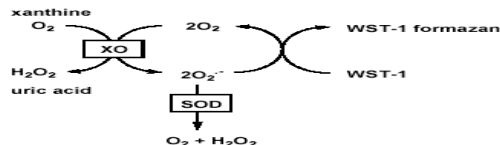


# Superoxide Dismutase (SOD) Activity Assay Kit

(Catalog #K335-100; 100 assays; Store kit at 4 °C)

## I. Introduction:

Superoxide dismutase (SOD) is one of the most important antioxidative enzymes. It catalyzes the dismutation of the superoxide anion into hydrogen peroxide and molecular oxygen. The sensitive SOD assay kit utilizes WST-1 that produces a water-soluble formazan dye upon reduction with superoxide anion. The rate of the reduction with a superoxide anion is linearly related to the Xanthine Oxidase (XO) activity, and is inhibited by SOD (below). Therefore, the inhibition activity of SOD can be determined by a colorimetric method.



## II. Kit Contents:

Component	K335-100	Cap Color	Part Number
	100 assays		
WST Solution	1 ml	Red	K335-100-1
SOD Enzyme Solution	20 µl	Green	K335-100-2
SOD Assay Buffer	20 ml	WM	K335-100-3
SOD Dilution Buffer	10 ml	NM	K335-100-4

## III. Reagent Preparation and Storage Conditions:

**WST Working Solution:** Dilute 1 ml of WST solution with 19 ml of SOD Assay Buffer Solution. The diluted solution is stable for up to 2 months at 4 °C.

**SOD Enzyme Working Solution:** Centrifuge the SOD Enzyme Solution for 5 sec. Mix well by pipetting (The step is necessary, as the enzyme has two layers and must be mixed well before dilution). Dilute 15 µl with 2.5 ml of SOD Dilution Buffer. The diluted SOD enzyme solution is stable for up to 3 weeks at 4 °C.

## III. Sample Preparation:

- Blood samples:** Collect blood using citrate or EDTA. Centrifuge at 1,000 x g for 10 min at 4 °C. Transfer the plasma layer to a new tube without disturbing the buffy layer and store at -80 °C until ready for analysis. Resuspend the buffy layer from the red cell pellet. Resuspend the erythrocytes in 5X volume of ice cold distilled water and centrifuge at 10,000 x g for 10 min to pellet the erythrocyte membranes. Store the supernatant at -80 °C until ready for analysis. Plasma can be diluted approx. 3 - 10x and the red cell lysate diluted approx. 100X prior to SOD assay.
- Tissue and cells:** Tissue should be perfused with PBS or 150 mM KCl to remove any red blood cells. Homogenize tissue or lyse cells in ice-cold 0.1 M Tris/HCl, pH 7.4 containing 0.5 % Triton X-100, 5 mM β-ME, 0.1 mg/ml PMSF. Centrifuge the crude tissue homogenate/cell lysate at 14000 x g for 5 minutes at 4 °C and discard the cell debris. The supernatant contains total SOD activity from cytosolic and mitochondria. If it is desired to measure SOD activity from cytosol and mitochondria separately, cytosol and Mitochondria can be separated by using BioVision's Cat# K256-100 Mitochondrial/Cytosol Fractionation Kit. SOD activity is then measured from the Mitochondria and Cytosol fractions separately.

## IV. SOD Assay Protocol:

\*Refer to Table 1 for the amount of solution in each well. If you are using a SOD standard (not included with the kit), set up wells for it in the same manner as the sample.

- Add 20 µl of Sample Solution to each sample and blank 2 well and add 20 µl H<sub>2</sub>O to each Blank 1 and Blank 3 well (See Table I).
- Add 200 µl of the WST Working Solution to each well.
- Add 20 µl of Dilution Buffer to each Blank 2 and Blank 3 well.
- Add 20 µl of Enzyme Working solution to each sample and Blank 1 well, mix thoroughly.

**Note:** Since the superoxide will release immediately after the addition of Enzyme working Solution to each well, use a multiple channel pipette to avoid reaction time lag of each well.

- Incubate plates at 37 °C for 20 min.
- Read the absorbance at 450 nm using a microplate reader.
- Calculate the SOD activity (inhibition rate %) using the following equation.

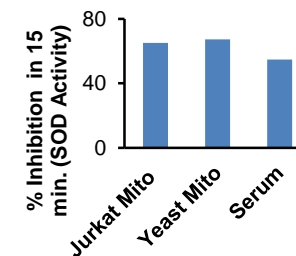
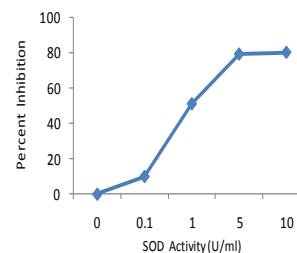
$$\text{SOD Activity (inhibition rate \%)} = \frac{(A_{\text{blank1}} - A_{\text{blank3}}) - (A_{\text{sample}} - A_{\text{blank2}})}{(A_{\text{blank1}} - A_{\text{blank3}})} \times 100$$

Table 1: Amount of each solution for sample, blank1, 2, and 3

	sample	blank 1	blank 2	blank 3
Sample Solution	20 µl		20 µl	
ddH <sub>2</sub> O		20 µl		20 µl
WST Working Solution	200 µl	200 µl	200 µl	200 µl
Enzyme Working Solution	20 µl	20 µl		
Dilution Buffer			20 µl	20 µl

**Note:** For specific activity of SOD, it is recommended to do a series 1/10th dilutions and obtain IC<sub>50</sub> (µg). SOD Activity (U/mg) = 1000/IC<sub>50</sub> (µg)

**Unit Definition:** One Unit is defined as the amount of SOD that inhibits the XO activity by 50% (IC<sub>50</sub> (µg)) under the assay conditions.



**Figures:** SOD Activity (% inhibition rate): human serum (10 µl) and isolated mitochondria from Jurkat cells (10 µg), and yeast (*Saccharomyces cerevisiae*, 100 µg), was used to determine SOD Activity according to the kit protocol. Activity was measured in 15 min. at 37 °C.

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## GENERAL TROUBLESHOOTING

Problems	Cause	Solution
Assay not working	<ul style="list-style-type: none"> <li>• Use of ice-cold assay buffer</li> <li>• Omission of a step in the protocol</li> <li>• Plate read at incorrect wavelength</li> <li>• Use of a different 96-well plate</li> </ul>	<ul style="list-style-type: none"> <li>• Assay buffer must be at room temperature</li> <li>• Refer and follow the data sheet precisely</li> <li>• Check the wavelength in the data sheet and the filter settings of the instrument</li> <li>• Fluorescence: Black plates (clear bottoms) ; Luminescence: White plates ; Colorimeters: Clear plates</li> </ul>
Samples with erratic readings	<ul style="list-style-type: none"> <li>• Use of an incompatible sample type</li> <li>• Samples prepared in a different buffer</li> <li>• Cell/ tissue samples were not completely homogenized</li> <li>• Samples used after multiple free-thaw cycles</li> <li>• Presence of interfering substance in the sample</li> <li>• Use of old or inappropriately stored samples</li> </ul>	<ul style="list-style-type: none"> <li>• Refer data sheet for details about incompatible samples</li> <li>• Use the assay buffer provided in the kit or refer data sheet for instructions</li> <li>• Use Dounce homogenizer (increase the number of strokes); observe for lysis under microscope</li> <li>• Aliquot and freeze samples if needed to use multiple times</li> <li>• Troubleshoot if needed</li> <li>• Use fresh samples or store at correct temperatures until use</li> </ul>
Lower/ Higher readings in Samples and Standards	<ul style="list-style-type: none"> <li>• Improperly thawed components</li> <li>• Use of expired kit or improperly stored reagents</li> <li>• Allowing the reagents to sit for extended times on ice</li> <li>• Incorrect incubation times or temperatures</li> <li>• Incorrect volumes used</li> </ul>	<ul style="list-style-type: none"> <li>• Thaw all components completely and mix gently before use</li> <li>• Always check the expiry date and store the components appropriately</li> <li>• Always thaw and prepare fresh reaction mix before use</li> <li>• Refer datasheet &amp; verify correct incubation times and temperatures</li> <li>• Use calibrated pipettes and aliquot correctly</li> </ul>
Readings do not follow a linear pattern for Standard curve	<ul style="list-style-type: none"> <li>• Use of partially thawed components</li> <li>• Pipetting errors in the standard</li> <li>• Pipetting errors in the reaction mix</li> <li>• Air bubbles formed in well</li> <li>• Standard stock is at an incorrect concentration</li> <li>• Calculation errors</li> <li>• Substituting reagents from older kits/ lots</li> </ul>	<ul style="list-style-type: none"> <li>• Thaw and resuspend all components before preparing the reaction mix</li> <li>• Avoid pipetting small volumes</li> <li>• Prepare a master reaction mix whenever possible</li> <li>• Pipette gently against the wall of the tubes</li> <li>• Always refer the dilutions in the data sheet</li> <li>• Recheck calculations after referring the data sheet</li> <li>• Use fresh components from the same kit</li> </ul>
Unanticipated results	<ul style="list-style-type: none"> <li>• Measured at incorrect wavelength</li> <li>• Samples contain interfering substances</li> <li>• Use of incompatible sample type</li> <li>• Sample readings above/below the linear range</li> </ul>	<ul style="list-style-type: none"> <li>• Check the equipment and the filter setting</li> <li>• Troubleshoot if it interferes with the kit</li> <li>• Refer data sheet to check if sample is compatible with the kit or optimization is needed</li> <li>• Concentrate/ Dilute sample so as to be in the linear range</li> </ul>
<p><b>Note:</b> The most probable list of causes is under each problem section. Causes/ Solutions may overlap with other problems.</p>		

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