AMPK (A1/B1/G1) Kinase Assay

By Kevin Hsiao, M.S., Hicham Zegzouti, Ph.D., Jolanta Vidugiriene, Ph.D., and Said A. Goueli, Ph.D., Promega Corporation

Scientific Background:

AMP-activated protein kinase (AMPK) exhibits a key role as a master regulator of cellular energy homeostasis (1). AMPK exists as a heterotrimeric complex composed of a catalytic α subunit and regulatory β and γ subunits. Binding of AMP to the γ subunit allosterically activates the complex. AMPK is activated in response to stresses that deplete cellular ATP (low glucose, hypoxia and ischemia) (2) and via signaling pathways in response to adiponectin, leptin and CAMKKβ.


ADP-Glo™ Kinase Assay

Description

ADP-Glo™ Kinase Assay is a luminescent kinase assay that measures ADP formed from a kinase reaction; ADP is converted into ATP, which is converted into light by Ultra-Glo™ Luciferase (Fig. 1). The luminescent signal positively correlates with ADP amount (Fig. 2) and kinase activity (Fig. 3A). The assay is well suited for measuring the effects chemical compounds have on the activity of a broad range of purified kinases—making it ideal for both primary screening as well as kinase selectivity profiling (Fig. 3B). The ADP-Glo™ Kinase Assay can be used to monitor the activity of virtually any ADP-generating enzyme (e.g., kinase or ATPase) using up to 1mM ATP.

Figure 1. Principle of the ADP-Glo™ Kinase Assay. The ATP remaining after completion of the kinase reaction is depleted prior to an ADP to ATP conversion step and quantitation of the newly synthesized ATP using luciferase/luciferin reaction.

Figure 2. Linearity of the ADP-Glo Kinase Assay. ATP-to-ADP conversion curve was prepared at 150µM ATP+ADP concentration range. This standard curve is used to calculate the amount of ADP formed in the kinase reaction. Z’ factors were determined using 200 replicates of each of the % conversions shown.
Protocol

- Dilute enzyme, substrate, ATP and inhibitors in Kinase Buffer.
- Add to the wells of 384 low volume plate:
  1 μl of inhibitor or (5% DMSO)
  2 μl of enzyme (defined from table 1)
  2 μl of substrate/ATP mix
- Incubate at room temperature for 60 minutes.

- Add 5 μl of ADP-Glo™ Reagent
- Incubate at room temperature for 40 minutes.
- Add 10 μl of Kinase Detection Reagent
- Incubate at room temperature for 30 minutes.
- Record luminescence (Integration time 0.5-1second).

Table 1. AMPK A1/B1/G1 Enzyme Titration. Data are shown as relative light units (RLU) that directly correlate to the amount of ADP produced. The correlation between the % of ATP converted to ADP and corresponding signal to background ratio is indicated for each kinase amount.

<table>
<thead>
<tr>
<th>AMPK A1/B1/G1, ng</th>
<th>200</th>
<th>100</th>
<th>50</th>
<th>25</th>
<th>12.5</th>
<th>6.25</th>
<th>3.13</th>
<th>1.56</th>
<th>0.78</th>
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<tbody>
<tr>
<td>RLU</td>
<td>808110</td>
<td>608535</td>
<td>523397</td>
<td>488251</td>
<td>487581</td>
<td>461541</td>
<td>394460</td>
<td>228759</td>
<td>117995</td>
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<tr>
<td>S/B</td>
<td>17.0</td>
<td>12.8</td>
<td>11.0</td>
<td>10.2</td>
<td>10.2</td>
<td>9.7</td>
<td>8.3</td>
<td>4.8</td>
<td>2.5</td>
<td>1</td>
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<tr>
<td>% Conversion</td>
<td>75.7</td>
<td>55.7</td>
<td>47.2</td>
<td>43.6</td>
<td>43.6</td>
<td>41.0</td>
<td>34.3</td>
<td>17.7</td>
<td>6.6</td>
<td>0</td>
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</table>

Figure 3. AMPK (A1/B1/G1) Kinase Assay Development: (A) AMPK enzyme was titrated using 150μM ATP and the luminescence signal generated from each of the amounts of the enzyme is shown. (B) Staurosporine dose response was created using 10ng of AMPK to determine the potency of the inhibitor (IC50).

Assay Components and Ordering Information:

<table>
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<tr>
<th>Products</th>
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<tr>
<td>ADP-Glo™ Kinase Assay</td>
<td>Promega</td>
<td>V9101</td>
</tr>
<tr>
<td>AMPK (A1/B1/G1) Kinase Enzyme System</td>
<td>Promega</td>
<td>V1921</td>
</tr>
<tr>
<td>ADP-Glo + AMPK (A1/B1/G1) Kinase Enzyme System</td>
<td>Promega</td>
<td>V9021</td>
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<tr>
<td>AMPK (A1/B1/G1) Kinase Buffer: 40mM Tris, 7.5; 20mM MgCl2; 0.1mg/ml BSA; 50μM DTT; 100μM AMP.</td>
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Promega Corporation • 2800 Woods Hollow Road • Madison, WI 53711-5399 USA • Telephone 608-274-4330 • Fax 608-277-2601

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