

## Colorimetric Hydrogen Peroxide Kit

Catalog No. 907-015

96 Determination Kit

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**FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.**

## **Description**

Assay Designs' Colorimetric Hydrogen Peroxide kit is a complete kit for the quantitative determination of Hydrogen Peroxide in biological fluids and tissue culture media. Please read the complete kit insert before performing this assay. The kit is designed to measure low concentrations of  $H_2O_2$  in biological matrices. The kit has a color reagent that contains a dye, xylenol orange, in an acidic solution with sorbitol and ammonium iron sulfate that reacts to produce a purple color proportional to the concentration of  $H_2O_2$  in the sample. The exact mechanism of the color reaction is not known, but probably involves coordinated iron reacting with  $H_2O_2$  and the dye molecule.

## **Introduction**

Hydrogen Peroxide ( $H_2O_2$ ) is a reactive oxygen metabolic by-product that serves as a key regulator for a number of oxidative stress-related states.<sup>1,2</sup> Functioning through NF kappa-B and other factors, hydroperoxide-mediated pathways have been linked to asthma, inflammatory arthritis, atherosclerosis, diabetic vasculopathy, osteoporosis, a number of neurodegenerative diseases and Down's Syndrome.<sup>3-11</sup> Perhaps the most intriguing aspect of  $H_2O_2$  biology is the recent report that antibodies have the capacity to convert molecular oxygen into hydrogen peroxide to contribute to the normal recognition and destruction processes of the immune system.<sup>12,13</sup> Measurement of this reactive species will help to determine how oxidative stress modulates varied intracellular pathways.

## **Precautions**

FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.

1. Dispose of the contents of the plate with care. Attention should be taken in handling because of unknown effects of the contents.
2. We test this kit's performance in a variety of samples, however it is possible that high levels of interfering substances may cause variation in assay results. Refer to Sample Handling, page 4.
3. The standard is light-sensitive and should be protected from direct light for prolonged periods of time.

## **Materials Supplied**

1. **Half-Area Microtiter Plate, 1 each, Catalog No. 80-0915**  
The plate is ready to use.
2. **Hydrogen Peroxide Standard, 0.5 mL, Catalog No. 80-0941**  
A solution of Hydrogen Peroxide at 100,000 ng/mL in water with preservatives.
3. **Hydrogen Peroxide Color Reagent, 11 mL, Catalog No. 80-0968**  
A solution of colorimetric substrate in dilute acid.
4. **Hydrogen Peroxide Assay Layout Sheet, 1 each, Catalog No. 30-0170**
5. **Plate Sealer, 2 each, Catalog No. 30-0012**

## **Storage**

All components of this kit, **except the Hydrogen Peroxide Color Reagent**, are stable at 4°C until the kit's expiration date. The Hydrogen Peroxide Color Reagent **must** be stored at -20°C.

## **Materials Needed but Not Supplied**

1. Recommended sample diluent, 50 mM Phosphate, pH 6.0.
2. Precision pipets for volumes between 34 µL and 1,000 µL.
3. Repeater pipet for dispensing 100 µL.
4. Microplate reader capable of reading between 540 and 570 nm, ideally 550 nm.
5. Graph paper for plotting the standard curve.

## **Sample Handling**

Assay Designs' Hydrogen Peroxide kit is compatible with samples in a wide range of matrices. Samples diluted sufficiently into the recommended Sample Diluent of 50 mM Phosphate, pH 6.0 can be read directly from the standard curve. Please refer to the Sample Recovery recommendations on page 11 for details of suggested dilutions. **If the end user chooses to use a different buffer as the Sample Diluent, it is up to the end user to determine if the buffer works in the assay, the appropriate dilution of samples, and assay validation.**

Samples in Tissue Culture Media can also be read in the assay provided the standards have been diluted into the Tissue Culture Media. There will be a small change in the standard curve associated with running the standards and samples in media. Media containing ferrous salts should be avoided as they will interfere with sensitive detections. The presence of pH indicator will not affect relative assay detection as long as standards and samples are in the same media.

## **Procedural Notes**

1. Do not mix components from different lot numbers or use reagents beyond the expiration date.
2. Allow all reagents, with the exception of the Hydrogen Peroxide Color Reagent, to warm to room temperature for at least 30 minutes before opening.
3. The Hydrogen Peroxide Color Reagent must be kept at 4°C during use.
4. Standards can be made up in either glass or plastic tubes.
5. Pre-rinse the pipet tip with the reagent, use fresh pipet tips for each sample, standard and reagent.
6. Pipet standards and samples to the bottom of the wells.
7. Add the reagent to the side of the well to avoid contamination.

## **Reagent Preparation**

### **1. Hydrogen Peroxide Standard**

Allow the 100,000 ng/mL Hydrogen Peroxide standard solution to warm to room temperature. Label six 12 x 75 mm tubes #1 through #6.

Pipet 966  $\mu$ L of sample diluent (buffer or Tissue Culture Media) into tube #1. Pipet 500  $\mu$ L of Diluent into tubes #2 - #6.

Add 34  $\mu$ L of the 100,000 ng/mL standard to tube #1. Vortex thoroughly. Add 500  $\mu$ L of tube #1 to tube #2 and vortex thoroughly. Add 500  $\mu$ L of tube #2 to tube #3 and vortex. Continue this for tubes #4 through #6.

**The concentration of Hydrogen Peroxide in tubes #1 through #6 will be 3,400, 1,700, 850, 425, 212.5 and 106.25 ng/mL respectively. This converts to 100  $\mu$ M, 50  $\mu$ M, 25  $\mu$ M, 12.5  $\mu$ M, 6.25  $\mu$ M and 3.125  $\mu$ M respectively. See Hydrogen Peroxide Assay Layout Sheet for dilution details.**

## **Assay Procedure**

**All standards and samples should be run in duplicate.**

**All samples should be allowed to warm to room temperature for at least 30 minutes prior to use.**

1. Determine the number of wells to be used. Cover unused wells tightly with a plate sealer. **DO NOT REUSE WELLS!**
2. Pipet 50  $\mu$ L of sample diluent (buffer or Tissue Culture Media) into duplicate Blank (Zero Standard) wells.
3. Pipet 50  $\mu$ L of Standards #1 through #6 into duplicate wells.
4. Pipet 50  $\mu$ L of Samples into duplicate wells.
5. Pipet 100  $\mu$ L of Color Reagent into the Blank, Standards and Sample wells.
6. Mix well by shaking or tapping the side of the plate for 10 seconds.
7. Incubate for 30 minutes at room temperature.
8. Blank the plate reader against the blank wells, read the optical density between 540 and 570 nm, preferably at 550 nm. If the plate reader is not able to be blanked against the Blank wells, manually subtract the mean optical density of the blank wells from all readings.

## Calculation of Results

Several options are available for the calculation of the concentration of Hydrogen Peroxide in the samples. We recommend that the data be handled by a software package utilizing a 4 parameter logistic curve fitting program. If this type of data reduction software is not readily available, the concentration of Hydrogen Peroxide can be calculated as follows:

1. Calculate the average net Optical Density (OD) for each standard and sample by subtracting the average Blank OD from the average OD for each standard and sample:  
$$\text{Average Net OD} = \text{Average OD} - \text{Average Blank OD}$$
2. Using Log-it log paper, plot the Average Net OD for each Standard versus Hydrogen Peroxide Concentration. Approximate a straight line through the points. The concentration of Hydrogen Peroxide in the unknowns can be determined by interpolation.

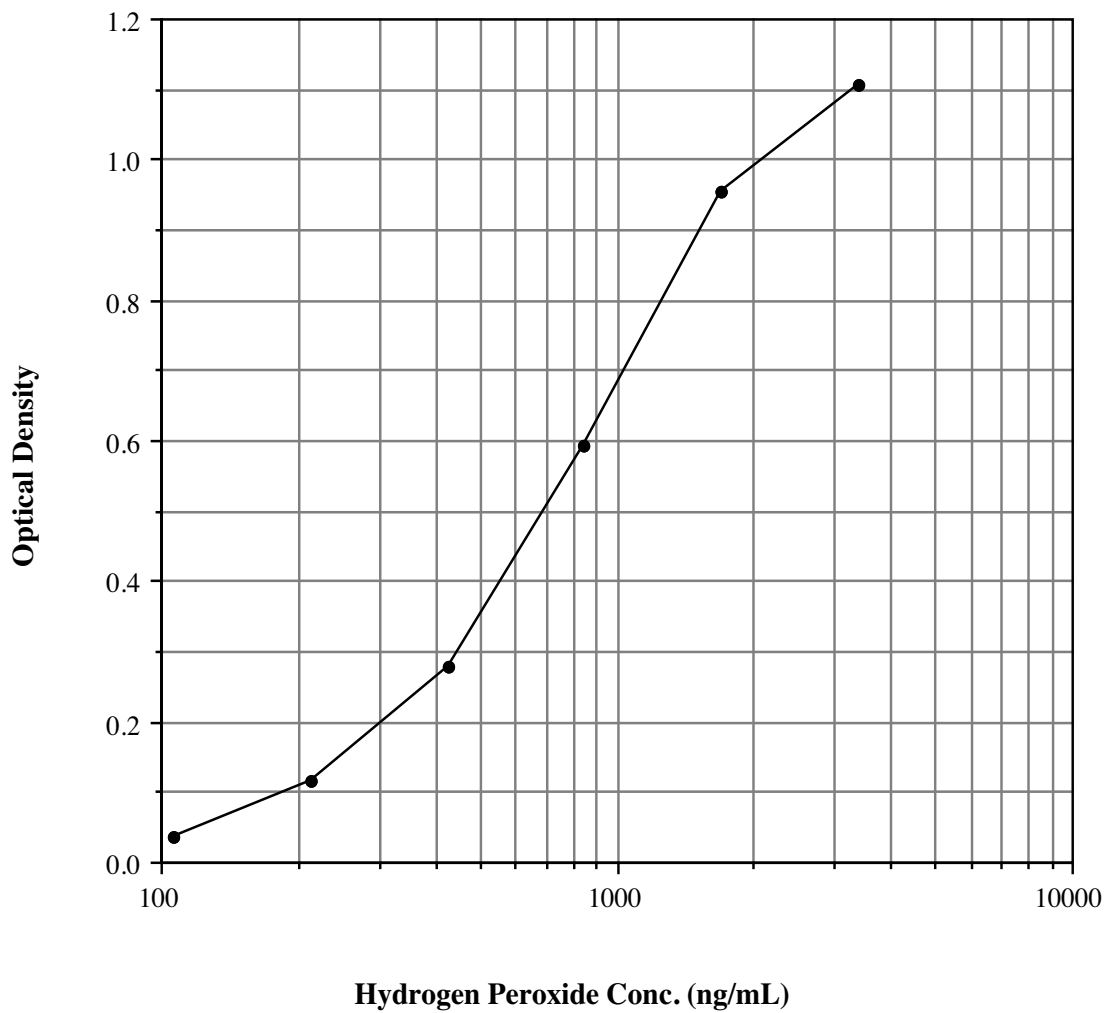
## Typical Results

The results shown below are for illustration only and **should not** be used to calculate results from another assay.

<u>Sample</u>	<u>Average OD</u>	<u>Net OD</u>	<u>Hydrogen Peroxide</u> <u>ng/mL</u>	<u>µM</u>
Blank	0.306			
S1	1.412	1.106	<b>3,400</b>	<b>100</b>
S2	1.262	0.956	<b>1,700</b>	<b>50</b>
S3	0.899	0.593	<b>850</b>	<b>25</b>
S4	0.585	0.279	<b>425</b>	<b>12.5</b>
S5	0.421	0.115	<b>212.5</b>	<b>6.25</b>
S6	0.341	0.035	<b>106.25</b>	<b>3.125</b>
Unknown 1	0.838	0.532	<b>767.6</b>	<b>22.58</b>
Unknown 2	1.200	0.894	<b>1,555.1</b>	<b>45.74</b>

### Typical Standard Curve

A typical standard curve is shown below. This curve **must not** be used to calculate Hydrogen Peroxide concentrations; each user must run a standard curve for each assay.



## **Performance Characteristics**

The following parameters for this kit were determined using the guidelines listed in the National Committee for Clinical Laboratory Standards (NCCLS) Evaluation Protocols.<sup>14</sup>

### **Sensitivity**

Hydrogen Peroxide sensitivity in 50mM Phosphate, pH 6.0 was calculated by determining the average OD bound for sixteen (16) wells run as the zero standard, and comparing to the average OD for sixteen (16) wells run with Standard #6. The detection limit was determined as the concentration of Hydrogen Peroxide measured at two (2) standard deviations from the zero along the standard curve.

OD for Zero Standard =	0.277 ± 0.020 (7.3%)
OD for Standard #6 =	0.362 ± 0.051 (14.0%)
Delta OD (106.25-0 ng/mL) = 0.362-0.277 =	0.085
2 SD's of Zero Standard =	0.041
Sensitivity = $\frac{0.041}{0.085}$ x 106.25 ng/mL =	<b>51.25 ng/mL</b>

### **Linearity**

A sample containing 2,880 ng/mL Hydrogen Peroxide was serially diluted 5 times 1:2 in the recommended sample diluent and measured in the assay. The data was plotted graphically as actual Hydrogen Peroxide concentration versus measured Hydrogen Peroxide concentration.

The line obtained had a slope of 0.9342 with a correlation coefficient of 0.9983.

## Precision

Intra-assay precision was determined by taking samples containing low, medium and high concentrations of Hydrogen Peroxide and running these samples multiple times (n=16) in the same assay. Inter-assay precision was determined by measuring three samples with low, medium and high concentrations of Hydrogen Peroxide in multiple assays (n=8). The precision numbers listed below represent the percent coefficient of variation for the concentrations of Hydrogen Peroxide determined in these assays as calculated by a curve fitting program.

	Hydrogen Peroxide ( <u>ng/mL</u> )	Inter-assay ( <u>%CV</u> )	Intra-assay ( <u>%CV</u> )
Low	314.2		10.0
Medium	772.1		3.0
High	1,606.2		4.0
Low	326.46	2.2	
Medium	768.21	1.7	
High	1,732.93	5.7	

## Sample Recoveries

Please refer to pages 4 and 5 for Sample Handling recommendations and Standard preparation.

Hydrogen Peroxide concentrations were measured in horse heparinized plasma, human serum, human urine and tissue culture media. Hydrogen Peroxide was spiked into the undiluted samples of these matrices which were then diluted with the appropriate diluent and assayed in the kit. The following results were obtained:

<b>Sample</b>	<b>% Recovery *</b>	<b>Recommended Dilution *</b>
Horse heparin Plasma	94.5	≥1:64
Human Serum	94.7	≥1:64
Human Urine	90.6	≥1:64
Tissue Culture Media	105.6	None

\* See Sample Handling instructions on page 4 for details.

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## **LIMITED WARRANTY**

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**Material Safety Data Sheet (MSDS) available on our website or by fax.**

**Assay Designs, Inc.  
800 Technology Drive  
Ann Arbor, MI 48108  
U.S.A.**

**Telephone: (734) 668-6113  
(800) 833-8651 (USA & Canada only)  
Fax: (734) 668-2793  
e-mail: [info@assaydesigns.com](mailto:info@assaydesigns.com)  
website: [www.assaydesigns.com](http://www.assaydesigns.com)**

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