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. Meter Correction Factors: Multiply the meter reading by 1.05 for mercury lamps and by 0.91 for fluorescent lamps. All of the bulbs used in the toxicity laboratory are fluorescent.

2.3. Meter readings and corrected meter readings (true light levels) are indicated in this SOP.

2.4. 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 140548190

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 within 1% of the readings obtained by the current calibrated meter.

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. Incubator #1, Incubator #2, Incubator #3 and Incubator #4 have door lights.

4. METHODS

4.1. General Measurement

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4.1.1. General measurement is for the culture room, water bath, and the animal cultures. Room light readings usually range between 10-80 Foot-Candles (FC). Readings at the surface of cultures and water bath should range between 55-110 FC (corrected: 50-100 FC). To correct illumination deviations from EPA or NELAC required ranges, replace old light bulbs or move test vessels until proper illumination is achieved. These measurements should be conducted annually, at minimum.

4.1.2. Turn power on by moving the switch on left side of meter from the "Off Line" position to the first black-line (one click). This sets the measurement range to 0-199.9 FC. The light meter has two switches on the front. The left-side switch turns the meter on and sets the measurement range. The right-side switch sets the meter so that the measurement is in FC.

4.1.3. Set meter to foot-candles (FC): Move (slide toward bottom of meter) the right-side meter switch to the first blue line (from top of meter- labeled FAST).

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

4.1.5. Allow 5-10 seconds for the reading to stabilize and then 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 Step 2 in General Measurement (if not already on), except move the left-side switch from the "Off Line" to the second black-line (two clicks). This sets the measurement range to 200-1999 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 396-484 FC (corrected: 360-440 FC). Change light bulbs or adjust placement of test flasks on the shakers as needed to maintain this range.

4.2.3.2. Record Light bulb changes in the *Algal Assay Light Measurement Logbook.*

4.2.4. Record the measurements in the Algal Assay Light Measurement Logbook.

4.3. Toxicity Incubators #1, #3, #4, and #5 (Bioassay tests and *C. dubia* cultures)

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

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

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4.3.3. Colored tape has already been placed on the incubator shelves to indicate where test vessels can be placed to meet light intensity requirements (corrected: 50-100 FC for vertebrate and invertebrate bioassays).

4.3.4. The tape is 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 reduce light intensity as needed to meet requirements.

4.3.6. Note: Steps 4.3.6-4.3.9 can be skipped since the distance used in Step 4.3.11 has been previously found to be 15.3 cm (~ 6 inches). However, the Steps remain 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 Step 2 of General Measurement. 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 (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. 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 Incubator #1, Incubator #3 , Incubator #4 and Incubator #5.

4.3.11. Use the wall switch timer located in the corner by the SATO printer to turn off the overhead room lights.

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 Step 4 (represents front of shelf; 15.3 cm for Incubators #1, #3, #4 and #5). 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.

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4.3.14. Place the ruler on the shelf, allowing the ruler to extend the distance measured in Step 4. Use the distance and light measurements recorded in Step 6 to determine placement of colored tape so as to indicate that the light intensity between the front tape and the rear tape falls between 55-110 FC on the meter (corrected: 50-100 FC). TIP: Write the FC values on the colored tape.

4.3.15. Record the measurements in the Light Measurement Log sheet.

4.4. Toxicity Incubator #2 (Algal tests)

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

4.4.2. Colored tape has been placed on shelves to indicate where algal toxicity test vessels can be placed (corrected: 360-440 FC). Algal Toxicity tests can be run in Incubator #2.

4.4.3. Turn on door light and all of the additional lights in Incubator #2. (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 Step 2 of the AGP Culture procedure. Set the meter to the 200-1999 FC range for Algal toxicity test vessel placement.

4.4.5. Measure the illumination at various distances from the additional lighting so as to establish a meter range of 396-484 FC (corrected 360-440 FC). Mark the established area with colored tape to indicate that test vessels placed on the tape 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 marking tape. Move the fixtures as needed to obtain the necessary illumination range. TIP: Write the FC values on the colored tape.

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

4.5. Toxicity Incubators #1, #3, #4, and #5

4.5.1. Incubator #4 is currently used to Culture *C. dubia*, but can be used for toxicity testing if needed (*C. dubia* cultures relocated).

4.5.2. Turn the light meter on per Step 2 of *General Measurement.* Set the meter to the 0-199.9 FC range for bioassay vessel measurements.

Measure the illumination at various distances from the light bulbs (on each shelf) so as to establish a range of 55-110 FC (corrected: 50-100 FC). Mark the boundary of the desired range with colored tape to indicate that test vessels placed within the area would receive the appropriate illumination.

4.5.2.1. Incubator #3 has light fixtures on each shelf that can be moved horizontally as needed. Adjust the position of the fixtures as needed. Replace light bulbs as needed (decreased output, etc.)

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4.5.3. Record the measurements in the Light Measurement Log sheet.

5. DATA ARCHIVAL

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

5.1.1. The corrected entry is written as near its appropriate space as possible or else in the comment box on the appropriate bench sheet.

5.1.2. If the correction requires an explanation, write a comment and reference the error. Initial and date the explanation.

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

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

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

5.5. *Algal Assay Light Measurement Log*

5.6. *Light-Measurement Log* sheet

6. QUALITY CONTROL

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

7. 7. SAFETY/HAZARDOUS WASTE MANAGEMENT

7.1. Proper laboratory protection, including lab hood or ventilation system, lab coat, gloves and safety glasses, is 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

8.2. Refer to the Laboratory Quality Manual for sample disposal http://www.dep.state.fl.us/labs/library/lab_sops.htm

8.3. Laboratory Health and Safety Manual and Hazardous Waste Management https://www.fldepnet.org/content/dear/bureau-laboratories-safety-documents

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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.

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