



**AssayMax™**  
**Human Hemopexin ELISA Kit**

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Thank you for choosing Assaypro.

## Assay Summary

**Step 1.** Add 50  $\mu$ l of Standard or Sample per well.  
Incubate 2 hours.

**Step 2.** Wash, then add 50  $\mu$ l of Biotinylated Antibody per well.  
Incubate 1 hour.

**Step 3.** Wash, then add 50  $\mu$ l of SP Conjugate per well.  
Incubate 30 minutes.

**Step 4.** Wash, then add 50  $\mu$ l of Chromogen Substrate per well.  
Incubate 12 minutes.

**Step 5.** Add 50  $\mu$ l of Stop Solution per well.  
Read at 450 nm immediately.

## Symbol Key



Consult instructions for use.

## Assay Template

[illegible]



# AssayMax™ Human Hemopexin ELISA Kit

Catalog No. EH2001-1

*Sample insert for reference use only*

## Introduction

Hemopexin is a heme binding plasma glycoprotein which, after haptoglobin, forms the second line of defense against hemoglobin-mediated oxidative damage during intravascular hemolysis. A decrease in plasma hemopexin concentration reflects a recent release of heme compounds in the extracellular compartment. Heme-hemopexin complexes are delivered to hepatocytes by receptor-mediated endocytosis, after which hemopexin is recycled to the circulation (1). Studies indicate that increased hemopexin levels are associated with minimal change disease (MCD) [2], sporadic Alzheimer's disease (AD) [3], chronic alcoholism (4), hemolytic anemias, chronic neuromuscular diseases, and acute intermittent porphyria (5).

## Principle of the Assay

The AssayMax™ Human Hemopexin ELISA (Enzyme-Linked Immunosorbent Assay) Kit is designed for detection of hemopexin in human **milk, urine, saliva, and CSF samples**. This assay employs a quantitative **sandwich enzyme immunoassay** technique that measures human hemopexin in approximately 4 hours. A polyclonal antibody specific for human hemopexin has been pre-coated onto a 96-well microplate with removable strips. Hemopexin in standards and samples is sandwiched by the immobilized antibody and a biotinylated polyclonal antibody specific for human hemopexin, which is recognized by a streptavidin-peroxidase (SP) conjugate. All unbound material is washed away and a peroxidase enzyme substrate is added. The color development is stopped and the intensity of the color is measured.

## Caution and Warning

- This product is for **Research Use Only** and is not intended for use in diagnostic procedures.
- Prepare all reagents (diluent buffer, wash buffer, standard, biotinylated antibody, and SP conjugate), as instructed, prior to running the assay.
- Prepare all samples prior to running the assay. The dilution factors for the samples are suggested in this insert. However, the user should determine the optimal dilution factor.
- Spin down the SP conjugate vial and the biotinylated antibody vial before opening and using contents.

- The Stop Solution is an acidic solution.
- The kit should not be used beyond the expiration date.

## Reagents

- **Human Hemopexin Microplate:** A 96-well polystyrene microplate (12 strips of 8 wells) coated with a polyclonal antibody against human hemopexin.
- **Sealing Tapes:** Each kit contains 3 pre-cut, pressure sensitive sealing tapes that can be cut to fit the format of the individual assay.
- **Human Hemopexin Standard:** Human hemopexin in a buffered protein base (280 ng, lyophilized).
- **Biotinylated Human Hemopexin Antibody (50x):** A 50-fold concentrated biotinylated polyclonal antibody against human hemopexin (120  $\mu$ l).
- **MIX Diluent Concentrate (10x):** A 10-fold concentrated buffered protein base (30 ml).
- **Wash Buffer Concentrate (20x):** A 20-fold concentrated buffered surfactant (30 ml, 2 bottles).
- **SP Conjugate (100x):** A 100-fold concentrate (80  $\mu$ l).
- **Chromogen Substrate (1x):** A stabilized peroxidase chromogen substrate tetramethylbenzidine (7 ml).
- **Stop Solution (1x):** A 0.5 N hydrochloric acid solution to stop the chromogen substrate reaction (11 ml).

## Storage Condition

- Upon arrival, immediately store components of the kit at recommended temperatures up to the expiration date.
- Store SP Conjugate and Biotinylated Antibody at -20°C.
- Store Microplate, Diluent Concentrate (10x), Wash Buffer, Stop Solution, and Chromogen Substrate at 2-8°C.
- Unused microplate wells may be returned to the foil pouch with the desiccant packs and resealed. May be stored for up to 30 days in a vacuum desiccator.
- Store Standard at 2-8°C before reconstituting with Diluent and at -20°C after reconstituting with Diluent.

## Other Supplies Required

- Microplate reader capable of measuring absorbance at 450 nm
- Pipettes (1-20  $\mu$ l, 20-200  $\mu$ l, 200-1000  $\mu$ l, and multiple channel)
- Deionized or distilled reagent grade water

## Sample Collection, Preparation, and Storage

- **Milk:** Collect milk using sample tube. Centrifuge samples at 800 x *g* for 10 minutes. A 300-fold sample dilution is suggested into MIX Diluent or within the range of 30x – 3000x; however, user should determine optimal dilution factor depending on application needs. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.
- **Urine:** Collect urine using sample pot. Centrifuge samples at 800 x *g* for 10 minutes. A 10-fold sample dilution is suggested into MIX Diluent or within the range of 1x – 100x; however, user should determine optimal dilution factor depending on application needs. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.
- **Saliva:** Collect saliva using sample tube. Centrifuge samples at 800 x *g* for 10 minutes. A 60-fold sample dilution is suggested into MIX Diluent or within the range of 6x – 600x; however, user should determine optimal dilution factor depending on application needs. The undiluted samples can be stored at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.
- **CSF:** Collect cerebrospinal fluid (CSF) using sample pot. Centrifuge samples at 3000 x *g* for 10 minutes. A 300-fold sample dilution is suggested into MIX Diluent or within the range of 30x – 3000x; however, user should determine optimal dilution factor depending on application needs. The undiluted samples can be stored at -80°C for up to 3 months. Avoid repeated freeze-thaw cycles.

*Applicable samples may also include biofluids, cell culture, and tissue homogenates. If necessary, user should determine optimal dilution factor depending on application needs.*

***Refer to Dilution Guidelines for further instruction.***

<b>Guidelines for Dilutions of 100-fold or Greater</b> <i>(for reference only; please follow the insert for specific dilution suggested)</i>	
<b>100x</b>	<b>10000x</b>
A) 4 µl sample : 396 µl buffer (100x) = 100-fold dilution  <i>Assuming the needed volume is less than            or equal to 400 µl.</i>	A) 4 µl sample : 396 µl buffer (100x) B) 4 µl of A : 396 µl buffer (100x) = 10000-fold dilution  <i>Assuming the needed volume is less than            or equal to 400 µl.</i>
<b>1000x</b>	<b>100000x</b>
A) 4 µl sample : 396 µl buffer (100x) B) 24 µl of A : 216 µl buffer (10x) = 1000-fold dilution  <i>Assuming the needed volume is less than            or equal to 240 µl.</i>	A) 4 µl sample : 396 µl buffer (100x) B) 4 µl of A : 396 µl buffer (100x) C) 24 µl of B : 216 µl buffer (10x) = 100000-fold dilution  <i>Assuming the needed volume is less than            or equal to 240 µl.</i>

## Reagent Preparation

- Freshly dilute all reagents and bring all reagents to room temperature before use.
- MIX Diluent Concentrate (10x):** Dilute the MIX Diluent Concentrate 10-fold with reagent grade water to produce a 1x solution. When diluting the concentrate, make sure to rinse the bottle thoroughly to extract any precipitates left in the bottle. Mix the 1x solution gently until the crystals have completely dissolved. Store for up to 30 days at 2-8°C.
- Human Hemopexin Standard:** Reconstitute the Human Hemopexin Standard (280 ng) with 0.7 ml of MIX Diluent to generate a 400 ng/ml standard stock solution. Allow the vial to sit for 10 minutes with gentle agitation prior to making dilutions. Prepare duplicate or triplicate standard points by serially diluting from the standard stock solution (400 ng/ml) 2-fold with equal volume of MIX Diluent to produce 200, 100, 50, 25, 12.5, and 6.25 ng/ml solutions. MIX Diluent serves as the zero standard (0 ng/ml). Any remaining stock solution should be stored at -20°C and used within 30 days. Avoid repeated freeze-thaw cycles.



Standard Point	Dilution	[Hemopexin] (ng/ml)
P1	1 part Standard (400 ng/ml)	400
P2	1 part P1 + 1 part MIX Diluent	200
P3	1 part P2 + 1 part MIX Diluent	100
P4	1 part P3 + 1 part MIX Diluent	50
P5	1 part P4 + 1 part MIX Diluent	25
P6	1 part P5 + 1 part MIX Diluent	12.5
P7	1 part P6 + 1 part MIX Diluent	6.25
P8	MIX Diluent	0.0

- **Biotinylated Human Hemopexin Antibody (50x):** Spin down the antibody briefly and dilute the desired amount of the antibody 50-fold with MIX Diluent to produce a 1x solution. The undiluted antibody should be stored at -20°C.
- **Wash Buffer Concentrate (20x):** Dilute the Wash Buffer Concentrate 20-fold with reagent grade water to produce a 1x solution. When diluting the concentrate, make sure to rinse the bottle thoroughly to extract any precipitates left in the bottle. Mix the 1x solution gently until the crystals have completely dissolved.
- **SP Conjugate (100x):** Spin down the SP Conjugate briefly and dilute the desired amount of the conjugate 100-fold with MIX Diluent to produce a 1x solution. The undiluted conjugate should be stored at -20°C.

## Assay Procedure

- Prepare all reagents, standard solutions, and samples as instructed. Bring all reagents to room temperature before use. The assay is performed at room temperature (20-25°C).
- Remove excess microplate strips from the plate frame and return them immediately to the foil pouch with desiccants inside. Reseal the pouch securely to minimize exposure to water vapor and store in a vacuum desiccator.
- Add 50 µl of Human Hemopexin Standard or sample to each well. Gently tap plate to thoroughly coat the wells. Break any bubbles that may have formed. Cover wells with a sealing tape and incubate for 2 hours. Start the timer after the last addition.
- Wash the microplate manually or automatically using a microplate washer. Invert the plate and decant the contents; hit 4-5 times on absorbent material to completely remove the liquid. If washing manually, wash five times with 200 µl of Wash Buffer per well. Invert the plate each time and decant the contents; hit 4-5 times on absorbent material to completely remove the liquid. If using a microplate washer,

wash six times with 300  $\mu$ l of Wash Buffer per well; invert the plate and hit 4-5 times on absorbent material to completely remove the liquid.

- Add 50  $\mu$ l of Biotinylated Human Hemopexin Antibody to each well. Gently tap plate to thoroughly coat the wells. Break any bubbles that may have formed. Cover wells with a sealing tape and incubate for 1 hour.
- Wash the microplate as described above.
- Add 50  $\mu$ l of SP Conjugate to each well. Gently tap plate to thoroughly coat the wells. Break any bubbles that may have formed. Cover wells with a sealing tape and incubate for 30 minutes. Turn on the microplate reader and set up the program in advance.
- Wash the microplate as described above.
- Add 50  $\mu$ l of Chromogen Substrate to each well. Gently tap plate to thoroughly coat the wells. Break any bubbles that may have formed. Incubate in ambient light for 12 minutes or until the optimal blue color density develops.
- Add 50  $\mu$ l of Stop Solution to each well. The color will change from blue to yellow. Gently tap plate to ensure thorough mixing. Break any bubbles that may have formed.
- Read the absorbance on a microplate reader at a wavelength of 450 nm **immediately**. If wavelength correction is available, subtract readings at 570 nm from those at 450 nm to correct optical imperfections. Otherwise, read the plate at 450 nm only. Please note that some unstable black particles may be generated at high concentration points after stopping the reaction for about 10 minutes, which will reduce the readings.

## Data Analysis

- Calculate the mean value of the duplicate or triplicate readings for each standard and sample.
- To generate a standard curve, plot the graph using the standard concentrations on the x-axis and the corresponding mean 450 nm absorbance (OD) on the y-axis. The best fit line can be determined by regression analysis using log-log or four-parameter logistic curve fit.
- Determine the unknown sample concentration from the Standard Curve and multiply the value by the dilution factor.

## Typical Data

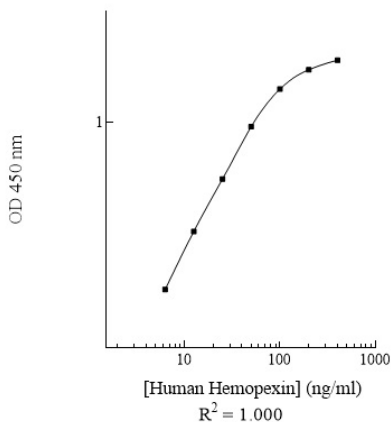
- The typical data is provided for reference only. Individual laboratory means may vary from the values listed. Variations between laboratories may be caused by technique differences.

Standard Point	ng/ml	OD	Average OD
P1	400	2.136 2.204	2.170
P2	200	1.978 1.872	1.925
P3	100	1.560 1.466	1.513
P4	50	0.979 0.917	0.948
P5	25	0.481 0.505	0.493
P6	12.5	0.264 0.248	0.256
P7	6.25	0.119 0.129	0.124
P8	0.0	0.023 0.025	0.024
Sample: Pooled Milk (300x)		0.194 0.212	0.203

## Standard Curve

- The curve is provided for illustration only. A standard curve should be generated each time the assay is performed.

Human Hemopexin Standard Curve



## Performance Characteristics

- The minimum detectable dose of human hemopexin as calculated by 2SD from the mean of a zero standard was established to be 1.2 ng/ml.
- Intra-assay precision was determined by testing three reference control samples twenty times in one assay.
- Inter-assay precision was determined by testing three reference control samples in twenty assays.

	Intra-Assay Precision			Inter-Assay Precision		
Sample	1	2	3	1	2	3
n	20	20	20	20	20	20
CV (%)	3.8%	3.9%	5.5%	9.3%	9.2%	10.6%
Average CV (%)	4.4%			9.7%		

## Spiking Recovery

- Recovery was determined by spiking one milk and one saliva sample with different hemopexin concentrations.

Sample	Unspiked Sample (ng/ml)	Spiking Value (ng/ml)	Expected	Observed	Recovery (%)
Milk	12.108	48.501	60.609	53.448	88%
		26.611	38.719	34.670	90%
		15.092	27.200	24.255	89%
Saliva	29.817	48.501	78.318	69.168	88%
		26.611	56.428	50.559	90%
		15.092	44.909	40.436	90%
Average Recovery (%)					89%

## Linearity

- Milk samples were serially diluted to test for linearity.

Average Percentage of Expected Value (%)	
Sample Dilution	Milk
150x	93%
300x	99%
600x	104%

## Cross-Reactivity

Species	Cross-Reactivity (%)
Canine	None
Bovine	None
Equine	None
Monkey	<5%
Mouse	None
Rat	None
Swine	None
Rabbit	None

## Troubleshooting

Issue	Causes	Course of Action
Low Precision	Use of improper components	<ul style="list-style-type: none"> <li>• Check the expiration date listed before use.</li> <li>• Do not interchange components from different lots.</li> </ul>
	Improper wash step	<ul style="list-style-type: none"> <li>• Check that the correct wash buffer is being used.</li> <li>• Check that all wells are empty after aspiration.</li> <li>• Check that the microplate washer is dispensing properly.</li> <li>• If washing by pipette, check for proper pipetting technique.</li> </ul>
	Splashing of reagents while loading wells	<ul style="list-style-type: none"> <li>• Pipette properly in a controlled and careful manner.</li> </ul>
	Inconsistent volumes loaded into wells	<ul style="list-style-type: none"> <li>• Pipette properly in a controlled and careful manner.</li> <li>• Check pipette calibration.</li> <li>• Check pipette for proper performance.</li> </ul>
	Insufficient mixing of reagent dilutions	<ul style="list-style-type: none"> <li>• Thoroughly agitate the lyophilized components after reconstitution.</li> <li>• Thoroughly mix dilutions.</li> </ul>
	Improperly sealed microplate	<ul style="list-style-type: none"> <li>• Check the microplate pouch for proper sealing.</li> <li>• Check that the microplate pouch has no punctures.</li> <li>• Check that three desiccants are inside the microplate pouch prior to sealing.</li> </ul>
Unexpectedly Low or High Signal Intensity	Microplate was left unattended between steps	<ul style="list-style-type: none"> <li>• Each step of the procedure should be performed uninterrupted.</li> </ul>
	Omission of step	<ul style="list-style-type: none"> <li>• Consult the provided procedure for complete list of steps.</li> </ul>
	Steps performed in incorrect order	<ul style="list-style-type: none"> <li>• Consult the provided procedure for the correct order.</li> </ul>
	Insufficient amount of reagents added to wells	<ul style="list-style-type: none"> <li>• Check pipette calibration.</li> <li>• Check pipette for proper performance.</li> </ul>
	Wash step was skipped	<ul style="list-style-type: none"> <li>• Consult the provided procedure for all wash steps.</li> </ul>
	Improper wash buffer	<ul style="list-style-type: none"> <li>• Check that the correct wash buffer is being used.</li> </ul>
	Improper reagent preparation	<ul style="list-style-type: none"> <li>• Consult reagent preparation section for the correct dilutions of all reagents.</li> </ul>
	Insufficient or prolonged incubation periods	<ul style="list-style-type: none"> <li>• Consult the provided procedure for correct incubation time.</li> </ul>

<b>Deficient Standard Curve Fit</b>	Non-optimal sample dilution	<ul style="list-style-type: none"> <li>• Sandwich ELISA: If samples generate OD values higher than the highest standard point (P1), dilute samples further and repeat the assay.</li> <li>• Competitive ELISA: If samples generate OD values lower than the highest standard point (P1), dilute samples further and repeat the assay.</li> <li>• User should determine the optimal dilution factor for samples.</li> </ul>
	Contamination of reagents	<ul style="list-style-type: none"> <li>• A new tip must be used for each addition of different samples or reagents during the assay procedure.</li> </ul>
	Contents of wells evaporate	<ul style="list-style-type: none"> <li>• Verify that the sealing film is firmly in place before placing the assay in the incubator or at room temperature.</li> </ul>
	Improper pipetting	<ul style="list-style-type: none"> <li>• Pipette properly in a controlled and careful manner.</li> <li>• Check pipette calibration.</li> <li>• Check pipette for proper performance.</li> </ul>
	Insufficient mixing of reagent dilutions	<ul style="list-style-type: none"> <li>• Thoroughly agitate the lyophilized components after reconstitution.</li> <li>• Thoroughly mix dilutions.</li> </ul>

## References

- (1) Delanghe JR *et al.* (2001) *Clin Chim Acta*. 312(1-2):13-23.
- (2) Bakker WW *et al.* (2005) *Pediatr Nephrol*. 20(10):1410-5.
- (3) Yu HL *et al.* (2003) *Proteomics*. 3(11):2240-8.
- (4) Kristensson-Aas A *et al.* (1986) *Eur J Clin Invest*. 16(2):178-83.
- (5) Suzuki K *et al.* (2004) *Nippon Rinsho*. 62(3):577-86.

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