, Calculations, Acceptance Criteria and Documentation

10.1. Record the accession number, analyst initials, VRBGA lot date, incubation start and end dates and times, TSA lot date, incubation start and end dates and times, colony morphology, source of colony (sample, matrix spike, or positive control), Gram stain results, and colony identification on the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

10.2. If the identified organism(s) is a BTGN, circle “Positive for BTGN” and record the organism identity, otherwise circle “Negative for BTGN” on the Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (e.g., LEB-RS-606A).

10.2.1. In addition to reporting as positive for BTGN, a note is added to the final report that includes the identification of the organism.

10.3. If an identified organism(s) isn’t a regulated analyte, check the comment at the bottom of the form, and record the identified organism on the Bile Tolerant Gram-Negative Bacteria Results Sheet (e.g., LEB-RS-606A).

10.3.1. The comment at the bottom of the results sheet is added as a note in the final report.

10.4. If an identified organism(s) is a regulated analyte that is not a BTGN, the sample is reported as negative for BTGN, but a note is entered onto the report explaining that the organism is regulated but was isolated from the BTGN presence/absence analyses.

10.5. If at any point in the analyses the matrix spike fails to grow in any medium, the test results are valid if the positive and negative controls for the aerobic plate counts and mold plate counts meet QC criteria (see NYS DOH LEB-605).

11.0. Method Performance

11.1. Demonstration of Capability

11.1.1. Prior to acceptance and use of this method for data reporting, a satisfactory initial demonstration of capability (DOC) is required. Thereafter, an ongoing DOC is to be performed annually.

11.1.2. An initial DOC shall be made prior to using any method, and at any time there is a change in instrument type, personnel or method or any time that a method has not been performed by the laboratory or analyst in a twelve (12) month period.

11.1.3. All DOCs shall be documented, and all data applicable to the demonstration shall be retained and readily available at the laboratory. Consult state regulations and standards for additional information on performing a DOC for microbiological contaminants.

11.1.4. Consult relevant standards, regulations and Accreditation Body requirements for additional information on performing DOCs for microbial contaminants

11.2. Laboratory Detection Limits

11.2.1. Detection limits are determined in accordance with relevant standards, regulations and accreditation body requirements.
12.0. Waste Management/Pollution Prevention

12.1. It is the responsibility of the laboratory to comply with all federal, state and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions.

12.2. Bacterial/fungal cultures and contaminated or potentially contaminated disposable materials are disposed of in biohazardous waste cans and autoclaved prior to discarding.

12.3. Dispose of non-hazardous aqueous waste in the laboratory sink followed by flushing with tap water.

12.4. Dispose of glassware in appropriately labeled boxes. Be sure that, whenever possible, the glass has been thoroughly rinsed and is contaminant-free before disposal.

12.5. Consult federal, state and local regulations for additional information or for information on the disposal of products not described in this method.
13.0. References


13.4. TNI 2016 Standards – EL-V1M5-2016-Rev2.0: Microbiological Testing

13.5. NYS DOH LEB-604, Microbial Presence/Absence Test for Medical Marijuana Samples

13.6. Title 10 (Health), Subpart 55-2.15 and Chapter XIII, Section 1004.14 of the official Compilation of Codes, Rules, and Regulations, of the State of New York.

13.7. NYS DOH LEB-605, Aerobic Bacteria and Mold Plate Counts for Medical Marijuana Testing

13.8. NYS DOH LEB-613, Identification of Thermophilic Actinomycetes in Medical Marijuana Products
## 14.0. Appendices - Forms

### Bile Tolerant Gram-Negative Bacteria Identification Results Sheet (LEB-RS-606A)

Incubate VRBGA for 18-24 hours and TSA for 18-24 hours (30-35°C Incubator)

<table>
<thead>
<tr>
<th>Accession Number:</th>
<th>Analyst Initials:</th>
</tr>
</thead>
</table>

**Final Results (circle one):**
- Negative for BTGN
- Positive for BTGN

<table>
<thead>
<tr>
<th>VRBGA Start Date/Time:</th>
<th>Sample Growth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRBGA End Date/Time:</td>
<td>M.S./P.C. (circle one) Growth:</td>
</tr>
<tr>
<td>VRBGA Lot Date:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TSA Start Date/Time:</th>
<th>Gram Stain Results:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSA End Date/Time:</td>
<td>API® 20E Start Date/Time:</td>
</tr>
<tr>
<td>TSA Lot Date:</td>
<td>API® 20E End Date/Time:</td>
</tr>
<tr>
<td>Gram Stain Date/Time:</td>
<td>Stain Positive Control Result:</td>
</tr>
<tr>
<td>Gram Stain Lot/Exp Date:</td>
<td>Stain Negative Control Result:</td>
</tr>
</tbody>
</table>

**Source (Sample, M.S., or P.C.), Colony Morphology and API® 20E Colony Identification**

1.
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3.
4.
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7.
8.
9.
10.

All API® 20E Result Sheets are attached. VRBGA = Violet Red Bile Glucose Agar, TSA = Trypticase Soy Agar, M.S. = matrix spike, P.C. = positive control plate used in lieu of a matrix spike. *K. pneumoniae* ATCC 13883, used as a matrix spike, is typically pink/purple and shiny on VRBGA agar.

If the contaminant is a non-regulated analyte(s), check below and fill in the organism(s) identified so the text will be entered as a note onto the report

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**“(+) for ___________________________________ (not ELAP-regulated analyte)”**

Reviewed by __________________________ Date __________________________

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