

## Superoxide Dismutases (SOD) Activity Colorimetric Assay Kit

Cat #: orb1173252 (manual)

### Product Features

**Product name:** Superoxide Dismutases (SOD) Activity Colorimetric Assay Kit

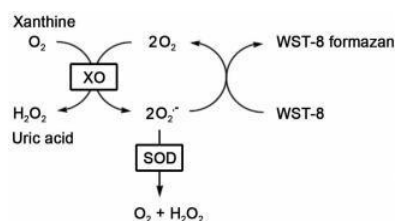
**Catalog number:** orb1173252

**Sample Types:** Serum, Plasma, Animal and Plant Tissues, Cells, Bacteria, Fungus

**Storage:** Stored at -20°C for 6 months, protected from light

### Assay Principle

Superoxide dismutases (SOD, EC1.15.1.1) are enzymes that catalyze the dismutation of superoxide anion into  $O_2$  and  $H_2O_2$ . They are an important antioxidant defense against the toxicity of superoxide radical in all cells exposed to  $O_2$ . Aberrant SOD activities have been linked to diseases such as amyotrophic lateral sclerosis, perinatal lethality, neural disorders and cancer. There are three major families of superoxide dismutase: Cu/Zn, Fe/Mn, and the Ni type. Three forms of superoxide dismutase are present in humans. SOD1 is located in the cytoplasm, SOD2 in the mitochondria, and SOD3 is extracellular. Superoxide Dismutases (SOD) Activity Colorimetric Assay Kit provides a simple and easy assay for the quantitative determination of SOD enzyme activity in serum, plasma, animal and plant tissues, cells lysates and other biological fluids. In the assay, superoxide anion ( $O_2^-$ ) is provided by xanthine oxidase (XO) catalyzed reaction.  $O_2^-$  reacts with a tetrazolium salt WST-8 dye to form a water-soluble colored formazan product. SOD scavenges the  $O_2^-$  thus less  $O_2^-$  is available for the chromogenic reaction. This inhibition activity of SOD is measured by colorimetric method at OD 450 nm. The activity of SOD was negatively correlated with the amount of formazan.



### Kit Components

Kit components	Size		Storage conditions
	48 T	96 T	
Assay Buffer	18 mL	36 mL	4°C
Sample Diluent	18 mL	36 mL	4°C
Lysis Buffer (5×)	12 mL	24 mL	4°C
WST-8	0.7 mL	1.4 mL	-20°C, protected from light
Enhancer	130 $\mu$ L	260 $\mu$ L	-20°C, protected from light

Xanthine Oxidase	130 $\mu$ L	260 $\mu$ L	-20°C
Xanthine	1.3 mL	1.3 mL $\times$ 2	-20°C

Note: Before formal testing, it is recommended to select 2-3 samples with large expected differences for pre-experiment.

### Materials Required but Not Supplied

- Microplate reader or visible spectrophotometer capable of measuring absorbance at 450 nm
- 96-well plate or microglass cuvette, precision pipettes, disposable pipette tips
- Incubator, centrifuge
- Deionized water
- Dounce homogenizer (for tissue samples)

### Reagent Preparation

**Note:** Briefly centrifuge small vials at low speed prior to opening.

**Assay Buffer:** Ready to use as supplied. Equilibrate to room temperature before use. Store at 4°C.

**Sample Diluent:** Ready to use as supplied. Equilibrate to room temperature before use. Store at 4°C.

**1 $\times$ Lysis Buffer:** Equilibrate to room temperature before use. Dilute Lysis Buffer (5 $\times$ ) with deionized water to 1 $\times$ Lysis Buffer. Store at 4°C.

**WST-8:** Ready to use as supplied. Keep on ice protected from light during the assay. Store aliquots at -20°C, protected from light.

**Enhancer:** Ready to use as supplied. Keep on ice protected from light during the assay. Store aliquots at -20°C, protected from light.

Note: Enhancer is normally a magenta solution.

Xanthine: Ready to use as supplied. Keep on ice during the assay. Store aliquots at -20°C. The Xanthine reagent may appear to be turbid. Briefly vortex this tube before pipetting.

Working Xanthine Oxidase: Xanthine Oxidase packaged and stored at -20°C. Take an appropriate amount and dilute Xanthine Oxidase 20 times with Sample Diluent before use. Keep on ice during the assay, protected from light.

Working Reagent: Prepare before use. For each well, mix 148  $\mu$ L Assay Buffer, 10  $\mu$ L Xanthine, 5  $\mu$ L WST-8 and 1  $\mu$ L Enhancer.

### Sample Preparation

1. Animal Tissues: Weigh 0.1 g tissue, add 1 mL 1 $\times$ Lysis Buffer and homogenize on ice. Centrifuge at 12,000 g at 4°C for 5 min, use supernatant for detection.
2. Cells, bacteria or fungi: Collect 5 $\times$ 10<sup>6</sup> cells, bacteria or fungi into the centrifuge tube, wash cells, bacteria or fungi with cold PBS, centrifuge at 800 g for 2 min, discard the supernatant. add 1 mL of cold 1 $\times$ Lysis Buffer, and ultrasonic break on ice for 3 min (power 30% or 300 W, ultrasonic 3 s, interval 7 s). Centrifuge at 12,000g for 5 min at 4°C, use supernatant for detection.

**Note:** If it is desired to determine cytosolic and mitochondrial SOD activities separately, tissue/cell samples can be prepared according to Mattiazzi et al (2002). JBC 277:29626-33.

3. Serum, Plasma: Serum is collected according to conventional methods, and diluted by Sample Diluent for detection; Blood is collected with anticoagulants and mix upside down. Centrifuge at 4°C, 600 g for 10 min, transfer the supernatant to another new tube and diluted by Sample Diluent for detection.
4. Plant Tissues: Weigh 0.1 g tissue, add 1 mL of cold 1×Lysis Buffer, and ultrasonic break on ice for 3 min (power 30% or 300 W, ultrasonic 3 s, interval 7 s). Centrifuge at 12,000g for 5 min at 4°C, use supernatant for detection.

**Note:** It is recommended to use fresh samples. If the experiment is not conducted immediately, the samples can be stored at -80°C for 1 month. Processed samples must be tested on the same day. During the measurement process, the sample is placed on ice to prevent denaturation and inactivation. For additional measurement, it is recommended to use Protein Quantification Kit (BCA Assay), Cat # orb1147876.

### Assay Procedure

1. Preheat the microplate reader or visible spectrophotometer for more than 30 min and adjust the wavelength to 450 nm. Visible spectrophotometer was returned to zero with deionized water.
2. Incubate the Working Reagent at 37°C (for mammals) or 25°C (for other species) for more than 5 min before measurement.
3. Add the following reagents to the 96-well plate or microglass cuvette:

Reagent	Sample well (μL)	Sample Control well (μL)	Blank well (μL)	Blank Control well (μL)
Sample	20	20	0	0
Working Xanthine Oxidase	40	0	40	0
Sample Diluent	0	40	20	60
Working Reagent	164	164	164	164

4. Mix well, incubate at 37 °C (for mammals) or 25 °C (for other species) for 30 min, read optical density at 450 nm. Finally, calculate  $\Delta A_{\text{Sample}} = A_{\text{Sample}} - A_{\text{Sample Control}}$ ,  $\Delta A_{\text{Blank}} = A_{\text{Blank}} - A_{\text{Blank Control}}$ .

**Note:** The Blank well and Blank Control only need to measure 2-3 time. Each different color sample should set a corresponding control well, to eliminate the background OD value of the sample itself.

### Data Analysis

**Note: We provide you with calculation formulae, including the derivation process and final formula. The two are exactly equal. It is suggested that the concise calculation formula in bold is final formula.**

1. Calculation of Inhibition percentage

$$\text{Inhibition percentage} = (\Delta A_{\text{Blank}} - \Delta A_{\text{Sample}}) \div \Delta A_{\text{Blank}} \times 100\%$$

**Note:** Try to keep the sample's inhibition percentage in the range of 30-70%. If the calculated inhibition percentage is less than 30% or greater than 70%, it is usually necessary to adjust the sample amount. If the determined inhibition percentage is too high, the sample needs to be appropriately diluted with Sample Diluent; if the determined inhibition percentage is low, it is necessary to increase sample concentration.

2. SOD active unit definition: When the inhibition percentage in the above-mentioned xanthine oxidase coupling reaction system is 50%, the SOD enzyme activity in the reaction system is defined as an enzyme activity unit (U/mL).

3. Calculation of SOD activity

(1) Calculation of serum (plasma) SOD activity

$$\text{SOD activity (U/mL)} = [\text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times V_{\text{Total}}] \div V_{\text{Sample}} \times n$$

$$= 11.2 \times \text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times n$$

(2) Calculation of tissues/cells SOD activity

a. Calculated by protein concentration

$$\text{SOD activity (U/mg prot)} = [\text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times V_{\text{Total}}] \div (V_{\text{Sample}} \times \text{Cpr}) \times n$$

$$= 11.2 \times \text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \div \text{Cpr} \times n$$

b. Calculated by fresh weight of samples

$$\text{SOD activity (U/g fresh weight)} = [\text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times V_{\text{Total}}] \div (W \times V_{\text{Sample}} \div V_{\text{Sample Total}}) \times n$$

$$= 11.2 \times \text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \div W \times n$$

c. Calculated by number of cells

$$\text{SOD activity (U/10}^4 \text{ cells)} = [\text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times V_{\text{Total}}] \div (500 \times V_{\text{Sample}} \div V_{\text{Sample Total}}) \times n$$

$$= 0.0224 \times \text{Inhibition percentage} \div (1 - \text{Inhibition percentage}) \times n$$

$V_{\text{Total}}$ : Total reaction volume, 0.224 mL

W: weight of sample, g

$V_{\text{Sample}}$ : sample volume added, 0.02 mL

$V_{\text{Sample Total}}$ : 1 × Lysis Buffer added to samples, 1 mL

n: dilution factor

Cpr: sample protein concentration, mg/mL

500: Total number of cells,  $5 \times 10^6$ .

### Disclaimer

The reagent is only used in the field of scientific research, not suitable for clinical diagnosis or other purposes. For your safety and health, please wear a lab coat and disposable gloves.