Measurement of Light Intensity for AGP Cultures, Animal Cultures, Toxicity Incubators, and the Bioassay Laboratory

1. SCOPE AND APPLICATION

    1.1. This procedure is based on the instruction manual for the Fisher brand Traceable® Dual Range Light Meter. It is used to measure light intensity in the bioassay laboratory, culture areas, and bioassay test incubators. Measurements are required annually at a minimum. The FDEP Laboratory performs measurements monthly and at the beginning of any algal toxicity test.

    1.2. The use of this SOP constitutes acknowledgement that the meter manual has been read and understood. The manual and the meter are stored on the top shelf of the AGP shakers in B246.

2. SUMMARY OF THE METHOD

    2.1. Light meter is turned on. The light collector is held near the light source and moved until recommended range is achieved. Incubators are marked with tape or other means to indicate where placement of containers will result in containers being within appropriate ranges. Light bulbs over AGP racks are replaced if appropriate ranges are not met. Light measurements are recorded in the appropriate logbook.

    2.2. All lights should be allowed a minimum of five (5) minutes to "warm" up prior to measurements.

3. SUPPLIES

    3.1. Traceable® Dual Range Light Meter (Fisher) SN 102084 (calibration expires 1/26/2025).

        3.1.1. Light meter must be within calibration dates; however, meters with expired calibration dates can be used IF side by side readings are verified to be within 1% of the readings obtained from a meter with a non-expired calibration. Note that a 1% variance is very small. It's recommended that the light meter be replaced after calibration expiration.

        3.1.2. If not recalibrating meter, purchase a new light meter upon reaching calibration expiration date.

    3.2. Black waterproof pen

    3.3. Ruler, 12 in (30.48 cm) or 18 in (45.72 cm)

        3.3.1. The ruler is used to measure light intensity at set distances from incubator door lights. Incubators #1, #4, #5, and #7 have door lights.

    3.4. *AGP Light Measurement* Logbook

    3.5. *Light Intensity Measurement QCs* Log sheet

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3.6. Thermo Scientific Incubators (Incubator #4, #5, #1, #7, and #8)

4. METHODS

4.1. General Measurement

4.1.1. General measurement is for the culture room and water bath. Room light readings usually range between 10-80 Foot-Candles (FC). Readings at the surface of cultures and water bath should range between 50-100 FC. To correct illumination deviations from EPA or NELAC recommended ranges, replace old light bulbs, or move test vessels until proper illumination is achieved. These measurements should be conducted annually, at a minimum.

4.1.2. Turn power on by holding 'POWER' button. The switch in the bottom right corner, showing various Lux and FC values, determines the range of measure. Ensure the switch is set to 2000/200 Lux/FC to measure foot-candles of light from 0-199.9.

4.1.3. Set the meter to measure fluorescent light source: Press the 'LIGHT SOURCE' button until an 'F' appears at the bottom of the display.

4.1.4. Set meter to foot-candles (FC): Press the 'LUX/FC' button until 'Ft-cd' appears on the right side of the display.

4.1.5. Place the light-collector on or as near as possible to the surface at which the measurement is desired. (The collector is the white dome set in black plastic.) It is attached to the meter by an electric cord. The collector should be parallel to both the surface and the light source.

4.1.6. Allow 5-10 seconds for the reading to stabilize. Record the meter reading in the appropriate logbook.

4.2. AGP Cultures (Shaker Tables)

4.2.1. Light measurements should be conducted monthly over the Algal Assay shaker racks.

4.2.2. Turn power on per 4.1.2 (if not already on) and change the measurement range to 200-1999 FC by moving the bottom right switch to 20000/2000 Lux/FC.

4.2.3. Measure the light intensity at the front, left side, right side, and rear of each shaker rack, ensuring that the collector is held at the level of the water in the flasks.

4.2.3.1. The light measurement should range between 360-440 FC. Change light bulbs or adjust placement of test flasks on the shakers, as needed, to maintain this range. If necessary, make it clear using colored tape which areas of the shaker racks should not be used.

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4.2.3.2. Record light bulb changes in the *AGP Light Measurement Logbook.*

4.2.4. Record the measurements in the *AGP Light Measurement Logbook*.

4.3. Toxicity Incubators #1, #4, #5, #7, and #8 (Bioassay tests and *C. dubia* cultures)

4.3.1. Light measurements should be taken monthly in each incubator.

4.3.2. Door lights alone are used for vertebrate and invertebrate bioassay tests.

4.3.3. Colored tape or other means (marker, etc.) can be used on the incubator shelves to indicate where test vessels should be/should not be placed to meet light intensity recommendations (50-100 FC for vertebrate and invertebrate bioassays).

4.3.3.1. If Incubator #7 or #8 is occupied by algae rather than a bioassay test, refer to section 4.4 for measurements.

4.3.3.2. Incubator #4 is currently used to culture *C. dubia* but can be used for toxicity testing if needed. (*C. dubia* cultures would be relocated in that case.)

4.3.4. The placement indicators are moved as needed to keep vessels within these parameters.

4.3.5. Additionally, sections of the plastic door lightbulb shield can be strategically covered to block light, thus reducing light intensity as needed to meet requirements.

4.3.6. Note: 4.3.6 through 4.3.10 can be skipped since the distance used in 4.3.10 has been previously found to be 15.3 cm (~ 6 inches). However, the process remains here so that a procedure to determine the proper distance for light measurements is available for new equipment.

4.3.7. Turn the light meter on per 4.1.2. Set the meter to the 0-199.9 FC range for bioassay vessel measurements. Set the meter to the 200-1999 FC range for algal toxicity test vessel placement and for AGP tests or cultures.

4.3.8. Open the incubator door. Ensure door lights are on. Place the ruler on a shelf so that the ruler: (1) is parallel to the side of the incubator; (2) extends sufficiently from the shelf to contact the light bulb as the door is closed; and, (3) is aligned so as to be pushed toward the back of the incubator as the door is closed.

4.3.9. Close the incubator door.

4.3.10. Open the door. Measure the length of the ruler extending from the shelf. Two measurements are needed. (See comment).

4.3.10.1. The second measurement is used to confirm the first. The measurements should be the same; however, if they differ by more than 0.5 cm, the measurements should be repeated. This length represents the distance from the light bulb to the edge of the shelf.

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It should be the same for each shelf since the light bulbs are parallel to the door and the door is perpendicular to the plane of the shelves. This distance is **15.3 cm** for Incubators #1, #4, #5, and #7.

4.3.11. To turn off the overhead room lights, use the wall switch timer located in the corner near the B246 door to the hallway.

4.3.12. Place the end of the ruler against a door light bulb. Keep the ruler perpendicular to the vertical plane of the door. Measure the light intensity at a distance equal to the distance obtained in 4.3.10.1 (represents front of shelf; 15.3 cm for Incubators #1, #4, #5 and #7). Make several more measurements at 5-8 cm increments (away from the light). Record the distance and light measurements on scrap paper. Always ensure that the rear of the light collector is parallel to the vertical plane of the door.

4.3.13. Turn the room lights on.

4.3.14. Place the ruler on the shelf, allowing the ruler to extend the distance measured in 4.3.10.1. Use the distance and light measurements recorded in 4.3.12 to determine placement of colored tape/marker to indicate that the light intensity between the front and the rear indicators falls between 50-100 FC. FC values can be written on colored tape.

4.3.15. Record the measurements in the *Light Intensity Measurement QCs* Log sheet.

4.4. Toxicity Incubators #7 and #8 (when used for Algal toxicity tests)

4.4.1. Light measurements should be taken before each algal toxicity test.

4.4.2. Colored tape or other marker can be used on shelves to indicate where algal toxicity test vessels can be placed (360-440 FC).

4.4.3. Turn on door light and, if not already on, turn on all the additional lights in Incubator #7. (Plug the light on the top shelf into the brown cord. Press the power strip switch to the on position.)

4.4.4. Turn the light meter on per 4.2.2 to set the meter to the 200-1999 FC measurement range for algal toxicity test vessel placement.

4.4.5. Measure the illumination at various distances from the additional lighting to establish a meter range of 360-440 FC. Mark the established area with colored tape/marker to indicate that test vessels placed on the indicator would receive the appropriate illumination.

4.4.5.1. The distance and illumination from the door lights should already be established. Based on previous measurements, the door lights and additional lights will not cause excessive light intensity unless there is an overlap at the door light intensity indicator. Move the

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fixtures as needed to obtain the necessary illumination range. Tip: Write the FC values on colored tape.

4.4.6. Record the measurements (range) on the Algal Toxicity Test Bench sheets.

5. DATA ARCHIVAL

5.1. Use a black, waterproof pen for all bench sheets and logbooks.

5.2. To correct raw data entries, place a single line through the incorrect or illegible entry, write the corrected entry near the error, date and initial the correction. Do not overwrite entries.

5.2.1. The corrected entry is written as near as possible to the error or in the comment box on the appropriate bench sheet.

5.2.2. If the correction requires an explanation, write a comment and reference the error with a letter. Initial and date the explanation. Do not attempt to put all information (correction and comments) into a small space.

5.2.3. Use sequential alphabetical annotation to identify errors and corresponding comments (i.e. use 'A' for first error and use 'A' for corresponding explanatory comment; use 'B' for second error and 'B' for corresponding comment , etc.).

5.3. Record information in appropriate logbooks (*AGP Light Measurement Log* and *Light Intensity Measurement QCs* Log sheet).

6. QUALITY CONTROL

6.1. Refer to QA manual for corrective action and handling out-of-control data.

6.2. If a problem occurs during sample processing, a nonconformance report (NCR) is submitted describing the problem and the corrective action.

7. 7. SAFETY/HAZARDOUS WASTE MANAGEMENT

7.1. Laboratory safety features (ex. lab hood or ventilation system), and personal protection equipment (PPE) (lab coat, gloves and safety glasses) are required when working with chemicals and unprocessed samples.

7.2. Refer to the Laboratory Quality Manual for sample disposal.

7.3. Refer to the Laboratory Health and Safety Manual and Hazardous Waste Management.

7.4. Read MSDS information for reagent handling and disposal.

8. REFERENCES

8.1. Fisher brand -Traceable® Dual Range Light Meter Instruction Manual

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8.2 Refer to the Laboratory Quality Manual for sample disposal https://floridadep.gov/dear/florida-dep-laboratory/content/dep-laboratory-quality-assurance-manual-and-sops

8.3 Laboratory Health and Safety Manual and Hazardous Waste Management https://www.floridadep.net/resources/health-safety-manual

Appendix of Changes:

05/14/2008 Added Scope and Application, Summary of the Method and Appendix of Changes. Changed dated to dates in comment for **Materials** Step 1. Added Bioassay Laboratory to title.

04/13/2009 Added References section.

04/07/2010 Changed "Culture Lab Light-Measurement Logbook to Light Measurement Log sheet". Changed associated location Comment for Log Sheet. Added Incubators # 4 and # 5 to appropriate instructions.

03/18/2011 Added Incubator #5 to appropriate comments. Replaced orange and green with colored. Replaced 'intensity should' with 'light readings usually' in General Measurements comment.

02/24/2012 Added Incubator # 3, Incubator # 4 and Incubator # 5 to appropriate comments and Steps. Added correction of illegible entries to Documentation Section. Removed references to AGP Room.

01/09/2014 Reformatted SOP.

02/09/2015 Formatted for 508 compliance.

11/04/2015 Updated links.

11/30/2016 Updated links.

10/16/2017 Removed incubator #2. Added incubator #6. Updated meter SN.

10/08/2018 Removed incubator #3. Changed font to Calibri. Added incubator # 7. Added Algal Assay Light Measurement to the supplies section.

10/16/2020 Updated links. Updated data archival section with universal language. Updated materials section. Moved NCR note to quality control section. Updated light meter serial number and expiration date.

10/01/2021 Corrected minor grammatical errors.

10/09/2022 Check links and grammar. Updated all Incubator #6 mentions to Incubator #7. Updated meter SN and expiration date. Updated log sheet titles.

10/12/2023 Checked for grammar and readability. Updated SN and expiration date for light meter. Made significant changes to reflect current procedures.

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