

Glucose Dehydrogenase (GCDH) Activity Assay Kit

Note: Take two or three different samples for prediction before test.

Detection instrument: Spectrophotometer

Cat No: NA0675

Size: 50T/48S

Components:

Extract solution: 60 mL×1. Store at 4°C.

Reagent I: 50 mL×1. Store at 4°C.

Reagent II: Powder×1. Store at 4°C. Add 15 mL of Reagent I to dissolve it before use, and keep the unused reagent at 4°C.

Reagent III: Powder×2. Store at -20°C and protect from light. Add 5 mL of Reagent I into each bottle to dissolve it before use. It is recommended to store the reagent in a dark place at -20°C after repacking to avoid repeat freezing and thawing.

Product Description:

GCDH (EC 1.1.1.47) catalyzes D-glucose and NAD(P) to form D-Gluconic acid and NAD(P)H, which are mainly found in the liver of many microorganisms and higher animals. GCDH is an ideal enzyme for the preparation of high content fructooligosaccharide, and it is also a diagnostic enzyme for clinical blood glucose determination, which can be widely used in food industry and pharmaceutical industry. GCDH catalyzes the formation of d-Gluconic acid and NADH from D-glucose and NAD. The activity of glucose dehydrogenase can be reflected by the change of absorbance value of NADH at 340 nm.

Required material

Spectrophotometer, tabletop centrifuge, water bath, 1 mL quartz cuvette, transferpettor, mortar/homogenizer, ice and distilled water.

Procedure:

I. Extraction of crude enzyme solution:

Tissue sample:

The proportion of tissue mass (g): extraction solution volume (mL)=1:5~10 (it is recommended to weigh about 0.1g of tissue, add 1 mL of extraction solution), carry out homogenization in the ice bath. Centrifuge at 8000×g for 10 minutes at 4°C, take the supernatant and put it on ice for testing.

Bacteria/cells:

First, collect the cells/bacteria into the centrifuge tube, and then discard the supernatant after centrifugate. The proportion of the number of cells (10^4): the volume of the extraction solution (mL) is 500~1000:1 (it is recommended to add 1 mL of the extraction solution to 5 million cells/bacteria), break the cells/bacteria in the ice bath by ultrasonic (power 20% or 200W, ultrasonic 3s, interval 7s, total time 5 minutes). Then centrifuge at 8000 ×g for 10 minutes at 4°C, take the supernatant and put it on ice for testing.

Serum (plasma): Direct detection.

Determination procedure:

1. Preheat the spectrophotometer 30 minutes, adjust wavelength to 340 nm, set zero with distilled water.
2. Preparation of working solution: mix well according to the volume ratio of Reagent I : Reagent II: Reagent III = 4:3:2, and reserve. Preheat for 10 minutes at 37°C.
3. Operation table: add the following reagents into the 1 mL quartz cuvette respectively:

Reagent name (μL)	Blank tube (B)	Test tube (T)
Working solution	900	900
Distilled water	100	-
Sample	-	100

Add the working solution and start timing, mix it immediately, measure the absorbance value A₁ at 340 nm for 10s, quickly put it in 37°C-water bath or incubator for 1 minutes. Take it out and dry it quickly, measured the absorbance value A₂ at 70s, calculate the $\Delta A_T = A_{2T} - A_{1T}$, $\Delta A_B = A_{2B} - A_{1B}$, $\Delta A = \Delta A_T - \Delta A_B$. Blank tube only needs to be done 1-2 times.

II. GCDH enzyme activity calculation:

1. Calculate according to micro quartz cuvette:

- 1) Calculated by protein concentration:

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalyzes the generation of 1 nmol of NADH per minute every per milligram of protein.

$$\text{The activity of GCDH(U/mg prot)} = \Delta A \div (\epsilon \times d) \times 10^9 \times V_{RT} \div (V_S \times C_{pr}) \div T = 1607.7 \times \Delta A \div C_{pr}$$

- 2) Calculated by sample weight

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalyzes the generation of 1 nmol of NADH per minute every gram of sample.

$$\text{The activity of GCDH(U/g fresh weight)} = \Delta A \div (\epsilon \times d) \times 10^9 \times V_{RT} \div (V_S \times W \div V_{ST}) \div T = 1607.7 \times \Delta A \div W$$

- 3) Calculated by bacteria or cell amount:

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalyzes the generation of 1 nmol of NADH per minute every 10⁴ bacteria/cells.

$$\text{The activity of GCDH(U/10}^4 \text{ cell)} = \Delta A \div (\epsilon \times d) \times 10^9 \times V_{RT} \div (V_S \div V_{ST} \times N) \div T = 1607.7 \times \Delta A \div N$$

- 4) Calculated by liquid volume

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalyzes the generation of 1 nmol of NADH per minute every milliliter sample.

$$\text{The activity of GCDH(U/mL)} = \Delta A \div (\epsilon \times d) \times 10^9 \times V_{RV} \div V_S \div T = 1607.7 \times \Delta A$$

ε: Molar extinction coefficient of NADH, 6.22×10³ L/mol/cm;

d: Optical diameter of cuvette, 1 cm;

10⁹: Unit conversion coefficient, 1 mol = 10⁹ nmol;

V_{RV}: The total volume of the reaction system, 1×10⁻³ L;

V_S: The volume of the sample in the reaction system, 0.1 mL;

V_{ST} : The volume of the added extract, 1 mL;
Cpr: Supernatant protein concentration, mg/mL;
W: Sample weight, g;
T: React time, 1 minute;
N: Amount of Bacteria/cell, 10^4 cells as unit;

Note

1. Put the supernatant of sample extraction on ice to be tested, and it is recommended to complete the test within the same day after sample extraction.
2. When A_1 or A_2 is greater than 1, it is recommended to dilute the sample with extraction solution before determination.
3. When ΔA is greater than 1, it is recommended to dilute the sample with extraction solution before determination.

Experimental example:

1. Take 0.1g liver and add 1 mL of Extract solution for homogenate. After taking the supernatant, operate according to the determination steps. Measure with micro quartz cuvette and calculate $\Delta A_T = A_{2T} - A_{1T} = 0.726 - 0.682 = 0.044$, $\Delta A_B = A_{2B} - A_{1B} = 0.031 - 0.031 = 0$, $\Delta A = \Delta A_T - \Delta A_B = 0.044 - 0 = 0.044$.
GCDH activity (U/g mass) = $1607.7 \times \Delta A \div W = 1607.7 \times 0.044 \div 0.1 = 707.388$ U/g mass.

Related Products:

NA0683/NA0442 Neutral Xylanase Activity Assay Kit
NA0681/NA0439 β -xylosidase Activity Assay Kit