

Intended Use

The Beacon Microcystin Plate Kit is an immunoassay for the detection of Microcystin in water samples. This product has been verified by the U.S. EPA ETV program and is intended for research use only.

Principles

Microcystin HRP Enzyme Conjugate is pipetted into the test wells followed by the Calibrators, Controls, and the Sample Extract(s). A soluble polyclonal Microcystin antibody solution is then added to the test wells to initiate the reaction. During an incubation, Microcystin and Microcystin HRP Enzyme Conjugate compete for binding to the soluble Microcystin antibody which is in turn immobilized on the test wells. Following the incubation, the wells are washed to remove any unbound Microcystin and Microcystin HRP Enzyme Conjugate. After washing, a colorless substrate is added to the wells and any bound enzyme conjugate will convert the substrate to a blue color. Following an incubation, the reaction is stopped with the addition of Stop Solution and the amount of color in each well is measured. The color of the unknown sample is compared to the color of the calibrators and the Microcystin concentration of the sample is derived.

Reagents and Materials Provided

1 Unit	Plate containing 12 test strips of 8 wells each that are vacuum sealed in an aluminized pouch with a desiccant.
5 X 2 mL	Vials of Microcystin Calibrators (0, 0.1, 0.3, 0.8, and 2 ppb).
1 X 2 mL	Vial of Microcystin Control (1 ppb).
1 X 8 mL	Bottle of Microcystin HRP Enzyme Conjugate.
1 X 8 mL	Bottle of Microcystin Antibody.
1 X 25 mL	Bottle of 100X Wash Concentrate (dilute prior to use).
1 X 14 mL	Bottle of Substrate.
1 X 14 mL	Bottle of Stop Solution.

Reagents and Materials Required but Not Provided

- Pipette(s) with disposable tips capable of dispensing the required volume(s).
- Multichannel pipette(s) (8 channels) with disposable tips capable of dispensing the required volume(s) (recommended if running more than two strips at once).
- Laboratory quality distilled or deionized water.
- Reagents and materials for sample preparation.
- Materials for 1X wash solution preparation.
- Personal protective equipment.
- Paper towels or equivalent absorbent material.
- Timer.
- Microtiter plate or strip reader capable of reading at 450 nm.

Kit Handling Notes and Precautions

- Read the product brochure in its entirety prior to use.
- The kit, in its original packaging, can be used until the end of the month indicated on the box label.
- Do not use reagents after expiration date.
- Store all kit components at 2°C to 8°C (36°F to 46°F) when not in use.
- Reagents should be brought to room temperature, 20°C to 28°C (68°F to 82°F), prior to use. Avoid prolonged (> 24 hours) storage at room temperature.
- Do not freeze kit components or expose them to temperatures greater than 37°C (99°F).
- Running Calibrators, Controls, and Samples in duplicate will improve assay precision and accuracy.
- Precise transfer of samples and reagents by using a calibrated pipette that is capable of dispensing the required volume is critical to obtain proper assay results.
- If running more than two strips at once, the use of a multi-channel pipette is recommended when adding the Antibody, Substrate and Stop Solution.
- All procedural steps should be completed without interruption. Ensure all reagents, materials and equipment are ready at the appropriate time.
- Each reagent is optimized for use in the Beacon Microcystin Plate Kit. Do not substitute reagents from any other manufacturer into the test kit. Do not combine reagents from other Beacon Microcystin Plate Kits with different lot numbers.
- Do not reuse test wells.
- Dilution or adulteration of reagents or samples not called for in the procedure may result in inaccurate results.
- Damage to or obstruction of the optical surface may cause unsatisfactory results.

Performance Characteristics

The Beacon Microcystin Plate Kit can detect several Microcystin congeners. The percent cross reactivity (based on IC₅₀) of Microcystin congeners relative to Microcystin-LR (used in the calibrators and controls) is shown in the table below.

Compound	% Cross-Reactivity
Microcystin-LR	100
Microcystin-RR	73
Microcystin-YR	58
Microcystin-LY	6
Microcystin-LA	2
Microcystin-LF	3
Microcystin-LW	4
Nodularin	126

Limit of Detection (LOD) and Quantitation (LOQ)

The LOD and LOQ of this assay was determined through testing a statistically significant (n>40) amount of negative control samples across different individuals, reagent lots, and days.

Sample Type	LOD (ppb)	LOQ (ppb)
Drinking Water	0.033	0.107
Recreational Water	0.044	0.144

Sample Collection, Storage, and Preparation

Drinking Water Samples:

1. Collect a representative sample (approximately 100 mL) in a clean amber glass or Polyethylene Terephthalate Glycol (PETG) bottle with a tight fitting lid.
2. If the sample is expected to contain chlorine or other oxidizers, immediately add sodium thiosulfate (ex. 4 ppm chlorine needs 0.01g/L) in order to neutralize the compound and use in the assay.

Note: Test the sample as soon as possible. If immediate testing is not possible, store refrigerated. In the event that testing cannot commence for more than 5 days, store frozen.

Recreational Water Samples:

1. Collect a representative sample (approximately 100 mL) in a clean amber glass or Polyethylene Terephthalate Glycol (PETG) bottle with a tight fitting lid.

Note: If immediate processing is not possible, store refrigerated. In the event that testing cannot commence for more than 5 days, store frozen.

2. Aliquot approximately 1.0 mL of sample to a 1.5 mL microcentrifuge tube.
3. Complete three freeze/thaw cycles to disrupt the algal cells.
4. Centrifuge at 2,000 X g for 3 minutes.
5. Carefully take the supernatant without disturbing the pellet and use in the assay.

1X Wash Solution Preparation

1. Measure 495 mL of laboratory quality distilled or deionized water and transfer to a clean container with a tight-fitting lid.
2. Measure 5 mL of the 100X Wash Concentrate and add to the container.
3. Gently swirl to mix.
4. Transfer the 1X Wash Solution to a wash bottle to use in the assay.

Assay Procedure

1. Allow kit components and the sample extract(s) to reach room temperature prior to running the test.
2. Place the appropriate number of test wells into a holder. Be sure to re-seal unused test wells in the zip-lock bag with the desiccant to limit exposure to moisture.
3. Dispense **50 µL of Enzyme Conjugate** into each well.
4. Dispense **50 µL of Calibrators, Controls and Sample Extract(s)** into the appropriate well. Be sure to use a clean pipette tip for each solution to avoid cross contamination.
5. Dispense **50 µL of Antibody** into each well.
6. Gently shake the wells for 30 seconds using a back-and-forth motion and incubate for **30 minutes** at room temperature.
7. Decant the contents of the wells into an appropriate waste container. Fill the wells to overflowing with 1X Wash Solution and then decant. Repeat this wash step four times for a total of five washes. Following the last wash, tap the inverted wells onto absorbent paper to remove excess wash solution.
8. Dispense **100 µL of Substrate** into each well.
9. Gently shake the wells for 30 seconds using a back-and-forth motion and incubate for **30 minutes** at room temperature.
10. Dispense **100 µL of Stop Solution** into each well in the same order of addition as the Substrate.
11. Gently shake the wells for 30 seconds using a back-and-forth motion.
12. Carefully wipe the optical surface with a soft, lint-free wipe. Measure and record the absorbance (Optical Density; OD) of each well at 450 nm using a plate or strip reader within 10 minutes of stopping the assay. If the reader has dual wavelength capability, read at 450 nm minus 605 or 650 nm.
13. Dispose of used test wells in an appropriate waste container.

Quality Control (QC) Criteria

- The correlation coefficient (R^2) of the calibration curve, analyzed using a 4-parameter logistic regression, must be ≥ 0.99 .
- The average absorbance of the zero calibrator replicates must be ≥ 1.0 .
- The average absorbance of calibrator and control replicates must have a coefficient of variation (%CV) $< 15\%$.
- The average absorbance of sample replicates must have a coefficient of variation (%CV) $< 20\%$.
- The concentration of the control must fall between 0.8 and 1.3 ppb.

Result Interpretation

It is preferred for quantitative results to be determined using commercially available software for ELISA evaluation using a 4-parameter curve fit. Alternatively, a semi-log curve fit can be used if 4-parameter software is not available. A spreadsheet that will perform the curve fit and sample concentration calculations is available upon request. Please contact Beacon for further details.

To ensure the validity of the results, please adhere to the following:

- Ensure QC criteria are met.
- The concentration of Microcystin in a sample is determined by comparing the average sample absorbance to the standard curve. This value must then be multiplied by the dilution factor used.
- In the event that the average absorbance of the sample is lower than the highest calibrator, further dilute the sample extract in laboratory quality distilled or deionized water to fit into the standard curve and retest alongside the calibrators and controls. Sample results must be multiplied by the total dilution factor used.

Technical Assistance

For questions regarding this kit or for additional information about Beacon products, contact us.

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Safety

Stop Solution is 1N hydrochloric acid. Handle with care. To receive complete safety information on this product, contact Beacon Analytical Systems, Inc., and request Safety Data Sheets.

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