

# Alcohol Dehydrogenase (ADH) Activity Assay Kit

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

**Detection equipment:** Spectrophotometer/Microplate reader

**Cat No:** BC1085

**Size:** 100T/96S

## Components

Extract solution: 100 mL×1, store at 4°C. Contains insoluble substances, shake well before use;

Reagent I: 20 mL×1, store at 4°C. Transfer Reagent II to Reagent I when the solution will be used, split charging and store at -20°C.

Reagent II: Powder×1, store at -20°C.

Reagent III: 2 mL×1, store at 4°C.

## Description

Alcohol dehydrogenase (ADH) is a key enzyme in the metabolism of short chain alcohols. It catalyzes the reversible conversion of ethanol and acetaldehyde, and plays an important role in many physiological processes. In mammals, ADH is mainly produced in the liver. Liver damage causes ADH to be released into serum. The activity of serum ADH reflects whether the liver function is abnormal.

ADH catalyzes the reduction of acetaldehyde by NADH to ethanol and NAD<sup>+</sup>. NADH has an absorption peak at 340 nm but NAD<sup>+</sup> not, the activity of ADH is calculated by measuring the rate of absorbance decline at 340 nm.

## Required but not provided

Mortar/homogenizer, ice, low temperature centrifuge, spectrophotometer/microplate reader, micro quartz cuvette/96 well flat-bottom plate (UV plate), adjustable pipette and distilled water.

## Protocol

### I. Crude enzyme extraction:

#### 1. Tissue:

The mass of tissue (g): the volume of Extract solution (mL) of 1:5~10 (it is recommended to weigh about 0.1 g of tissue and add 1 mL of Extract solution) for ice bath homogenate. Centrifuge at 16000 ×g for 20 minutes at 4°C, take the supernatant and place it on ice for testing.

2. Bacteria and fungi: the number of cells (10<sup>4</sup>): the volume of Extract solution (mL) is 500~1000:1 (1 mL of Extract solution is recommended to be added to 5 million cells), the cells are broken by ultrasonic wave in ice bath (Power: 300W, ultrasonic wave: 3s, interval: 7s, total time: 3 minutes). Centrifuge at 16000 ×g for 20 minutes at 4°C, take the supernatant and place it on ice for test.

#### 3. Serum and other Liquids:

Direct determination.

## II. Procedure

1. Preheat spectrophotometer/microplate reader for 30 minutes, adjust wavelength to 340 nm, set zero with distilled water.

2. Keep the Reagent I in a 25°C water bath for more than 30 minutes.

3. Blank tube:

Add 20 µL of distilled water, 160 µL of Reagent I and 20 µL of Reagent III to the micro quartz cuvette/96 well flat-bottom plate (UV plate) in turn. Mix them quickly and measure the change of absorption value at 340 nm, record the absorption value at 15 s and 75 s respectively, record them as A1 and A2.  $\Delta A_B = A1 - A2$ . Only one or two blank tubes need to be test.

4. Test tube:

Add 20 µL of supernatant, 160 µL of Reagent I and 20 µL of Reagent III to the micro quartz cuvette/96 well flat-bottom plate (UV plate) in turn. Mix them quickly and measure the change of absorption value at 340 nm, record the absorption value at 15 s and 75 s respectively, record them as A3 and A4.  $\Delta A_T = A3 - A4$ .

## III. Calculation of ADH activity

### A. The calculation formula according to the determination of micro quartz cuvette

(1) Protein concentration

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1 µmol NADH per minute at 25°C every milligram tissue protein.

$$\text{ADH } (\mu\text{mol}/\text{min}/\text{mg prot}) = [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (C_{pr} \times V_{SV}) \div T = 1.61 \times (\Delta A_T - \Delta A_B) \div C_{pr}$$

(2) Sample weight

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1 µmol NADH per minute at 25°C every gram tissue.

$$\begin{aligned} \text{ADH } (\mu\text{mol}/\text{g fresh weight}) &= [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (V_{SV} \div V_{STV} \times W) \div T \\ &= 1.61 \times (\Delta A_T - \Delta A_B) \div W \end{aligned}$$

(3) Cells

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1 µmol NADH per minute at 25°C every 10 thousand cells.

$$\begin{aligned} \text{ADH } (\mu\text{mol}/10^4 \text{ cell}) &= [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (V_{SV} \div V_{STV} \times N) \div T \\ &= 1.61 \times (\Delta A_T - \Delta A_B) \div N \end{aligned}$$

(4) Liquids

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1 µmol NADH per minute at 25°C every milliliter liquid.

$$\begin{aligned} \text{ADH } (\mu\text{mol}/\text{mL liquids}) &= [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div V_{SV} \div T \\ &= 1.61 \times (\Delta A_T - \Delta A_B) \end{aligned}$$

$\epsilon$ : The molar extinction coefficient of NADH,  $6.22 \times 10^3$  L/mol/cm;

$d$ : Cuvette light diameter, 1 cm;

$V_{RV}$ : The total volume of reaction system,  $200 \mu\text{L} = 2 \times 10^{-4}$  L;

$10^6$ :  $1 \text{ mol} = 1 \times 10^6 \mu\text{mol}$ ;

$V_{SV}$ : The volume of sample, 20  $\mu\text{L}$ =0.02 mL;

$V_{STV}$ : The volume of extract solution, 1 mL;

T: Reaction time, 1 minute;

Cpr: Sample protein concentration, mg/mL;

W: Sample weight, g;

N: The number of cells.

## **B. The calculation formula according to the determination of 96 well plate:**

### (1) Protein concentration

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1  $\mu\text{mol}$  NADH per minute at 25°C every milligram tissue protein.

$$\text{ADH } (\mu\text{mol}/\text{min}/\text{mg prot}) = [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (Cpr \times V_{SV}) \div T \\ = 2.68 \times (\Delta A_T - \Delta A_B) \div Cpr$$

### (2) Sample weight

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1  $\mu\text{mol}$  NADH per minute at 25°C every gram tissue.

$$\text{ADH } (\mu\text{mol}/\text{g fresh weight}) = [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (V_{SV} \div V_{STV} \times W) \div T \\ = 2.68 \times (\Delta A_T - \Delta A_B) \div W$$

### (3) Cells

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1  $\mu\text{mol}$  NADH per minute at 25°C every 10 thousand cells.

$$\text{ADH } (\mu\text{mol}/10^4 \text{ cell}) = [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div (V_{SV} \div V_{STV} \times N) \div T \\ = 2.68 \times (\Delta A_T - \Delta A_B) \div N$$

### (4) Liquids

Unit definition: One unit of enzyme activity is defined as the amount of enzyme catalyzes the oxidation of 1  $\mu\text{mol}$  NADH per minute at 25°C every milliliter liquid.

$$\text{ADH } (\mu\text{mol}/\text{mL liquid}) = [(\Delta A_T - \Delta A_B) \div (\epsilon \times d) \times V_{RV} \times 10^6] \div V_{SV} \div T \\ = 2.68 \times (\Delta A_T - \Delta A_B)$$

$\epsilon$ : The molar extinction coefficient of NADH,  $6.22 \times 10^3$  L/mol/cm;

d: Cuvette light diameter, 0.6 cm;

$V_{RV}$ : The total volume of reaction system, 200  $\mu\text{L}$ = $2 \times 10^{-4}$ L;

$10^6$ : 1 mol= $1 \times 10^6$   $\mu\text{mol}$ ;

Cpr: Sample protein concentration, mg/mL;

W: Sample weight, g;

$V_{SV}$ : The volume of sample, 20  $\mu\text{L}$ =0.02 mL;

$V_{STV}$ : The volume of extract solution, 1 mL;

T: Reaction time, 1 minute;

N: The number of cells.

## **Note:**

The protein concentration of supernatant needs to be determined separately. It is recommended to use BCA

protein content determination kit of our company.

**Experimental instances:**

1. Take 0.1g of rat liver, add 1mL of extract solution, homogenate and grind. Take the supernatant and detect according to the measured steps. Calculate  $\Delta A_B = A1 - A2 = 0.5718 - 0.5648 = 0.007$ ,  $\Delta A_T = A3 - A4 = 0.8351 - 0.5341 = 0.301$ , calculate the enzyme activity according to sample weight:

$$\text{ADH (U/g weight)} = 1.61 \times (\Delta A_T - \Delta A_B) \div W = 1.61 \times (0.301 - 0.007) \div 0.1 = 4.7334 \text{ U/g weight.}$$

2. Take serum of horse to detect directly, calculate  $\Delta A_B = A1 - A2 = 0.5718 - 0.5648 = 0.007$ ,  $\Delta A_T = A3 - A4 = 0.6369 - 0.6036 = 0.0333$ , calculate the enzyme activity according to volume of serum:

$$\text{ADH ((U/mL)} = 1.61 \times (\Delta A_T - \Delta A_B) = 1.61 \times (0.0333 - 0.007) = 0.042343 \text{ U/mL.}$$

3. Take serum of mouse to detect directly, calculate  $\Delta A_B = A1 - A2 = 0.5718 - 0.5648 = 0.007$ ,  $\Delta A_T = A3 - A4 = 0.7381 - 0.7093 = 0.0288$ , calculate the enzyme activity according to volume of serum:

$$\text{ADH (U/mL)} = 1.61 \times (\Delta A_T - \Delta A_B) = 1.61 \times (0.0288 - 0.007) = 0.035098 \text{ U/mL.}$$

**Related products:**

BC0590/BC0595	Free fatty Acids(FFA) Assay Kit
BC2340/BC2345	Lipase(LPS) Activity Assay Kit
BC0320/BC0325	Plant Lipoxygenase (LOX) Assay Kit
BC0750/BC0755	Aldehyde Dehydrogenase (ALDH)