



# Human Immunoglobulin M

## Immunoenzymetric Assay for the Measurement of Human Immunoglobulin M Catalog # F170

### Intended Use

This kit is intended for use in quantifying very low concentrations of human immunoglobulin M (hIgM). The kit is for Research and Manufacturing Use Only and is not intended for diagnostic use in humans or animals.

### Summary and Explanation

The sensitive and specific quantitation of very low levels of hIgM can be accomplished by the use of a two-site immunoenzymetric assay, also termed ELISA. This technology allows for detection of hIgM down to a few picograms/mL. The antibodies used in this kit are very specific for hIgM and thus the assay will provide accurate results for hIgM even in the presence of other human immunoglobulins. Because of the very high sensitivity of this assay it is useful in detecting trace contamination by hIgM in a variety of sample types. This kit can be used to quantitate hIgM in human serum samples however it will be necessary to significantly dilute most serum samples to get them within the analytical range of this very sensitive assay.

### Principle of the Procedure

The hIgM assay is a two-site immunoenzymetric assay. Samples containing hIgM are reacted in microtiter strips coated with an affinity purified capture antibody. A second, horse radish peroxidase (HRP) enzyme labeled anti-hIgM antibody, is reacted simultaneously resulting in the formation of a sandwich complex of solid phase antibody-hIgM-enzyme labeled antibody. The microtiter strips are washed to remove any unbound reactants. The substrate, tetramethyl benzidine (TMB) is then reacted. The amount of hydrolyzed substrate is read on a microtiter plate reader and is directly proportional to the concentration of hIgM present.

### Storage & Stability

- \* All reagents should be stored at 2°C to 8°C for stability until the expiration date printed.
- \* The substrate reagent should not be used if its stopped absorbance at 450nm is greater than 0.1.

\* Reconstituted wash solution is stable until the expiration date of the kit.

### Reagents & Materials Provided

Component	Product #
<b>Anti-hIgM:HRP</b> Affinity purified goat antibody to hIgM, conjugated to HRP in a protein matrix with preservative, 1x12mL	<b>F173</b>
<b>Anti-hIgM coated microtiter strips</b> 12x8 well strips in a bag with desiccant	<b>F172</b>
<b>hIgM Standards</b> Highly purified hIgM in a bovine serum albumin matrix with preservative. Standards at 0, 0.5, 1.5, 5, 15, & 50ng/mL, 1mL/vial	<b>F171</b>
<b>TMB Substrate</b> 3,3',5,5' Tetramethyl benzidine, 1x12mL	<b>F005</b>
<b>Wash Concentrate (20X)</b> Tris buffered saline with preservative, 1x50mL	<b>F004</b>
<b>Stop Solution</b> 0.5N sulfuric acid, 1x12mL	<b>F006</b>

### Materials & Equipment

#### Required But Not Provided

- Microtiter plate reader spectrophotometer with dual wavelength capability at 450 & 650nm.  
*(If your plate reader does not provide dual wavelength analysis you may read at just the 450nm wavelength.)*
- Pipettors - 50µL and 100µL
- Repeating or multichannel pipettor - 100µL
- Microtiter plate rotator (150 - 200 rpm)
- Sample Diluent, (recommend Cygnus Cat. # I028)
- Distilled water
- 1 liter wash bottle for diluted wash solution

### Precautions

**For research or manufacturing use only.**

**Stop reagent is 0.5N H<sub>2</sub>SO<sub>4</sub>. Avoid contact with eyes, skin, and clothing. At the concentrations used in this kit none of the other chemical reagents are believed to be harmful.**

**The source serum used in preparation of the kit standards has been tested by FDA approved methods and has been found negative for antibody**

**to human immunodeficiency virus (HIV-I & HIV-II), antibody to Hepatitis C virus, and for Hepatitis B surface antigen. No known test method can offer total assurance that HIV, Hepatitis B and C, or other infectious agents are absent. Handle these reagents as if they were potentially infectious. This kit should only be used by qualified technicians.**

## Preparation of Reagents

- \* Bring all reagents to room temperature.
- \* Dilute wash concentrate to 1 liter in distilled water, label with kit lot/expiration date, and store at 4°C.

## Procedural Notes

1. Complete washing of the plates to remove excess unreacted reagents is essential to good assay reproducibility and sensitivity. We advise against the use of automated or other manual operated vacuum aspiration devices for washing plates as these may result in lower specific absorbances, higher non-specific absorbance, and more variable precision. The manual wash procedure described below generally provides lower backgrounds, higher specific absorbance, and better precision. If duplicate CVs are poor or if the absorbance of the "0" standard minus a substrate blank is greater than 0.2, evaluate plate washing procedure for proper performance.

2. Dilution of samples will be required for samples >50ng/mL. The diluent used should be compatible with accurate recovery. The preferred diluent is our Cat.# I028 available in 100mL, 500mL, or 1 liter bottles. This is the same material used to prepare the kit standards. As the sample is diluted in I028 its matrix begins to approach that of the standards thus reducing any inaccuracies caused by dilutional artifacts. Other prospective diluents should be validated in the assay to demonstrate that they do not give elevated background and are not contaminated with human serum proteins. The diluent should also give acceptable recovery when spiked with known quantities of hIgM.

3. High Dose Hook Effect may be observed in samples with very high concentrations of hIgM. Samples greater than 1mg/mL may give absorbances less than the 50ng/mL standard. High Dose Hook samples are most likely to be encountered in samples derived from human serum or blood. If a hook effect is possible samples should also be assayed diluted. If the absorbance of the undiluted sample is less than the diluted samples this may be indicative of the hook effect. Such samples should be diluted until the dilution adjusted value remains constant.

4. Because this is an extremely sensitive assay for hIgM, it is possible to inadvertently contaminate the kit reagents with various external sources of hIgM.

Such hIgM contamination can arise from use of pipettors or other laboratory equipment or surfaces that have come into contact with more concentrated forms of hIgM. For example, human serum contains several hundred µg/mL of IgM or almost a million fold greater than the standards used in this kit. Airborne contamination from these same concentrated sources or from technician mucosal aerosols or dander will also easily contaminate the kit reagents and potentially give false values and or poor assay reproducibility. Take precautions to minimize contamination.

## Limitations

\* Certain sample matrices may interfere in this assay. Although the assay is designed to minimize matrix interference, materials such as detergents in high concentration, high salt concentration, extremes of pH (<6.0 and >8.5) or very high protein concentrations may give erroneous results. It is recommended to test the sample matrix for interference by diluting the 50ng/mL standard 1 part to 4 parts of the matrix containing no or very low levels of hIgM. This diluted standard when assayed as an unknown should give an added value of 8 to 12ng/mL. In cases where hIgM in the sample will allow for sample dilution, such dilution will often overcome sample matrix interference. Consult *Cygnus Technologies* Technical Service Department for advice on how to quantitate the assay in problematic matrices.

\* Avoid the assay of samples containing sodium azide (NaN<sub>3</sub>) which will destroy the HRP activity of the conjugate and could result in the under-estimation of hIgM levels.

## Assay Protocol

-The assay is very robust such that assay variables like incubation times, sample size, and other sequential incubation schemes can be altered to manipulate assay performance for more sensitivity, increased upper analytical range, or reduced sample matrix interference. Before modifying the protocol from what is recommended, users are advised to contact our technical services for input on the best way to achieve your desired goals.

-The protocol specifies the use of an approved microtiter plate shaker or rotator for the immunological step. If you do not have such a device it is possible to incubate the plate without shaking, however it will be necessary to extend the first immunological incubation step by about 1 hour to achieve comparable results to the 1 hour shaking protocol. **Do not shake during the 30 minute substrate incubation step as this may result in higher backgrounds and worse precision.**

-Bring all reagents to room temperature. Set-up plate spectrophotometer to read dual wavelength at 450nm for the test wavelength and 650nm for the reference.

-Thorough washing is essential to proper performance of this assay.

- All standards, controls, and samples should be assayed in duplicate.
- Maintain a repetitive timing sequence from well to well for all assay steps to insure that all incubation times are the same for each well.
- Make a work list for each assay to identify the location of each standard, control, and sample.
- If the substrate has a distinct blue color prior to the assay it may have been contaminated. If the absorbance of 100µL of substrate plus 100µL of stop against a water blank is greater than 0.1 it may be necessary to obtain new substrate or the sensitivity of the assay may be compromised.
- Strips should be read within 30 minutes after adding stop solution since color will fade over time.

### Assay Protocol

- 1. Pipette 50µL of standards, controls and samples into wells indicated on work list.**
- 2. Pipette 100µL of anti-hIgM:HRP into each well.**
- 3. Cover or place in a zip-lock plastic bag, transfer to rotator, and incubate for 2 hours at 180rpm, at room temperature, 24°C ± 4°.**
- 4. Dump contents of wells into waste or gently aspirate with a pipettor. Blot and vigorously bang out residual liquid over absorbent paper. Fill wells generously with diluted wash solution by flooding wells from a squirt bottle or by pipeting in ~350 µL. Dump and bang again. Repeat for a total of 4 washes.**
- 5. Pipette 100µL of substrate.**
- 6. Incubate for 30 minutes. Do Not Shake.**
- 7. Pipette 100µL of stop solution.**
- 8. Read absorbance at 450/650nm blanking on the Zero standard.**

### Calculation of Results

The standards may be used to construct a standard curve with values reported in ng/mL. This data reduction may be performed through computer methods using curve fitting routines such as point to

point, spline, or 4 parameter logistic fit. **Do not use linear regression analysis to interpolate values for samples as this may lead to significant inaccuracies!** Data may also be manually reduced by plotting the absorbance values of the standard on the y-axis versus concentration on the x-axis and drawing a smooth point to point line. Absorbances of samples are then interpolated from this standard curve.

### Example Data

Well #	Contents	Abs. at 450nm	Mean Abs.	ng/mL hIgM
1A	Zero Std	0.000		
1B	Zero Std	0.002	0.001	
1C	0.5ng/mL	0.026		
1D	0.5ng/mL	0.026	0.026	
1E	1.5ng/mL	0.073		
1F	1.5ng/mL	0.077	0.075	
1G	5 ng/mL	0.266		
1H	5 ng/mL	0.258	0.262	
2A	15 ng/mL	0.746		
2B	15 ng/mL	0.739	0.743	
2C	50 ng/mL	1.976		
2D	50 ng/mL	1.955	1.966	
2E	sample A	2.255		
2F	sample A	2.215	2.235	>50
2G	sample B	0.072		
2H	sample B	0.070	0.071	1.4

### Quality Control

- Precision on duplicate samples should yield average % coefficients of variation of less than 10% for samples greater than 0.5 ng/mL and < 50 ng/mL. CVs for samples < 0.5 ng/mL may be greater than 10%.
- For optimal performance the absorbance of the substrate when blanked against water should be < 0.1.
- It is recommended that each laboratory assay appropriate quality control samples in each run to insure that all reagents and procedures are correct.

### Performance Characteristics

*Cygnus Technologies* has validated this assay by conventional criteria as indicated below. A more detailed copy of this "Validation Summary" report can be obtained by request. This validation is generic in nature and is intended to supplement but not replace certain user and sample specific validation that should be performed by each laboratory. At a minimum each laboratory is urged to perform a spike and recovery study in their sample types. In addition, any of your samples types containing hIgM within or above the analytical range of this assay should be evaluated for

dilutional linearity to insure that the assay is accurate and has sufficient antibody excess. Each laboratory and technician should also demonstrate competency in the assay by performing a precision study similar to that described below. A more detailed discussion of recommended user validation protocols can be obtained by contacting our Technical Services Department or on-line at our web site.

### Sensitivity

The lower limit of detection (**LOD**) is defined as that concentration corresponding to a signal two standard deviations above the mean of the zero standard. LOD is ~177 pg/mL.

The lower limit of quantitation (**LOQ**) is defined as the lowest concentration where concentration coefficients of variation (CVs) are <20%.

LOQ is 250 pg/mL.

### Precision

Both intra (n=20 replicates) and inter-assay (n=5 assays) precision were determined on 3 pools with low (1.28ng/mL), medium (4.46ng/mL), and high concentrations (15.05ng/mL). The % CV is the standard deviation divided by the mean and multiplied by 100.

Pool	Intra assay CV	Inter assay CV
Low	3.6%	6.5%
Medium	2.6%	3.8%
High	4.2%	9.2%

### Hook Capacity

Increasing concentrations of hIgM >50 ng/mL were assayed as unknowns. The hook capacity, defined as that concentration which will give an absorbance reading less than the 50 ng/mL standard was ~1mg/mL.

### Specificity/Cross-Reactivity

The antibodies used in this kit are essentially human  $\mu$ chain specific and have been affinity purified against hIgM. Because it is difficult to obtain hIgM for either immunogen, antigen affinity purification, or assay calibrator purposes that does not have trace IgG or IgA contamination or IgG and IgA that does not have trace contamination with IgM, it is difficult to accurately determine cross reactivity. With these limitations considered, it is believed that cross reactivity for human IgG and human IgA is negligible (<0.1%) for most assay applications. It is recommended that each user consider testing their particular sample types and sample matrices for cross reactivity, or other types of interferences. Sera from various other animals were diluted 1:1000 and tested for apparent reactivity in this assay. As indicated in the table below, certain sera showed very minimal positive reactivity on a weight to weight basis, however at these very low levels it cannot be conclusively determined if this is true immunological cross reactivity or some non-specific increase in assay signal.

Animal Species	%Cross Reactivity (Apparent hIgM/total protein)
Cat	Not detectable
Chicken	Not detectable
Cow	Not detectable
Dog	~0.009%
Goat	Not detectable
Hamster	~0.0004%
Horse	~0.0008%
Mouse	~0.0005%
Pig	~0.0008%
Rabbit	~0.0009%
Rat	~0.0008%
Sheep	Not detectable

### Recovery/ Interference Studies

Various buffer matrices have been evaluated by adding known amounts of the hIgM preparation used to make the standards in this kit. Because this assay is designed to minimize matrix interference most of these buffers yielded acceptable recovery defined as between 80-120%. In general, extremes in pH (<5.0 and >8.5) as well as some detergents like SDS and Tween can cause under-recovery. Very high concentrations of certain proteins can also interfere in accurate detection of hIgM. Each user should validate that their sample matrices yield accurate recovery by performing a similar experiment. For example, this experiment can be performed by diluting one part of the 50ng/mL standard provided with this kit into 4 parts of the sample matrix in question. Recovery should be on the order of 8 to 12 ng/mL hIgM. Consult *Cygnus Technologies* Technical Services if you have recovery problems in your matrix.

### Ordering Information/ Customer Service

To place an order or to obtain additional product information contact *Cygnus Technologies* Customer Support:

Tel: 910-454-9442 Fax: 910-454-9443

Email: cygnustec@aol.com

Web site: www.cygnustechnologies.com  
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Southport, NC 28461 USA

*Cygnus Technologies* also sells the following related microtiter plate ELISA kits:

Assay	Catalog #
hIgA	F165
Total hIgG	F160
h Albumin	F055
h Transferrin	F035N
h Insulin	F040