

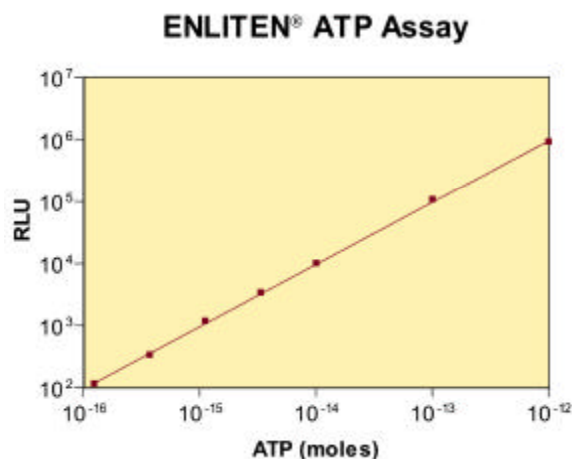
# A Modulus™ Method for Promega's ENLITEN® ATP Assay System



## 1. INTRODUCTION

The Modulus™ Single Tube combined with Promega's ENLITEN® ATP Assay System Bioluminescence Detection Kit provides a sensitive, rapid method for measuring adenosine 5'-triphosphate (ATP). A reliable method for ATP detection is useful for studying enzymes that produce or degrade ATP. ATP detection also provides an indirect measurement of microbes, food residue, or other biological material.

The ATP-dependent oxidation of luciferin by luciferase produces light that is measured by the Modulus Luminescence Module. When ATP is the limiting factor in the luciferin oxidation reaction, the amount of light produced is proportional to the ATP concentration of the sample. The limit of detection for ATP using the Modulus and ENLITEN® detection assay is approximately 0.1 femtomole (Figure 1.)



**Figure 1.** A standard curve obtained using the Modulus with a Luminescence Module and the ENLITEN® ATP Assay System. 10 mL of ATP Standard diluted in ATP-free water was added to a microfuge tube containing 100 mL of rL/L Reagent.

When designing your ATP assay with the ENLITEN® kit, it is important to remember several key aspects of the luciferase reaction. First, the rL/L reacts optimally at a pH of 7.73 and 23–25°C. Salts and many nonionic chemicals will impair light production. Therefore, exercise caution when selecting buffers and ATP extractants for the sample preparations. It is also recommended to check for ATP contamination in your assay buffer by comparing the RLU values obtained with your assay buffer and rL/L to those of ATP-Free Water.

Within your sample, there may exist several different ATP stores. For example, in cell preparations, ATP may be present in the media. Treatment of cells may alter the amount of ATP in the media.

If you wish to measure the ATP content in microorganisms or cells, you will need to extract the ATP before analysis. Trichloroacetic acid (TCA) is recommended because it releases ATP from cells and inactivates ATP-degrading enzymes. Because TCA inhibits the luciferase reaction, it is important to determine the minimum amount of TCA necessary. Generally, 0.5% to 2.5% TCA (final concentration) is sufficient for ATP extraction from bacteria and eukaryotic cells.

Preparing a standard curve is a useful tool for proper ATP analysis of your samples. A standard curve should be prepared daily or whenever a new aliquot of the rL/L Reagent is used. The standard curve should include varying concentrations of ATP diluted in your assay buffer. The composition of this buffer should be identical to the composition of the buffer for your samples.

Keeping these considerations in mind will help you obtain the most accurate ATP analysis.

## 2. MATERIALS REQUIRED

From Turner BioSystems:

- ❖ Modulus™ Single Tube (P/N 9200-001 or 9200-002)

From Promega:

- ❖ ENLITEN® ATP Assay System Bioluminescence Detection Kit for ATP (P/N FF2000) containing 1 vial rLuciferase/Luciferin (rL/L) Reagent, 12 mL Reconstitution Buffer, 1 vial ATP Standard ( $1 \times 10^{-7}$  M), 25 mL ATP-free Water

Other Materials:

- ❖ Adjustable p1000 Volume Pipetter and Tips
- ❖ Adjustable p200 Volume Pipetter and Tips
- ❖ Assay buffer
- ❖ 1.5 mL microfuge tubes
- ❖ Test tube rack
- ❖ Nitrile, vinyl, or latex gloves

**NOTE:** Individuals sensitive to latex should use vinyl or nitrile gloves.

Storage Conditions: The rL/L Reagent and Reconstitution Buffer must be stored at  $-20^{\circ}\text{C}$  prior to reconstitution. Store the ATP Standard at  $-20^{\circ}\text{C}$ .

## 3. REAGENT AND STANDARD PREPARATION

**NOTE:** ATP contamination will cause erroneous results and increase background. **Wear gloves to prevent ATP contamination** from your hands during reagent preparation and while performing the assay.

3.1 Equilibrate the sample buffer to room temperature.

3.2 Lightly tap the vial of the rL/L Reagent before opening to ensure the lyophilized material collects at the bottom of the vial.

3.3 Transfer the contents of the vial of rL/L Reconstitution Buffer to the vial of the rL/L Reagent.

3.4 Replace the stopper and slowly invert the vial several times to dissolve the contents. **Do not shake the reagent bottle.**

3.5 Allow the reconstituted rL/L Reagent to stand at room temperature for 1 hour before use.

**NOTE:** Reconstituted rL/L Reagent may be kept for 8 hours at room temperature. Store at  $-20^{\circ}\text{C}$  in single-use aliquots for long-term storage.

3.6 Prepare a 10-fold serial dilution of the ATP standard ( $1 \times 10^{-7}$  M) in assay buffer. Dilute to  $1 \times 10^{-11}$  M ATP.

## 4. INSTRUMENT SET-UP

4.1 Power OFF the Modulus™ Single Tube. Install the Luminescence Module into the sample compartment.

4.2 Turn ON the Modulus Single Tube and allow the instrument to warm up for 5 minutes.

4.3 Create a new protocol with a 10-second integration for the measurement time.

4.4 Save the protocol for future use (optional).

## 5. ATP STANDARD CURVE

5.1 Add 10  $\mu\text{L}$  of assay buffer to a microfuge tube containing 100  $\mu\text{L}$  of rL/L Reagent.

5.2 Immediately place the microfuge tube into the Modulus Luminescence Module and close the lid.

5.3 Touch “Measure Luminescence” to begin measurement.

5.4 Record the value and repeat as many times as necessary to obtain your background level on your assay buffer. Subtract the average of these background values from subsequent measurements.

5.5 From the dilutions obtained in step 3.6, add 10  $\mu\text{L}$  of the lowest concentration ( $1 \times 10^{-11}$  M) of ATP to a microfuge tube containing 100  $\mu\text{L}$  rL/L Reagent.

5.6 Immediately place the microfuge tube into the Modulus Luminescence Module and close the lid.

5.7 Touch "Measure Luminescence" to begin measurement.

5.8 Record this value and repeat with the next concentration of ATP. Continue for a total of five concentrations from  $1 \times 10^{-11}$  to  $1 \times 10^{-7}$  M ATP.

## 6. SAMPLE ANALYSIS

6.1 Add 10  $\mu$ L of your sample prepared in the assay buffer to a labeled test tube containing 100  $\mu$ L rL/L reagent.

6.2 Touch "Measure Luminescence."

6.3 Record the value and repeat steps 6.1–6.2 for your remaining samples.

6.4 Plot the RLU values of your samples along with the RLU values obtained during the standard curve procedure to determine the concentration of ATP in your samples.

## 7. ABOUT PROMEGA CORPORATION

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## 8. ABOUT TURNER BIOSYSTEMS, INC.

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