

# ApoGSH™ Glutathione Colorimetric Detection Kit

(Catalog #K261-100; 100 assays; Store kit at -20°C)

## I. Introduction:

Glutathione (GSH) is the major intracellular low-molecular-weight thiol that plays a critical role in the cellular defense against oxidative stress in mammalian cells. BioVision's ApoGSH™ Glutathione Colorimetric Assay Kit provides a convenient, colorimetric method for analyzing either total glutathione or the reduced form glutathione alone using a microtiter plate reader. The assay is based on the glutathione recycling system by DTNB and glutathione reductase (Fig. 1). DTNB and glutathione (GSH) react to generate 2-nitro-5-thiobenzoic acid which has yellow color. Therefore, GSH concentration can be determined by measuring absorbance at 412 nm. The generated GSSG can be reduced back to GSH by glutathione reductase, and GSH reacts with DTNB again to produce more 2-nitro-5-thiobenzoic acid. Therefore, the recycling system dramatically improves the sensitivity of total glutathione detection. The kit includes the 5-Sulfosalicylic acid (SSA) for the removal of proteins from samples and for the protection of GSH oxidation and  $\gamma$ -glutamyl transpeptidase reaction. The kit can quantify glutathione from 1-100 ng/well in a 200  $\mu$ l reaction. For detecting lower glutathione concentrations, such as in blood samples, increasing reaction time will generate stronger signal. The kit can also specifically detect the reduced form of glutathione (GSH) by omitting the glutathione reductase from the reaction mixture. The sensitivity for detecting the reduced form of glutathione (without recycling system) is 100 times lower than detecting the total glutath

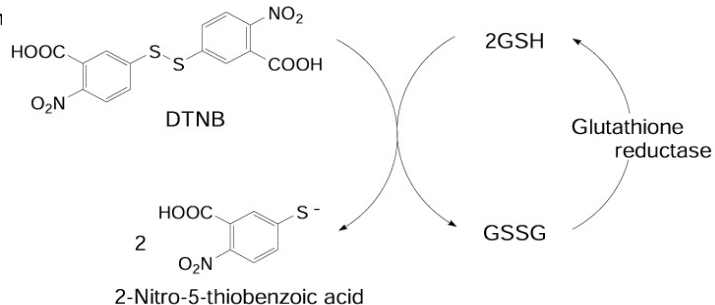


Fig. 1. Principle of Total Glutathione Assay.

Component	K261-100	Color code	Part
	100 assays	Cap color	Number
Glutathione Reaction Buffer	100 ml	NM	K261-100-1
Glutathione Substrate (DTNB)	2 vials	Red	K261-100-2
NADPH Generating Mix (lyophilized)	2 vials	Blue	K261-100-3
Glutathione Reductase (lyophilized)	2 vials	Green	K261-100-4
Sulfosalicylic Acid (SSA, 1 gram)	1 bottle	WM	K261-100-5
GSH Standard (lyophilized, MW 307)	2 x 1 mg	Yellow	K261-100-6

## III. Sample Preparation:

Note: Peptide thiol may interfere with the assay of reduced form glutathione. SSA treatment may not be able to completely remove all small peptides from samples. Further purification may be required to accurately measure reduced form glutathione. Peptide thiols don't significantly interfere with total glutathione assay.

### A. Cell Sample Preparation (0.5-1 x 10<sup>6</sup> cells/assay)

1. Treat cells by desired method. Concurrently incubate a control culture without treatment.
2. Collect cells by centrifugation at 700 x g for 5 minutes at 4°C. Remove supernatant.
3. Resuspend cell pellet in 0.5 ml ice-cold PBS. Transfer into a 1.5 ml microcentrifuge tube, and centrifuge at 700 x g for 5 minutes at 4°C. Remove supernatant.
4. Lyse cells in 80  $\mu$ l ice-cold Glutathione Buffer. Incubate on ice for 10 minutes.
5. Add 20  $\mu$ l of 5% SSA (see below for SSA preparation), mix well and centrifuge at 8000 x g for 10 min. Transfer supernatant to a fresh tube and use it for glutathione assay.

### B. Tissue Sample Preparation (100 mg)

1. Homogenize the tissue in 0.4 ml of Glutathione Buffer.
2. Add 100  $\mu$ l of 5% SSA (see below for SSA preparation), mix well, and centrifuge at 8000 x g for 10 minutes.
3. Transfer supernatant to a fresh tube and use it for glutathione assay.

### C. Plasma Sample Preparation

1. Centrifuge an anticoagulant treated blood at 1000 x g for 10 min at 4°C.
2. Transfer the top plasma layer to a new tube and add 1/4 vol of 5% SSA. Mix well.
3. Centrifuge at 8000 x g for 10 min at 4°C.
3. Transfer supernatant to a new tube, and use it for the glutathione assay.

### D. Erythrocyte Sample Preparation

1. Centrifuge an anticoagulant treated blood at 1000 x g for 10 min at 4°C.
2. Discard the supernatant and the white buffy layer.
3. Lyse the erythrocytes with 4 vol of Glutathione Buffer. Keep on ice for 10 min.
4. Add 1 vol 5% SSA, mix well, and centrifuge at 8000 x g for 10 minutes. Transfer supernatant to a fresh tube and use it for glutathione assay.

Note: Erythrocytes can be isolated from the remaining sample solution after the plasma sample isolation.

## IV. Preparation of Solutions & Storage Conditions:

**Substrate:** Add 1 ml of Glutathione Buffer to 1 vial of substrate and dissolve it completely. Store the remaining solution at -20°C, stable for 2 months.

**NADPH Generating Mix:** Add 1 ml of Glutathione Buffer to 1 vial of the NADPH mix. Store the solution at -20°C, stable for 2 months.

**Glutathione Reductase:** Add 1 ml of Glutathione Buffer to 1 vial of the enzyme and dissolve. Use up the solution within 1 day.

**SSA:** Add 19 ml of dH<sub>2</sub>O to make 5% solution and then dilute 5 ml of the solution with Glutathione Buffer to make 1% SSA solution. Store at 4°C, stable for 6 months.

**GSH Standard:** Add 1 ml of 1% SSA to the GSH standard vial to generate 1  $\mu$ g/ $\mu$ l GSH standard solution. Store at -20°C, stable for 2 months.

#### IV. Preparation of Solutions for Standard Curve:

To generate standard curve for detecting the reduced form of glutathione only, add 50, 40, 30, 20, 10, and 0  $\mu\text{l}$  of the 1  $\mu\text{g}/\mu\text{l}$  GSH standard into each labeled microcentrifuge tubes, add 1% SSA to make up for a total volume of 100  $\mu\text{l}/\text{tube}$ .

To generate standard curve for detecting the total glutathione, dilute the 1  $\mu\text{g}/\mu\text{l}$  glutathione solution into 10  $\text{ng}/\mu\text{l}$  with 1% SSA. Add 50, 40, 30, 20, 10, and 0  $\mu\text{l}$  of the 10  $\text{ng}/\mu\text{l}$  GSH standard into each labeled microcentrifuge tubes, add 1% SSA to make up for a total volume of 100  $\mu\text{l}/\text{tube}$ .

#### V. Glutathione Assay Protocol:

- Prepare enough Reaction Mix for the standard and samples to be assayed in 96-well plate (not provided). Each well should contain:

20 $\mu\text{l}$	NADPH Generating Mix
20 $\mu\text{l}$	Glutathione Reductase*
120 $\mu\text{l}$	Glutathione Reaction Buffer

\*For detecting the reduced form of glutathione only, omit Glutathione Reductase. Use 20  $\mu\text{l}$  of the Glutathione Reaction Buffer replace the 20  $\mu\text{l}$  of glutathione Reductase.

- Mix well. Add 160  $\mu\text{l}$  of the Reaction Mix to each well and incubate at room temperature for 10 minutes to generate NADPH.
- Add 20  $\mu\text{l}$  of either the GSH standard solutions or the sample solution. Incubate the plate at room temperature for 5-10 min.

**Note:** We recommend to make several dilutions of your sample using the 1% SSA to make sure the readings are within the range of the standard calibration curve.

- Add 20  $\mu\text{l}$  of Substrate solution, and incubate at room temperature for 5-10 min, or longer if the samples contain low levels of glutathione.

**Notes:** a) Since the reaction starts immediately after the addition of substrate, use a multichannel pipette or repeating pipette is recommended to avoid the reaction time lag among wells.

b) You can read samples immediately and at various times following addition of the substrate solution for kinetic studies.

- Read the absorbance at 405 nm or 415 nm using a microplate reader.
- Determine concentrations of GSH in the sample solutions using the standard glutathione calibration curve.

**Note: A.** Using reduced form glutathione Standard Curve for detecting reduced form of glutathione. Using total Glutathione Standard Curve for detecting total glutathione. There are about 10 to 100 fold difference in detection sensitivity between detecting reduced form glutathione and total glutathione (see procedure step IV for preparation of standard curve).

**B.** The colorimetric reaction is stable and the O.D. increases linearly over 30 min for total glutathione detection.

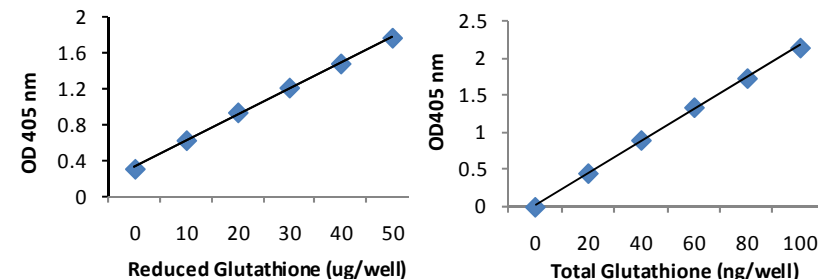
#### VI. Calculation of Total Glutathione

Pseudo-end point method:  $\text{Total Glutathione} = (\text{O.D.}_{\text{sample}} - \text{O.D.}_{\text{blank}})$   
 Kinetic method:  $\text{Total Glutathione} = (\text{Slope}_{\text{sample}} - \text{Slope}_{\text{blank}}) / \text{Slope}$

#### VI. Reagent Interference

Reducing agents such as ascorbic acid,  $\beta$ -mercaptoethanol, dithiothreitol (DTT) and cysteine, or thiol reactive compounds such as maleimide compounds, interfere with the glutathione assay and therefore should be avoided during the sample preparation.

When detecting the reduced form of glutathione, protein thiols can generate significant background signal. In such cases, it is necessary to completely remove proteins from samples. We suggest using Amicon Centrifugal Spin column with 5K molecular weight cut off filter to remove proteins. Then the reduced glutathione can be easily detected from spin through samples.



**Fig .2. Glutathione Standard Curve.** Various amounts of standard glutathione was added to the glutathione reaction and incubated for 10 min according to the kit instructions. Absorbance was measured at O.D. 405 nm.

#### VII. RELATED PRODUCTS:

##### Apoptosis Detection Kits & Reagents

- Annexin V Kits & Bulk Reagents
- Caspase Assay Kits & Reagents
- Mitochondrial Apoptosis Kits & Reagents
- Nuclear Apoptosis Kits & Reagents
- Apoptosis siRNA Vectors

##### Cell Fractionation System

- Mitochondria/Cytosol Fractionation Kit
- Nuclear/Cytosol Fractionation Kit
- Membrane Protein Extraction Kit
- Cytosol/Particulate Rapid Separation Kit
- Mammalian Cell Extraction Kit
- FractionPREP Fractionation System

##### Cell Damage & Repair

- HDAC Fluorometric & Colorimetric Assays & Drug Discovery Kits
- HAT Colorimetric Assay Kit & Reagents
- DNA Damage Quantification Kit
- Glutathione Fluorometric & Colorimetric Assay Kits
- Nitric Oxide Fluorometric & Colorimetric Assay Kits

##### Signal Transduction

- cAmp & cGMP Assay Kits
- Akt & JNK Activity Assay Kits
- Beta-Secretase Activity Assay Kit

##### Adipocyte & Lipid Transfer

- Recombinant Adiponectin, Survivin, & Leptin
- CETP Activity Assay & Drug Discovery Kits
- Total Cholesterol Quantification Kit

##### Molecular Biology & Reporter Assays

- siRNA Vectors
- Cloning Insert Quick Screening Kit
- Mitochondrial & Genomic DNA Isolation Kits