Pyruvate dehydrogenase Assay (PDH)

Cat. No. CB021
(100 Tests in 96-well plate)

Product Description

Pyruvate dehydrogenase (PDH) is the first component enzyme of the pyruvate dehydrogenase complex (PDC). As a key regulator of tricarboxylic acid (TCA) cycle flux, the PDC catalyzes the conversion of pyruvate into acetyl-CoA and regulates the entry of glucose-carbons into the TCA cycle. PDC deficiency is one of the most common neurodegenerative disorders associated with abnormal mitochondrial metabolism. This colorimetric assay is based on pyruvate dehydrogenase-catalyzed oxidation of pyruvate, where the resulting NADH can then convert a nearly colorless probe to a colored product. The intensity of the colored product is proportional to the amount of PDH in the sample, exhibiting maximum absorbance at 440nm.

Kit Components

- Assay buffer, 25 mL
- PDH positive control, 20 µL
- Developer (10X), 0.1 mL
- NAD, 2.0 mL
- WST, 3.91 mg
- Substrate, 1.6 mL
- Cofactor, 1.7 mL

Reagents and Positive Control Preparation

1. Diluted PDH positive control: Add 1 µl of PDH positive control into 9 µl assay buffer. Prepare diluted PDH positive control to a final volume of 10 µL/well in a 96-well flat bottom plate.
2. Developer solution (1X): dilute developer (10X) in assay buffer (1:10).
3. WST solution: reconstitute each vial of WST with 0.6 mL assay buffer. Vortex briefly and keep in the dark at -20°C until use. For longer storage, we suggest that you aliquot and store the reconstituted WST solution at -20°C, avoid repeated freeze/thaw cycles.

Procedure (96-well plate)

A. Preparation of test samples and blank

1. Cells or tissues can be homogenized in 4 volumes of the assay buffer. Centrifuge the samples at 10,000 ×g for 10 minutes at 4ºC to remove insoluble material. The soluble fraction may be assayed directly.
2. Samples should be serially diluted to make sure the readings are within the detection limitation range. Prepare test samples to a final volume of 10 µL/well in a 96-well flat bottom plate.
3. Prepare a blank by adding 10 µL assay buffer into one well of the 96-well flat bottom plate.

B. Working reagent preparation and measurements

1. Prepare appropriate volume of PDH assay working reagent based on the number of samples to be measured. For each well of reaction, prepare working reagent by mixing 22 µL assay buffer, 10 µL developer solution (1X), 20 µL NAD, 5 µL WST solution, 16 µL substrate, and 17 µL cofactor.

2. Add 90 µL of working reagent mix into each well of the 96-well plate containing the diluted PDH positive control, samples, and blank. Mix well immediately and start recording OD_{440nm} over 30 minute intervals, collecting data every 5 min. Figure 1 shows the data of diluted PDH positive control

C. Calculations

1. Determine the change in absorbance ΔOD_{440nm}/min by plotting the absorbance value at ΔOD_{440nm} as a function of reaction time to obtain the slope of the linear portion of the curve, as shown in Figure 2.

2. Calculate PDH activity using the following formula:

$$\text{PDH (U/ml)} = \frac{(\ OD_{440nm}/\text{min-blank}) \times 100\ \mu l}{1.94\ mM^{-1} \times 10\ \mu l} \times \text{sample dilution}$$

Note: The actual extinction coefficient of the formed WST-1 formazan at 440nm is 37 $mM^{-1}cm^{-1}$. This value has been adjusted for the path length of the solution in the 96-well plate.

Unit definition: One unit makes 1.0 µmol of WST-1 to WST-1 formazan per minute at pH 7.4 at 25 ºC

3. Use the formula to calculate PDH positive control activity:

$$\text{PDH positive control (U/ml)} = \frac{(0.0183\text{-}0.0024) \times 100\ \mu l}{1.94\ mM^{-1} \times 10\ \mu l} = 0.82\ \text{(U/ml)} \times 10 = X$$

Product Use

The PDH Assay kit measures the PDH activity of different types of samples, such as tissues and cell lysate. This product is for research purposes only and not for use in animals, humans, or diagnostic procedures.