

**AdipoGen**<sup>TM</sup> 

## **MANUAL**

### **GPX3 (human) ELISA Kit**

*For research use only. Not for diagnostic use.*

Version 2 (14-March-2011)

**Cat. No. AG-45A-0020EK-KI01**

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## Table of Contents

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<b>1. Intended Use</b>	<b>3</b>
<b>2. Introduction</b>	<b>3</b>
<b>3. General References</b>	<b>4</b>
<b>4. Assay Principle</b>	<b>5</b>
<b>5. Handling &amp; Storage</b>	<b>5</b>
<b>6. Kit Components</b>	<b>5</b>
<b>7. Materials Required but <i>Not</i> Supplied</b>	<b>6</b>
<b>8. General ELISA Protocol</b>	<b>7</b>
<b>8.1. Preparation and Storage of Reagents</b>	<b>7</b>
<b>8.2. Sample Collection, Storage and Dilution</b>	<b>8</b>
<b>8.3. Assay Procedure (Checklist)</b>	<b>9</b>
<b>9. Calculation of Results</b>	<b>10</b>
<b>10. Typical Data</b>	<b>10</b>
<b>11. Performance Characteristics</b>	<b>11-12</b>
<b>12. Technical Hints and Limitations</b>	<b>13</b>
<b>13. Troubleshooting</b>	<b>14</b>
<b>14. Assay Flow Chart</b>	<b>15</b>
<hr/>	
<b>Product Specific References</b>	<b>Backcover</b>

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## 1. Intended Use

The GPX3 (human) ELISA Kit is to be used for the *in vitro* quantitative determination of human GPX3 in serum, plasma and cell culture supernatant. This ELISA Kit is for research use only.

## 2. Introduction

Glutathione peroxidase (GPX) catalyzes the reduction of hydrogen peroxide, organic hydroperoxide, and lipid peroxides by reduced glutathione and functions in the protection of cells against oxidative damage. This enzyme, found mainly in the cytosol of mammalian cells, is unusual in its content of a selenocysteine residue in its active site that is encoded by a TGA (stop codon) (1). The glutathione peroxidase found in plasma now called GPX3 is immunologically distinct from the erythrocyte and liver cytosolic enzymes. It also has some differences in physical and kinetic properties. Takahashi et al. (2) isolated cDNA clones coding for plasma GPX3. They found that the nucleotide sequence consisted of a 678-bp open reading frame coding for a 226-amino acid polypeptide with a molecular mass of 25,389. The amino acid sequence showed only 44% homology with other human cellular GPX family. Takahashi et al. (2) concluded that as the plasma enzyme contains 1 atom of selenium per subunit, the in-frame TGA observed at positions 217-219 could be assigned to selenocysteine and a tetramer of approximately 90-100 kDa where each of the 4 identical subunits contains an active site with the selenium atom in the form of selenocysteine residue (2). GPX3 is also found in human milk (3). Chu et al. (4) found that glutathione peroxidase-3 is expressed in kidney, lung, heart, breast, placenta, and, in the human but not the rodent, in liver as well. Since redox control has been implicated in the cause of metabolic dysfunction, plasma or serum measurement of GPX3 may give some benefits to the diagnosis of these metabolic diseases.

### 3. General References

- (1) The structure of the mouse glutathione peroxidase gene: the selenocysteine in the active site is encoded by the 'termination' codon, TGA: I. Chambers, et al.; EMBO J. 5, 1221 (1986)
- (2) Primary structure of human plasma glutathione peroxidase deduced from cDNA sequences: K. Takahashi, et al.; J. Biochem. 108, 145 (1990)
- (3) Expression of glutathione peroxidase in human liver in addition to kidney, heart, lung, and breast in humans and rodents: F.F. Chu, et al.; Blood 79, 3233 (1992)
- (4) Partial sequence of human plasma glutathione peroxidase and immunologic identification of milk glutathione peroxidase as the plasma enzyme: N. Avissar, et al.; J. Nutrition 121, 1243 (1991)

## 4. Assay Principle

This assay is a sandwich Enzyme Linked-Immunosorbent Assay (ELISA) for quantitative determination of human GPX3 in biological fluids. A polyclonal antibody specific for GPX3 has been precoated onto the 96-well microtiter plate. Standards and samples are pipetted into the wells for binding to the coated antibody. After extensive washing to remove unbound compounds, GPX3 is recognized by the addition of a biotinylated polyclonal antibody specific for GPX3 (Detection Antibody). After removal of excess biotinylated antibody, HRP labeled streptavidin (Detector) is added. Following a final washing, peroxidase activity is quantified using the substrate 3,3',5,5'-tetramethylbenzidine (TMB). The intensity of the color reaction is measured at 450 nm after acidification and is directly proportional to the concentration of GPX3 in the samples.

## 5. Handling & Storage

- Reagent must be stored at 2-8°C when not in use.
- Plate and reagents should be at room temperature before use.
- Do not expose reagents to temperatures greater than 25°C.

## 6. Kit Components

1 plate coated with human GPX3 Antibody	(12 x 8-well strips)
1 bottle Wash Buffer 10X	(50 ml)
1 bottle Diluent 5X	(50 ml)
1 bottle Detection Antibody	(12 ml)
1 vial Detector 100X (HRP Labeled Streptavidin)	(150 µl)
1 vial human GPX3 Standard (lyophilized)	(64 ng)
1 vial human GPX3 QC sample (lyophilized)	
1 bottle Substrate Solution I (TMB)	(6 ml)
1 bottle Substrate Solution II (Peroxidase)	(6 ml)
1 bottle Stop Solution	(12 ml)
3 plate sealers (plastic film)	

## 7. Materials Required but Not Supplied

- Microtiterplate reader at 450 nm, with the correction wavelength set at 540 nm or 570 nm
- Calibrated precision single and multi-channel pipettes. Disposable pipette tips
- Deionized water
- Microtubes or equivalent for preparing dilutions
- Disposable plastic containers for preparing working buffers
- Plate washer: automated or manual
- Glass or plastic tubes for diluting and aliquoting standard

## 8. General ELISA Protocol

### 8.1. Preparation and Storage of Reagents

**NOTE:** Prepare just the appropriate amount of the buffers necessary for the assay.

- **Wash Buffer 10X** has to be diluted with deionized water 1:10 before use (e.g. 50 ml Wash Buffer 10X + 450 ml water) to obtain Wash Buffer 1X.
- **Diluent 5X** has to be diluted with deionized water 1:5 before use (e.g. 50 ml Diluent 5X + 200 ml water) to obtain Diluent 1X.
- **Detector 100X (HRP Labeled Streptavidin)** has to be diluted to the working concentration by adding 120 µl in 12 ml of Diluent 1X (1:100).

**NOTE:** The diluted Detector is used within one hour of preparation.

- **Substrate Solution I and II** have to be mixed together in equal volumes within 15 minutes of use.

**NOTE:** Freshly prepare just before use the Substrate Solution and protect from light!

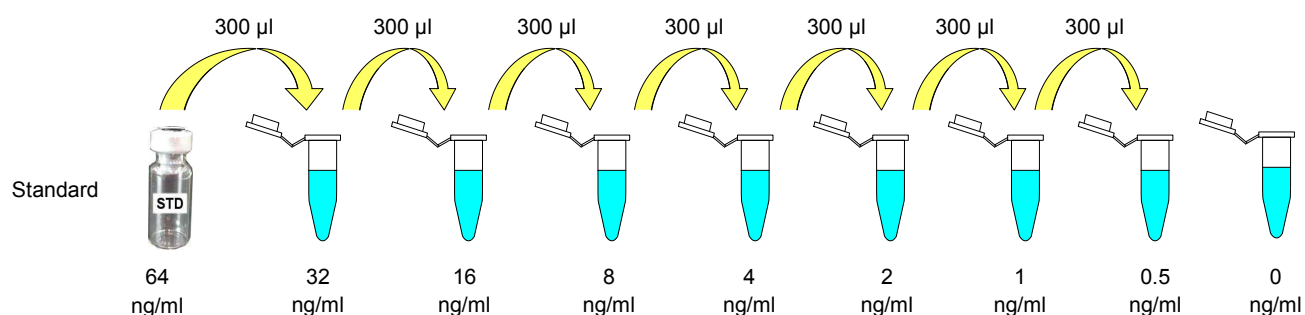
- **Human GPX3 Standard (STD)** has to be reconstituted with 1 ml of distilled water.
  - This reconstitution produces a stock solution of 64 ng/ml. Mix the standard to ensure complete reconstitution and allow the standard to sit for a minimum of 15 minutes. Mix well prior to making dilutions.

**NOTE:** The reconstituted standard is aliquoted and stored at -20°C

- Dilute the standard protein concentrate (STD) (**64 ng/ml**) in Diluent 1X. A seven-point standard curve using 2-fold serial dilutions in Diluent 1X is recommended.
  - Suggested standard points are:  
**32 , 16 , 8 , 4 , 2 , 1 , 0.5 and 0 ng/ml.**
- **Human GPX3 QC sample** has to be reconstituted with 1 ml of deionized water.
    - Refer to the Certificate of Analysis for current QC sample concentration. Mix the QC sample to ensure complete reconstitution and allow the QC sample to sit for a minimum of 15 minutes. The reconstituted QC sample is ready to use, do not dilute it.

**Dilute further for the standard curve:**

To obtain	Add	Into
<b>32 ng/ml</b>	300 µl of GPX3 (64 ng/ml)	300 µl of Diluent 1X
<b>16 ng/ml</b>	300 µl of GPX3 (32 ng/ml)	300 µl of Diluent 1X
<b>8 ng/ml</b>	300 µl of GPX3 (16 ng/ml)	300 µl of Diluent 1X
<b>4 ng/ml</b>	300 µl of GPX3 (8 ng/ml)	300 µl of Diluent 1X
<b>2 ng/ml</b>	300 µl of GPX3 (4 ng/ml)	300 µl of Diluent 1X
<b>1 ng/ml</b>	300 µl of GPX3 (2 ng/ml)	300 µl of Diluent 1X
<b>0.5 ng/ml</b>	300 µl of GPX3 (1 ng/ml)	300 µl of Diluent 1X
<b>0 ng/ml</b>	300 µl of Diluent 1X	Empty tube



## 8.2. Sample Collection, Storage and Dilution

**Serum** : Use a serum separator tube. Let samples clot at room temperature for 30 minutes before centrifugation for 20 minutes at 1,000xg. Assay freshly prepared serum or store serum in aliquot at ≤ -20°C for later use. Avoid repeated freeze/thaw cycles.

**Plasma** : Collect plasma using heparin, EDTA, or citrate as an anticoagulant. Centrifuge for 15 minutes at 1000xg within 30 minutes of collection. Assay freshly prepared plasma or store plasma sample in aliquot at ≤ -20°C for later use. Avoid repeated freeze/ thaw cycles.

**Serum, Plasma or Cell Culture Supernatant** have to be diluted in Diluent 1X. Samples containing visible precipitates must be clarified before use.

**NOTE:** As a starting point, 1/200 dilution of serum or plasma is recommended! If samples fall the outside range of assay, a lower or higher dilution may be required!



### 8.3. Assay Procedure (Checklist)

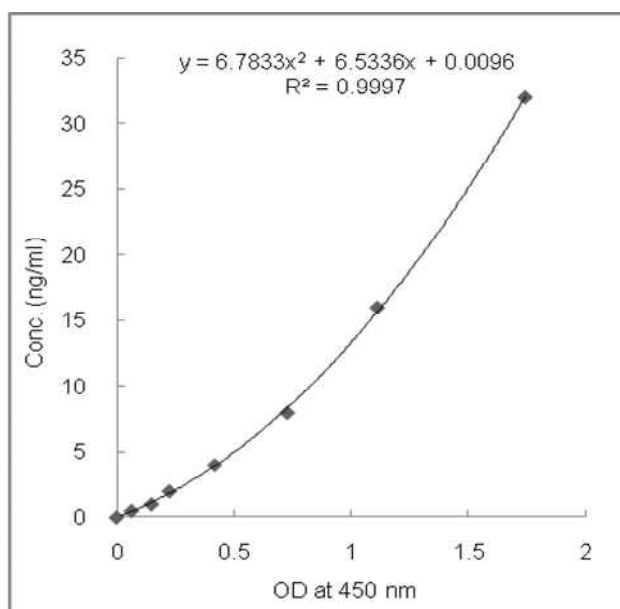
<input type="checkbox"/>	<p>1. Determine the number of 8-well strips needed for the assay and insert them in the frame for current use. The extra strips should be resealed in the foil pouch bag and stored at 4°C.</p> <p><b>NOTE:</b> Remaining 8-well strips coated with GPX3 antibody when opened can be stored at 4°C for up to 1 month.</p>
<input type="checkbox"/>	<p>2. Add 100 µl of the different standards into the appropriate wells in duplicate! At the same time, add 100 µl of diluted serum, plasma or cell culture supernatant samples in duplicate to the wells (<b>see 8.1. Preparation and Storage of Reagents and 8.2. Preparation of Samples</b>).</p>
<input type="checkbox"/>	<p>3. Cover the plate with plate sealer and incubate for <b>1 hour at 37°C</b>.</p>
<input type="checkbox"/>	<p>4. Aspirate the coated wells and add 300 µl of Wash Buffer 1X using a multichannel pipette or auto-washer. Repeat the process for a total of three washes. After the last wash, complete removal of liquid is essential for good performance.</p>
<input type="checkbox"/>	<p>5. Add 100 µl to each well of the Detection Antibody.</p>
<input type="checkbox"/>	<p>6. Cover the plate with plate sealer and incubate for <b>1 hour at 37°C</b>.</p>
<input type="checkbox"/>	<p>7. Aspirate the coated wells and add 300 µl of Wash Buffer 1X using a multichannel pipette or auto-washer. Repeat the process for a total of three washes. After the last wash, complete removal of liquid is essential for good performance.</p>
<input type="checkbox"/>	<p>8. Add 100 µl to each well of the diluted Detector (<b>see 8.1. Preparation and Storage of Reagents</b>).</p>
<input type="checkbox"/>	<p>9. Cover the plate with plate sealer and incubate for <b>1 hour at 37°C</b>.</p>
<input type="checkbox"/>	<p>10. Aspirate the coated wells and add 300 µl of Wash Buffer 1X using a multichannel pipette or auto-washer. Repeat the process for a total of five washes. After the last wash, complete removal of liquid is essential for good performance.</p>
<input type="checkbox"/>	<p>11. Add 100 µl to each well of mixed substrate solution.</p>
<input type="checkbox"/>	<p>12. Allow the color reaction to develop <b>at room temperature (RT°C) in the dark for 20 minutes</b>.</p>
<input type="checkbox"/>	<p>13. Stop the reaction by adding 100 µl of Stop Solution. Tap the plate gently to ensure thorough mixing. The substrate reaction yields a blue solution that turns yellow when Stop Solution is added.</p>
	<p><b>! CAUTION: CORROSIVE SOLUTION!</b></p>
<input type="checkbox"/>	<p>14. Measure the OD at 450 nm in an ELISA reader within 30 minutes.</p>

## 9. Calculation of Results

- Average the duplicate readings for each standard, QC and sample and subtract the average blank value (obtained with the 0 ng/ml point).
- Generate the standard curve by plotting the average absorbance obtained for each standard concentration on the horizontal (X) axis vs. the corresponding GPX3 concentration (ng/ml) on the vertical (Y) axis (see 10. TYPICAL DATA).
- Calculate the GPX3 concentrations of samples by interpolation of the regression curve formula as shown above in a form of a quadratic equation.
- If the test samples were diluted, multiply the interpolated values by the dilution factor to calculate the concentration of human GPX3 in the samples.

## 10. Typical Data

The following data are obtained using the different concentrations of standard as described in this protocol:



Standard hGPX3 (ng/ml)	Optical Density (mean)
32	1.745
16	1.114
8	0.729
4	0.419
2	0.226
1	0.149
0.5	0.064
0	0

**Figure:** Standard curve

## 11. Performance Characteristics

### A. Sensitivity (Limit of detection):

The lowest level of GPX3 that can be detected by this assay is 100 pg/ml. **NOTE:** *The Limit of detection was measured by adding two standard deviations to the mean value of 50 zero standard.*

**B. Assay range:** 0.5 ng/ml – 32 ng/ml

### C. Specificity:

This ELISA is specific for the measurement of natural and recombinant human GPX3. It does not cross-react with human adiponectin, human resistin, human FABP3, human FABP4, human ACE2, human IL-6, human SOCS-3, human 4-1BB ligand, human ANGPTL4, human Th-pok, human Foxp3, human ANGPTL6, humanIDO.

### D. Intra-assay precision:

Eight serum samples of known concentrations of human GPX3 were assayed in replicates 12 times to test precision within an assay.

Samples	Means (ng/ml)	SD	CV (%)	n
1	423.68	21.35	5.04	12
2	544.73	25.98	4.77	12
3	654.51	32.92	5.03	12
4	93.34	7.90	8.46	12
5	131.11	10.95	8.35	12
6	73.28	7.06	9.64	12
7	1,537.23	64.72	4.21	12
8	1,011.34	42.88	4.24	12

### E. Inter-assay precision:

Eight samples of known concentrations of human GPX3 were assayed in 8 separate assays to test precision between assays.

Samples	Means (ng/ml)	SD	CV (%)	n
1	403.75	19.50	4.83	8
2	549.24	26.20	4.77	8
3	643.32	26.83	4.17	8
4	94.19	3.85	4.09	8
5	32.09	1.50	4.66	8
6	64.68	0.72	1.12	8
7	1,296.41	62.10	4.79	8
8	1,516.90	76.45	5.04	8

**F. Recovery:**

When samples (serum) are spiked with known concentrations of human GPX3, the recovery averages 92% (range from 88% to 94%).

Samples	Average recovery (%)	Range (%)
1	90.60	84.6-100.5
2	88.20	83.0-100.0
3	92.94	85.1-103.5
4	93.14	87.7-101.2
5	92.58	89.1-98.3
6	92.70	87.2-98.3
7	94.08	87.8-97.8

**G. Linearity:**

Different human serum samples containing GPX3 were diluted several fold (1/80 to 1/120) and the measured recoveries ranged from 93% to 103%.

Samples	Sample Dilution	Expected (ng/ml)	Observed (ng/ml)	% of Expected
1	1 : 100	354.52	354.52	100
	1 : 80	443.15	425.68	96.06
	1 : 120	295.44	289.16	97.87
2	1 : 100	104.86	104.86	100
	1 : 80	131.07	131.12	100.04
	1 : 120	87.38	81.97	93.74
3	1 : 100	1,096.04	1,096.04	100
	1 : 80	1,370.05	1,316.60	96.10
	1 : 120	913.36	943.44	103.29

**H. Expected values:**

GPX3 levels range in plasma and serum from **100 to > 3,000 ng/ml** (from healthy donors).

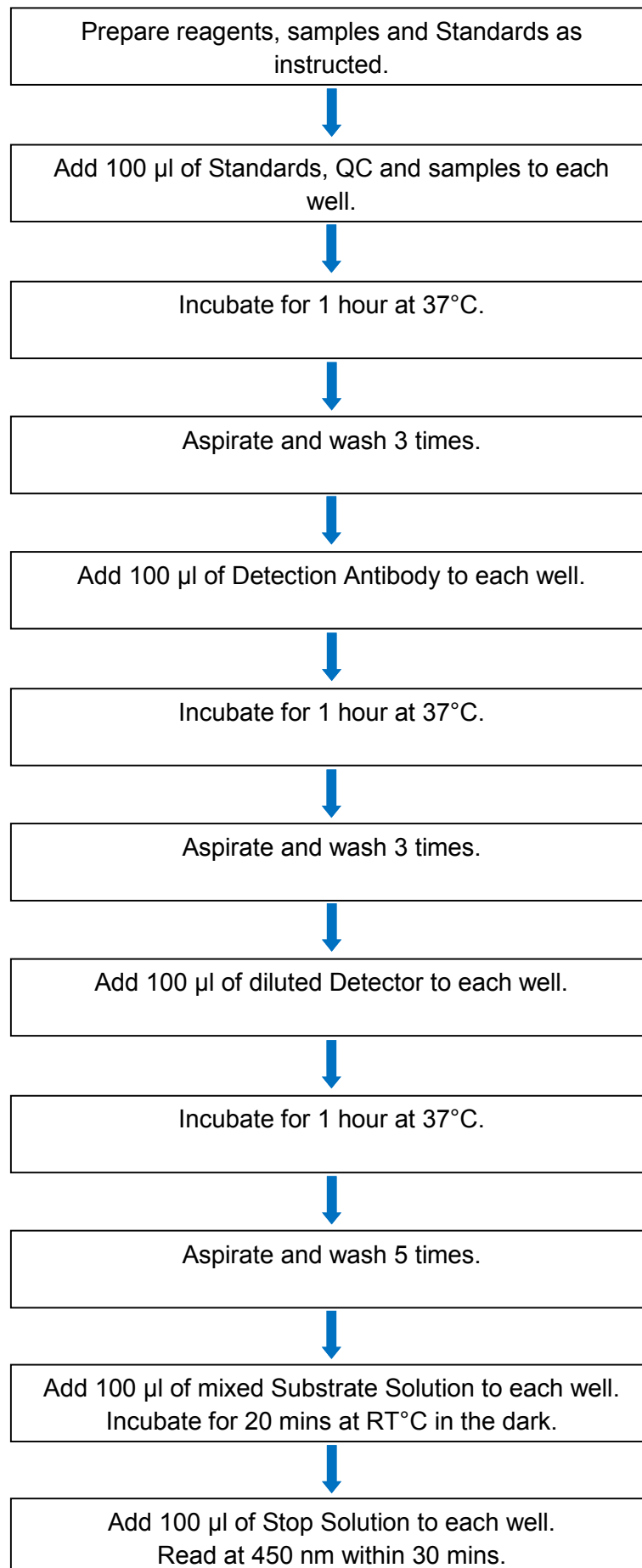
## 12. Technical Hints and Limitations

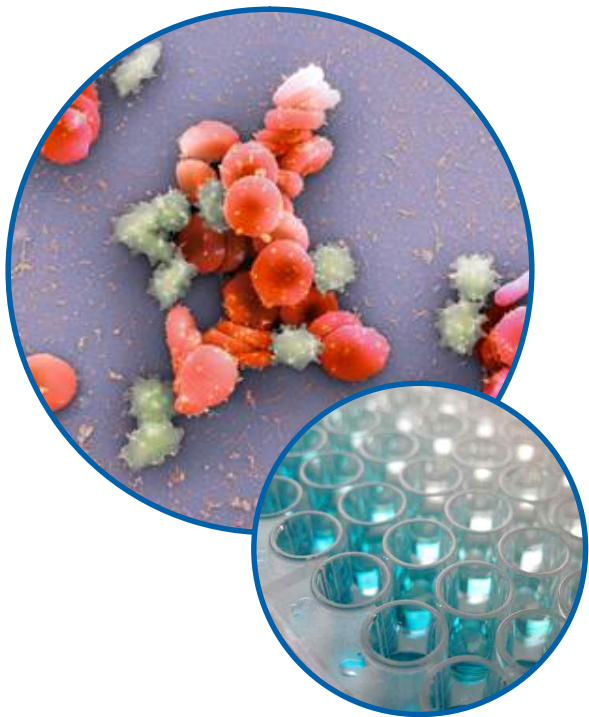
- It is recommended that all standards, QC sample and samples be run in duplicate.
- Do not combine leftover reagents with those reserved for additional wells.
- Reagents from the kit with a volume less than 100 µl should be centrifuged.
- Residual wash liquid should be drained from the wells after last wash by tapping the plate on absorbent paper.
- Crystals could appear in the 10X solution due to high salt concentration in the stock solutions. Crystals are readily dissolved at room temperature or at 37°C before dilution of the buffer solutions.
- Once reagents have been added to the 8-well strips, DO NOT let the strips DRY at any time during the assay.
- Keep Substrate Solution protected from light.
- The Stop Solution consists of phosphoric acid. Although diluted, the Stop Solution should be handled with gloves, eye protection and protective clothing.

### 13. Troubleshooting

PROBLEM	POSSIBLE CAUSES	SOLUTIONS
No signal or weak signal	Omission of key reagent	Check that all reagents have been added in the correct order.
	Washes too stringent	Use an automated plate washer if possible.
	Incubation times inadequate	Incubation times should be followed as indicated in the manual.
	Plate reader settings not optimal	Verify the wavelength and filter setting in the plate reader.
	Incorrect assay temperature	Use recommended incubation temperature. Bring substrates to room temperature before use.
High background	Concentration of detector too high	Use recommended dilution factor.
	Inadequate washing	Ensure all wells are filling wash buffer and are aspirated completely.
Poor standard curve	Wells not completely aspirated	Completely aspirate wells between steps.
	Reagents poorly mixed	Be sure that reagents are thoroughly mixed.
Unexpected results	Omission of reagents	Be sure that reagents were prepared correctly and added in the correct order.
	Dilution error	Check pipetting technique and double-check calculations.

## 14. Assay Flow Chart





**Product Specific References:**

1. Y.S. Lee, et al.; Mol. Endocrinol. 22, 2176 (2008)
2. J. Verhaeghe, et al.; Early Hum. Dev. 85, 767 (2009)
3. J. Verhaeghe, et al.; Metabolism 60, 71 (2011)

*For more References please visit [www.adipogen.com](http://www.adipogen.com)!*

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