

# Human Glutathione Peroxidase 1 ELISA kit

Catalog Number EEL198 (96 tests)

Rev 2.0

For safety and biohazard guidelines, read the Safety Data Sheets (SDSs) and follow the handling instructions. Wear appropriate protective eyewear, clothing, and gloves.

## Product description

The Human Glutathione Peroxidase 1 (GPX1) Immunoassay Kit is a solid-phase Sandwich Enzyme-Linked Immunosorbent Assay (ELISA). This assay is designed to detect and quantify the level of Human GPX1 in serum, plasma, and other biological fluids.

Glutathione Peroxidase 1 (GPX1) is a crucial antioxidant enzyme that protects cells from oxidative damage by reducing hydrogen peroxide and organic hydroperoxides to water and alcohols, using glutathione as a reducing agent. This selenoprotein, found in the cytoplasm and mitochondria, helps maintain cellular redox balance and prevent oxidative stress, which is linked to diseases like cancer, cardiovascular conditions, and neurodegenerative disorders. GPX1's role in detoxifying reactive oxygen species (ROS) and modulating apoptosis and immune responses underscores its importance in cellular defense and homeostasis. It serves as a valuable biomarker for oxidative stress and a potential therapeutic target for related diseases.

## Contents and storage

An unopened kit can be stored at 2-8°C for 12 months. After opening, store the items separately according to the conditions specified in the table below.

**Note:** All reagent bottle caps must be tightened to prevent evaporation and microbial pollution. The volume of reagents in partial shipments is slightly more than the volume marked on the label, please use accurate measuring equipment instead of directly pouring into the vial(s).

| Components                                                                     | Quantity (96 tests) | Storage                               |
|--------------------------------------------------------------------------------|---------------------|---------------------------------------|
| GPX1 Antibody Coated Microplate                                                | 8 wells x 12 strips | -20°C, 12 months                      |
| GPX1 Standard                                                                  | 2 vials             |                                       |
| GPX1 Biotinylated Detection Antibody (100X)                                    | 120 µL              |                                       |
| HRP Conjugate (100X)                                                           | 120 µL              | -20°C (Protect from light), 12 months |
| Standard & Sample Diluent                                                      | 20 mL               | 2-8°C, 12 months                      |
| Biotinylated Detection Antibody Diluent                                        | 14 mL               |                                       |
| HRP Conjugate Diluent                                                          | 14 mL               |                                       |
| Wash Buffer Concentrate (25X)                                                  | 30 mL               |                                       |
| Substrate Reagent                                                              | 10 mL               | 2-8°C (Protect from light), 12 months |
| Stop Solution; contains 1 M H <sub>2</sub> SO <sub>4</sub> ,<br><b>CAUSTIC</b> | 10 mL               | 2-8°C, 12 months                      |
| Plate Sealer                                                                   | 5                   |                                       |

## Required materials

- Distilled or deionized water
- Microtiter plate reader with software capable of measurement at or near 450 nm
- Plate washer—automated or manual (squirt bottle, manifold dispenser, or equivalent)
- Calibrated adjustable precision pipettes and glass or plastic tubes for diluting solutions
- Incubator capable of maintaining 37°C.

## Procedural guidelines

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**IMPORTANT!** Reagents are lot-specific. Do not mix or interchange different reagent lots from various kit lots.

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Allow reagents to reach room temperature before use. Mix to redissolve any precipitated salts.

### Sample preparation guidelines

**Serum:** Allow samples to clot for 1 hour at room temperature or overnight at 2-8°C before centrifugation for 20 min at 1000×g at 2-8°C. Collect the supernatant to carry out the assay.

**Plasma:** Collect plasma using EDTA or heparin (EDTA-Na<sub>2</sub> is most recommended) as an anticoagulant. Centrifuge samples for 15 min at 1000×g at 2-8°C within 30 min of collection. Collect the supernatant to carry out the assay.

**Other biological fluids:** Centrifuge samples for 20 min at 1000×g at 2-8°C. Collect the supernatant to carry out the assay.

Note:

- Collect samples in pyrogen/endotoxin-free tubes.
- Samples should be assayed within 7 days when stored at 2-8°C, otherwise samples must be aliquoted and stored at -20°C (≤ 1 month) or -80°C (≤ 3 months). Avoid multiple freeze-thaw cycles of frozen samples. Thaw completely and mix well (do not vortex) prior to analysis.
- Avoid the use of hemolyzed or lipemic sera.
- If large amounts of particulate matter are present in the sample, centrifuge, or filter sample prior to analysis.

### Prepare samples

Sample concentrations should be within the range of the standard curve. Because conditions may vary, the optimal dilution for each application should be determined (It is recommended to carry out the preliminary test referring to the expected values of samples on page 8).

Use all prepared samples within 2 hours of dilution. It is not recommended to conduct experiments after 2 hours.

## **Prepare 1X Wash Buffer**

1. Dilute 30 mL of Wash Solution Concentrate (25X) with 720 mL of deionized or distilled water. Label as 1X Wash Buffer.
2. Store the concentrate and 1X Wash Buffer at 2-8°C. Use the diluted buffer within 3 months.

Note: if crystals have formed in the concentrate, warm it in a 40°C-water bath and mix it gently until the crystals have completely dissolved and the performance is not affected.

## **Prepare 1X Biotinylated Detection Antibody Solution**

**Note: The working solution should be prepared just before use**

1. Calculate the required amount before the experiment (100 µL/well). In preparation, slightly more than calculated should be prepared.
2. Centrifuge the Concentrated Biotinylated Detection Ab at 800 ×g at 2-8°C for 1 min.
3. Dilute the Concentrated Biotinylated Detection Ab (100X) to 1X working solution with Biotinylated Detection Ab Diluent.

## **Prepare 1X HRP Conjugate Solution**

**Note: The working solution should be prepared just before use**

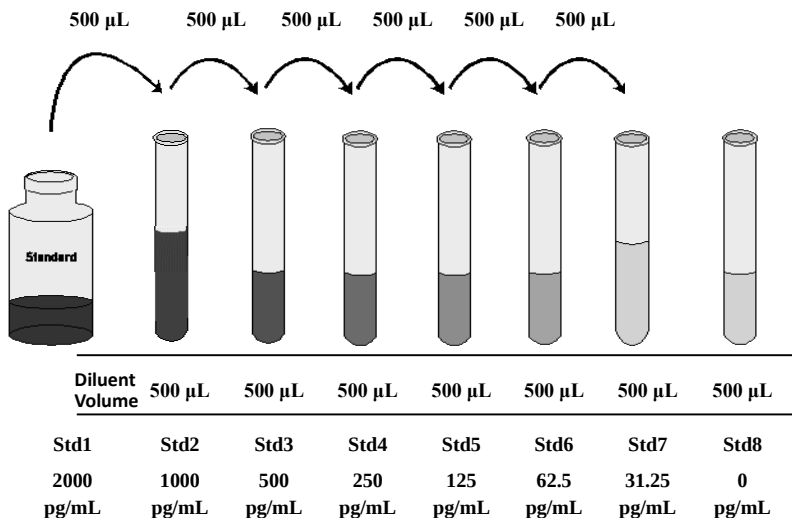
1. Calculate the required amount before the experiment (100 µL/well). In preparation, slightly more than calculated should be prepared.
2. Centrifuge the Concentrated HRP Conjugate at 800 ×g at 2-8°C for 1 min.
3. Dilute the Concentrated HRP Conjugate (100X) to 1X working solution with HRP Conjugate Diluent.

## **Prepare diluted standards**

Note: Use glass or plastic tubes for diluting standards.

1. Centrifuge the standard at 10,000 ×g at 2-8°C for 1 min to ensure the contents are at the bottom of vial.
2. Add 1 mL of Standard & Sample Diluent, let it stand for 10 min and invert it gently several times. Once fully dissolved, mix it thoroughly with a pipette. This reconstitution produces a working solution of 2000 pg/mL.
3. Take 7 tubes, add 500 µL of Standard & Sample Diluent to each tube. Pipette 500 µL of the 2000 pg/mL working solution to the first tube and mix up to produce a 1000 pg/mL working solution. Pipette 500 µL of the solution from the former tube into the latter one according to this step. The last tube is regarded as a blank, don't pipette solution into it from the former tube. The recommended dilution gradient is as follows: 2000, 1000, 500, 250, 125, 62.5, 31.25, 0 pg/mL.

4. The illustration of diluted standards below is for reference. Mix thoroughly between dilution gradients.



5. Use the diluted standards within 2 hours of preparation. If multiple standard tests are to be carried out, the redissolved standard solution (standard with the highest concentration) can be divided into 2-3 vials and frozen at  $-20^{\circ}\text{C}$ , to be used within half a month. Avoid multiple freeze-thaw cycles.

## Perform ELISA (Total assay time: 3.5 hours)

**IMPORTANT!** Perform a standard curve with each assay.

Allow all components to reach room temperature before use. Mix all liquid reagents prior to use.

Determine the number of 8-well strips required for the assay. Insert the strips in the frames for use. Re-bag any unused strips and frames, and store desiccated at  $-20^{\circ}\text{C}$  for future use. The silica pack in the bag keeps the plate dry.



### 1. Bind antigen

Note: solutions should be added to the bottom of the ELISA plate well, avoid touching the inside wall and causing foaming as much as possible.

- For the standard curve, add 100  $\mu$ L of standards to the appropriate wells. For samples, add 100  $\mu$ L of pretreated samples to the wells.
- Cover the plate with plate sealer and incubate for 90 min at 37°C.
- Thoroughly aspirate the solution. Do not wash.



### 2. Add biotinylated detection antibody

- Add 100  $\mu$ L of **Biotinylated Detection Antibody Working Solution** into each well.
- Cover the plate with plate sealer and incubate for 60 min at 37°C.
- Thoroughly aspirate the solution and wash wells 3 times with 350  $\mu$ L of 1X Wash Buffer. Decant the solution from each well, add 350  $\mu$ L of **wash buffer** to each well. Soak for 1 min and aspirate or decant the solution from each well and pat it dry against clean absorbent paper. Proceed immediately to the next step, making sure the wells do not dry out.



### 3. Add HRP conjugate

- Add 100  $\mu$ L **HRP Conjugate Working Solution** into each well.
- Cover the plate with plate sealer and incubate for 30 min at 37°C.
- Thoroughly aspirate the solution and repeat the wash process for 5 times as conducted in step 2.



### 4. Add substrate

- Add 90  $\mu$ L **Substrate Reagent** to each well.
- Cover the plate with plate sealer and incubate for about 15 min at 37°C. Protect the plate from light.

**Note:** The reaction time can be shortened or extended according to the actual color change, but not more than 30 min.



### 5. Add stop solution

- Add 50  $\mu$ L **Stop Solution** to each well. This step should be done in the same order as the substrate solution. Tap the side of the plate gently to mix.
- The solution in the wells will change from blue to yellow.

● Ag

Y Capture Ab

Y Biotinylated  
detection Ab

★ Streptavidin-  
HRP

## Read the plate and generate the standard curve

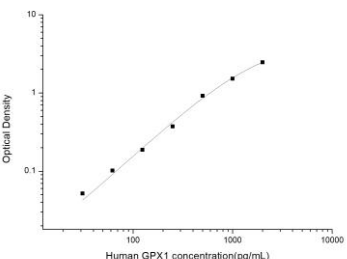
1. Preheat the Microplate Reader for about 15 min before OD measurement.
2. Read the absorbance at 450 nm. Read the plate within 10 minutes after adding the Stop Solution.
3. Use curve-fitting software to generate the standard curve. A four-parameter algorithm provides the best standard curve fit. Optimally, the background absorbance may be subtracted from all data points, including standards, unknowns, and controls, prior to plotting.
4. Read the concentrations for unknown samples and controls from the standard curve. Multiply value(s) obtained for sample(s) by the appropriate factor to correct for the sample dilution.

Note: If the OD of the sample surpasses the upper limit of the standard curve, you should re-test it with an appropriate dilution.

## Performance characteristics

### ■ Standard curve (example)

As the OD values of the standard curve may vary according to the conditions of the actual assay performance (e.g. operator, pipetting technique, washing technique or temperature effects), the operator should establish a standard curve for each test. Typical standard curve and data over the range of 0–2000 pg/mL GPX1 is provided below for reference only.

| Concentration (pg/mL) | OD at 450 nm | Corrected OD | <b>Standard Curve for Human GPX1</b><br> |
|-----------------------|--------------|--------------|----------------------------------------------------------------------------------------------------------------------------|
| 2000                  | 2.53         | 2.466        |                                                                                                                            |
| 1000                  | 1.59         | 1.526        |                                                                                                                            |
| 500                   | 0.983        | 0.919        |                                                                                                                            |
| 250                   | 0.438        | 0.374        |                                                                                                                            |
| 125                   | 0.251        | 0.187        |                                                                                                                            |
| 62.5                  | 0.166        | 0.102        |                                                                                                                            |
| 31.25                 | 0.116        | 0.052        |                                                                                                                            |
| 0                     | 0.064        | -            |                                                                                                                            |

### ■ Inter-assay Precision

Three Human serum samples with low, medium, and high level GPX1 were tested 10 times in duplicate to determine precision between assays.

| Parameters         | Sample 1 | Sample 2 | Sample 3 |
|--------------------|----------|----------|----------|
| Mean (pg/mL)       | 118.12   | 214.76   | 1037.22  |
| Standard deviation | 6.08     | 9.96     | 44.29    |
| %CV                | 5.15     | 4.64     | 4.27     |

CV = Coefficient of Variation

### ■ Intra-assay Precision

Three Human serum samples with low, medium, and high level GPX1 were assayed in replicates of 20 to determine precision within an assay.

| Parameters         | Sample 1 | Sample 2 | Sample 3 |
|--------------------|----------|----------|----------|
| Mean (pg/mL)       | 110.99   | 204.3    | 946.17   |
| Standard deviation | 5.67     | 8.52     | 51.85    |
| %CV                | 5.11     | 4.17     | 5.48     |

CV = Coefficient of Variation

### ■ Expected values

Sixteen random Human serum/plasma samples were tested in the assay.

| Sample Type   | GPX1 Range (pg/mL) | GPX1 Average (pg/mL) |
|---------------|--------------------|----------------------|
| Serum (n=16)  | 125.3-963.4        | 342.4                |
| Plasma (n=16) | 72.8-864.6         | 285.7                |

### ■ Recovery

The recovery of Human GPX1 spiked at three different levels in samples throughout the range of the assay was evaluated in various matrices.

| Sample Type              | Range (%) | Average Recovery (%) |
|--------------------------|-----------|----------------------|
| Serum (n=8)              | 88-103    | 95                   |
| EDTA plasma (n=8)        | 86-98     | 91                   |
| Cell culture media (n=8) | 86-100    | 91                   |

### ■ Linearity of dilution

Samples were spiked with high concentrations of Human GPX1 and diluted with Standard & Sample Diluent to produce samples with values within the range of the assay.

|      |             | Serum (n=5) | EDTA plasma (n=5) | Cell culture media(n=5) |
|------|-------------|-------------|-------------------|-------------------------|
| 1:2  | Range (%)   | 97-110      | 97-114            | 96-111                  |
|      | Average (%) | 102         | 105               | 101                     |
| 1:4  | Range (%)   | 91-106      | 79-93             | 88-99                   |
|      | Average (%) | 98          | 85                | 94                      |
| 1:8  | Range (%)   | 90-105      | 85-99             | 88-98                   |
|      | Average (%) | 97          | 92                | 93                      |
| 1:16 | Range (%)   | 87-102      | 81-92             | 85-97                   |
|      | Average (%) | 94          | 87                | 91                      |

- **Specificity**

This assay has been shown to detect GPX1 from Human samples only. Do not use the kit for non-Human samples.

- **Sensitivity**

The analytical sensitivity of the assay is 18.75 pg/mL Human GPX1. This was determined by adding two standard deviations to the mean O.D. obtained when the zero standard was assayed 20 times and calculating the corresponding concentration.

### **Limited product warranty**

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