

Tartrate Resistant Acid Phosphatase Activity Assay Kit

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

Operation Equipment: Spectrophotometer

Cat No: NA0137

Size:50T/24S

Components:

Extract solution:30 mL×1. Storage at 2-8°C.

Reagent I: 8 mL×1. Storage at 2-8°C.

Reagent II: powder×1,. Storage at 2-8°C. Before use, add 3.5mL of reagent I, dissolve it fully. If the reagent does not dissolve sufficiently, heat the reagent to 50°C to promote its dissolution. Unused reagents can be stored at 2-8°C for 8 weeks.

Reagent III: powder×1,. Storage at -20°C. Before use, add 3.5mL of water, dissolve it fully. Unused reagents can be stored at -20°C for 4 weeks. Avoid repeated freezing and thawing.

Reagent IV: powder×1. Storage at 2-8°C. Before use, add 5.5mL of water, dissolve it fully. Unused reagents can be stored at 2-8°C for 4 weeks.

Reagent V : 0.5 mL×1. Storage at 2-8°C. According to the ratio of reagent V: distilled water = 1:9 according to the number of samples before use.

Reagent VI: 3.5 mL×1. Storage at 2-8°C.

Reagent VII: 3.5 mL×1. Storage at 2-8°C.

Reagent VIII: 40 mL×1. Storage at 2-8°C.

Standard: 1 mL×1. Storage at 2-8°C. 5 μmol/mL phenol standard solution. Before use, take 100 μL of 5 μmol/mL phenol standard solution in an EP tube, add 700 μL of distilled water and mix thoroughly to make 0.625 μmol/mL phenol standard solution..

Product Description:

Tartrate resistant acid phosphatase (TRAP) is a characteristic enzyme of osteoclasts. TRAP is involved in the degradation of solid calcium and phosphorus mineralized substrates in the bone matrix, and its expression and secretion are closely related to osteoclast function.

In the presence of tartaric acid, the activity of anti-tartaric acid phosphatase is not inhibited, whereas the activity of other acid phosphatases is inhibited. Under acidic conditions, antitartaric acid phosphatase catalyzes the production of p-nitrophenol from PNPP. The p-nitrophenol appears yellow under alkaline conditions and can be detected by absorbance at 400 nm. The darker the yellow color of the product, the higher the anti-tartaric acid phosphatase activity, and vice versa, the lower the enzyme activity.

Reagents and Equipment Required but Not Provided:

Spectrophotometer, centrifuge, water bath/incubator, adjustable pipette, 1mL glass cuvette, mortar/homogenizer/cell sonicator, ice and distilled water

Procedure

I. Extraction of crude enzyme solution:

a. Tissue

The ratio of tissue mass (g): the volume of Extract solution (mL) is 1: 5~10 (it is suggested to take about 0.1 g of tissue and add 1mL of Extract solution), ice-bath homogenate. Centrifuge at 8000 g for 10 minutes at 4°C, take the supernatant and placed on the ice for test.

b. Bacteria or cells

The ratio of bacteria/cell amount (10^4): the volume of Extract solution (mL) is 500~1000:1(it is suggested to take about 5 million bacteria/cells and add 1 mL of Extract solution). Bacteria/cell is split by ultrasonic (placed on ice, 200 W, work time 3 s, interval 10 s, repeat 30 times). Centrifuge at 8000g for 10 minutes at 4°C, take the supernatant and placed on the ice for test.

c. Serum (plasma) sample: Detect sample directly. (If the solution is turbid, centrifuge to take the supernatant and then measure)

II. Determination procedure

a. Preheat the spectrophotometer 30 minutes, adjust wavelength to 400 nm, set zero with distilled water.

b. Then operate table.(Add the following reagents to the EP tube)

Reagent name (μL)	Test tube(T)	Control tube(C)	Standard tube(S)	Blank tube(B)
sample	50	50	-	-
Standard	-	-	50	-
distilled water	-	50	-	50
Reagent I	50	50	50	50
Reagent II	50	50	50	50
Reagent III	50	-	50	50
Reagent IV	50	50	50	50
Reagent V	50	50	50	50
Reagent VI	50	50	50	50
Reagent VII	50	50	50	50
	Reaction for 60 min at 37°C protected from light		-	-
Reagent VIII	600	600	600	600

After mixing, the absorbance at 400 nm was measured and recorded as A_t , A_c , A_s , and A_b . $\Delta A_t = A_t - A_c$, $\Delta A_s = A_s - A_b$. (Standard and standard blank tubes should be done only 1-2 times.)

III. Calculation formula

(1) Calculated by sample weight

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalytic production of 1 nmol phenol per gram of tissue per minute at 37°C .

TRAP activity (U/g mass) = $(\Delta A_t \times C_s \div \Delta A_s) \times V_s \div (W \div V_{se} \times V_s) \div T \times 10^3 \times F = 10.42 \times \Delta A_t \div \Delta A_s \div W \times F$

(2) Calculated by Protein concentration:

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalytic production of 1 nmol phenol per mg protein of tissue per minute at 37°C .

$$\text{TRAP activity (U/mg prot)} = (\Delta A_t \times C_s \div \Delta A_s) \times V_s \div (C_{pr} \times V_s) \div T \times 10^3 \times F = 10.42 \times \Delta A_t \div \Delta A_s \div C_{pr} \times F$$

(3) Calculated by Cell amount

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalytic production of 1 nmol phenol per 10⁴ cells of tissue per minute at 37°C .

$$\text{TRAP activity (U/10}^4 \text{ cell)} = (\Delta A_t \times C_s \div \Delta A_s) \times V_s \div (N \div V_{se} \times V_s) \div T \times 10^3 \times F = 10.42 \times \Delta A_t \div \Delta A_s \times F$$

(4) Calculated by the volume of culture medium

Unit definition: One unit of enzyme activity is defined as the amount of enzyme that catalytic production of 1 nmol phenol every milliliter per minute at 37°C.

$$\text{TRAP activity (U/mL)} = (\Delta A_t \times C_s \div \Delta A_s) \times V_s \div V_s \div T \times 10^3 \times F = 10.42 \times \Delta A_t \div \Delta A_s \times F$$

Cs: phenol standard solution 0.625 μmol/mL ;Vs :Sample volume in the reaction system 0.05mL ;Vse : volume of extract, mL ;T :Reaction time 60min ;Cpr :Sample protein concentration mg/mL ;W :Sample weight, mg ;10³: Unit conversion factor , 1μmol/mL=10³nmol/mL; N: Total number of bacteria or cells; F: Sample dilution factor.

Note:

1. If At or ΔAt is greater than 1.2, the sample can be diluted with distilled water or the enzymatic reaction time at 37°C can be shortened; ΔAt is less than 0.01, the sample can be increased or the enzymatic reaction time at 37°C can be extended. The calculation formula was modified simultaneously for the final calculation.

Experimental example:

1. Weigh 0.1006g of rabbit liver tissue, add 1mL of extract for ice bath homogenization, dilute the supernatant 2 times and follow the assay steps, measure with a 1mL glass cuvette to calculate ΔAt = At - Ac = 0.824 - 0.038 = 0.786, ΔAs = As - Ab = 0.653 - 0.033 = 0.620, bring into the formula Calculation.

$$\text{TRAP activity (U/g mass)} = 10.42 \times \Delta A_t \div \Delta A_s \div W \times F = 262.622 \text{ U/g mass}$$

2. Weigh 0.1000g of bamboo leaves, add 1mL of extract for ice bath homogenization, dilute the supernatant 8 times and follow the assay procedure, measure with a 1mL glass cuvette to calculate ΔAt = At - Ac = 0.656 - 0.045 = 0.611, ΔAs = As - Ab = 0.653 - 0.033 = 0.620, bring into the formula to calculate.

$$\text{TRAP activity (U/g mass)} = 10.42 \times \Delta A_t \div \Delta A_s \div W \times F = 821.499 \text{ U/g mass}$$

3. 0.05 mL of human serum was aspirated and operated according to the assay procedure, measured with a 1 mL glass cuvette to calculate ΔAt = At - Ac = 0.197 - 0.157 = 0.040, ΔAs = As - Ab = 0.653 - 0.033 = 0.620, and brought into the formula to calculate.

$$\text{TRAP activity (U/mL)} = 10.42 \times \Delta A_t \div \Delta A_s \times F = 0.672 \text{ U/mL}$$

Reference.:

[1] Megat R, Wahab A, Dasor M M, et al. Crevicular tartrate resistant acid phosphatase activity and rate of tooth movement under different continuous force applications[J]. African journal of pharmacy and pharmacology, 2011, 5(20):2213-2219.

[2] Natas̃a Mitic', Mohsen Valizadeh, Eleanor W.W. Leung, et al. Human tartrate-resistant acid phosphatase becomes an effective ATPase upon proteolytic activation [J]. Archives of Biochemistry and Biophysics 439 (2005) 154–164.

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