

### INTENDED USE

This human lactoferrin assay is intended for the quantitative determination of lactoferrin in human plasma, serum, milk, and cell culture samples. **For research use only.**

### BACKGROUND

Lactoferrin (aka lactotransferrin or growth-inhibiting protein 12) is an 82.4kDa 691 amino acid glycoprotein which carries 2 ferric ions per molecule and is the main iron binding protein in milk [1]. Lactoferrin has multiple physiological functions including iron absorption regulation and antibacterial, antiviral, and antiparasitic activity. Degranulated neutrophils are the primary source of plasma lactoferrin which is increased during inflammation and bacterial infection [2].

### ASSAY PRINCIPLE

Human lactoferrin will bind to the affinity purified capture antibody coated on the microtiter plate. After appropriate washing steps, biotin labeled anti-human lactoferrin primary antibody binds to the captured protein. Excess primary antibody is washed away and bound antibody is reacted with peroxidase conjugated streptavidin. Following an additional washing step, TMB substrate is used for color development at 450nm. A standard calibration curve is prepared along with the samples to be measured using dilutions of human lactoferrin. Color development is proportional to the concentration of total lactoferrin in the samples.

### REAGENTS PROVIDED

- **96-well antibody coated microtiter strip plate** (removable wells 8x12) containing anti-human lactoferrin antibody, blocked and dried.
- **10X Wash buffer:** 1 bottle of 50ml
- **Human lactoferrin standard:** 1 vial lyophilized standard
- **Anti-human lactoferrin primary antibody:** 1 vial lyophilized polyclonal antibody
- **Horseradish peroxidase-conjugated streptavidin:** 1 vial concentrated HRP labeled streptavidin
- **TMB substrate solution:** 1 bottle of 10ml solution

### STORAGE AND STABILITY

Store all kit components at 4°C upon arrival. Return any unused microplate strips to the plate pouch with desiccant. Reconstituted standards and primary may be stored at -80°C for later use. Do not freeze-thaw the standard and primary antibody more than once. Store all other unused kit components at 4°C. This kit should not be used beyond the expiration date.

### OTHER REAGENTS AND SUPPLIES REQUIRED

- Microtiter plate shaker capable of 300 rpm uniform horizontally circular movement
- Manifold dispenser/aspirator or automated microplate washer
- Microplate reader capable of measuring absorbance at 450 nm
- Pipettes and Pipette tips
- Deionized or distilled water
- Polypropylene tubes for dilution of standard
- Paper towels or laboratory wipes
- 1N H<sub>2</sub>SO<sub>4</sub> or 1N HCl
- Bovine Serum Albumin Fraction V (BSA)
- Tris(hydroxymethyl)aminomethane (Tris)
- Sodium Chloride (NaCl)

### PRECAUTIONS

- **FOR LABORATORY RESEARCH USE ONLY. NOT FOR DIAGNOSTIC USE.**
- Do not mix any reagents or components of this kit with any reagents or components of any other kit. This kit is designed to work properly as provided.
- Always pour peroxidase substrate out of the bottle into a clean test tube. Do not pipette out of the bottle as contamination could result.
- Keep plate covered except when adding reagents, washing, or reading.
- **DO NOT** pipette reagents by mouth and avoid contact of reagents and specimens with skin.
- **DO NOT** smoke, drink, or eat in areas where specimens or reagents are being handled.

## PREPARATION OF REAGENTS

- TBS buffer:** 0.1M Tris, 0.15M NaCl, pH 7.4
- Blocking buffer (BB):** 3% BSA (w/v) in TBS
- 1X Wash buffer:** Dilute 50ml of 10X wash buffer concentrate with 450ml of deionized water

## SAMPLE COLLECTION

Collect plasma using EDTA, citrate or heparin as an anticoagulant. Centrifuge for 15 minutes at 1000xg within 30 minutes of collection. Assay immediately or aliquot and store at  $\leq -20^{\circ}\text{C}$ . Avoid repeated freeze-thaw cycles.

## ASSAY PROCEDURE

Perform assay at room temperature. Vigorously shake plate (300rpm) at each step of the assay.

### Preparation of Standard

Reconstitute standard by adding 1ml of blocking buffer directly to the vial and agitate gently to completely dissolve contents. This will result in a 1,000ng/ml standard solution.

Dilution table for preparation of human lactoferrin standard:

Lactoferrin concentration (ng/ml)	Dilutions
100	900 $\mu\text{l}$ (BB) + 100 $\mu\text{l}$ (from vial)
50	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (100ng/ml)
20	600 $\mu\text{l}$ (BB) + 400 $\mu\text{l}$ (50ng/ml)
10	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (20ng/ml)
5	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (10ng/ml)
2	600 $\mu\text{l}$ (BB) + 400 $\mu\text{l}$ (5ng/ml)
1	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (2ng/ml)
0.5	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (1ng/ml)
0.2	600 $\mu\text{l}$ (BB) + 400 $\mu\text{l}$ (0.5ng/ml)
0.1	500 $\mu\text{l}$ (BB) + 500 $\mu\text{l}$ (0.2ng/ml)
0	500 $\mu\text{l}$ (BB) Zero point to determine background

**NOTE: DILUTIONS FOR THE STANDARD CURVE AND ZERO STANDARD MUST BE MADE AND APPLIED TO THE PLATE IMMEDIATELY.**

## Standard and Unknown Addition

Remove microtiter plate from bag and add 100 $\mu\text{l}$  lactoferrin standards (in duplicate) and unknowns to wells. Carefully record position of standards and unknowns. Shake plate at 300rpm for 30 minutes. Wash wells three times with 300 $\mu\text{l}$  wash buffer. Remove excess wash by gently tapping plate on paper towel or kimwipe.

NOTE: The assay measures total human lactoferrin in the 0.1-100 ng/ml range. If the unknown is thought to have high lactoferrin levels, dilutions may be made in blocking buffer. A 1:100-1:500 dilution for normal human plasma or serum and 1:200,000 dilution for breast milk is suggested for best results.

### Primary Antibody Addition

Reconstitute primary antibody by adding 10ml of blocking buffer directly to the vial and agitate gently to completely dissolve contents. Add 100 $\mu\text{l}$  to all wells. Shake plate at 300rpm for 30 minutes. Wash wells three times with 300 $\mu\text{l}$  wash buffer. Remove excess wash by gently tapping plate on paper towel or kimwipe.

### Streptavidin-HRP Addition

Briefly centrifuge vial before opening. Dilute 2.5 $\mu\text{l}$  of HRP conjugated streptavidin into 2.5ml blocking buffer to generate a 1:1,000 dilution. Add 0.1ml of 1:1,000 dilution to 9.9ml of blocking buffer to generate a 1:100,000 dilution. Add 100 $\mu\text{l}$  of the 1:100,000 dilution to all wells. Shake plate at 300rpm for 30 minutes. Wash wells three times with 300 $\mu\text{l}$  wash buffer. Remove excess wash by gently tapping plate on paper towel or kimwipe.

### Substrate Incubation

Add 100 $\mu\text{l}$  TMB substrate to all wells and shake plate for 2-10 minutes. Substrate will change from colorless to different strengths of blue. Quench reaction by adding 50 $\mu\text{l}$  of 1N  $\text{H}_2\text{SO}_4$  or HCl stop solution to all wells when samples are visually in the same range as the standards. Add stop solution to wells in the same order as substrate upon which color will change from blue to yellow. Mix thoroughly by gently shaking the plate.

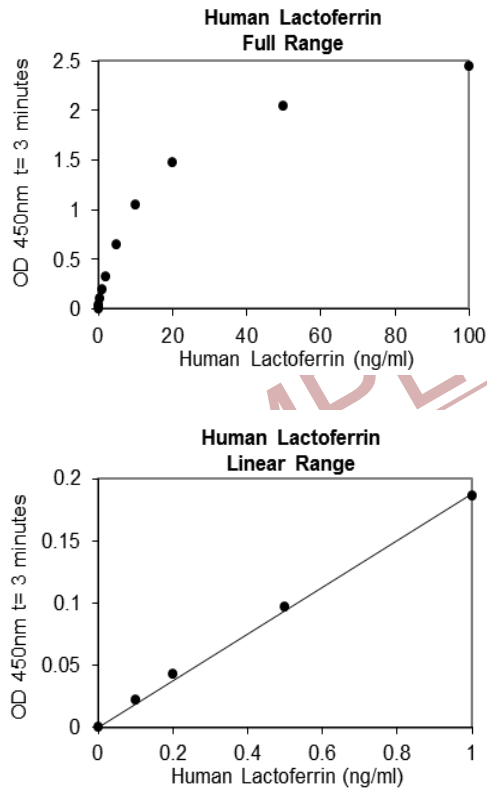
### Measurement

Set the absorbance at 450nm in a microtiter plate spectrophotometer. Measure the absorbance in all wells at 450nm. Subtract zero point from all standards and unknowns to determine corrected absorbance ( $A_{450}$ ).

## Calculation of Results

Plot  $A_{450}$  against the amount of lactoferrin in the standards. Fit a straight line through the linear points of the standard curve using a linear fit procedure if unknowns appear on the linear portion of the standard curve. Alternatively, create a standard curve by analyzing the data using a software program capable of generating a four parameter logistic (4PL) curve fit. The amount of lactoferrin in the unknowns can be determined from this curve. If samples have been diluted, the calculated concentration must be multiplied by the dilution factor.

A typical standard curve (EXAMPLE ONLY):



## EXPECTED VALUES

The concentration of lactoferrin in normal human plasma is 100ng/ml and is higher in serum [3]. The concentration of lactoferrin in milk is 5.3 mg/ml immediately after birth then decreases to 1-2 mg/ml [4].

## PERFORMANCE CHARACTERISTICS

**Sensitivity:** The minimum detectable dose (MDD) was determined by adding two standard deviations to the mean optical density value of twenty zero standard replicates (range  $OD_{450}$ : 0.06-0.068) and calculating the corresponding concentration. The MDD was 0.019 ng/mL.

**Intra-assay Precision:** These studies are currently in progress. Please contact us for more information.

**Inter-assay Precision:** These studies are currently in progress. Please contact us for more information.

**Recovery:** These studies are currently in progress. Please contact us for more information.

**Linearity:** To assess the linearity of the assay, human plasma samples containing high concentrations of antigen were serially diluted to produce samples with values within the dynamic range of the assay.

Sample	1:2	1:4	1:8	1:16
n	4	4	4	4
Average % of Expected	99	93	92	95
Range	95-104%	81-104%	82-103%	83-115%

**Specificity:** Pooled normal plasma from mouse, rat, pig, horse, cyno monkey, rhesus monkey, rabbit, sheep, and canine were assayed for cross-reactivity. No significant cross-reactivity was observed.

**Sample Values:** Samples were evaluated for the presence of the antigen at varying dilutions.

Sample Type	Dilution	Mean ( $\mu\text{g/mL}$ )
Citrate Plasma	1:320	0.144
	1:640	0.143
Milk, Centrifuged	1:1,000,000	1,440
	1:2,000,000	1,330
	1:4,000,000	1,340
Urine, Centrifuged	1:100	0.094
	1:200	0.084
Saliva, Centrifuged	1:100	0.339
	1:40	0.316

## DISCLAIMER

This information is believed to be correct but does not claim to be all-inclusive and shall be used only as a guide. The supplier of this kit shall not be held liable for any damage resulting from handling of or contact with the above product.

## REFERENCES

1. Adlerova N, *et al.*: Vet Med (Praha) 2008, 53:457-468.
2. Baynes RD and Bezwoda WR: Adv Exp Med Biol. 1994, 357:133-41.
3. Birgens HS: Scand J Haematol. 1985, 34:326-331.
4. Goldman AS and Goldblum RM: Textbook of Gastroenterology and Nutrition in Early Infancy 1989, 135-142.

### Example of ELISA Plate Layout

96 Well Plate: 22 Standard wells, 74 Sample wells

	1	2	3	4	5	6	7	8	9	10	11	12
A	0	0.1 ng/ml	0.2 ng/ml	0.5 ng/ml	1 ng/ml	2 ng/ml	5 ng/ml	10 ng/ml	20 ng/ml	50 ng/ml	100 ng/ml	
B	0	0.1 ng/ml	0.2 ng/ml	0.5 ng/ml	1 ng/ml	2 ng/ml	5 ng/ml	10 ng/ml	20 ng/ml	50 ng/ml	100 ng/ml	
C												
D												
E												
F												
G												
H												

**SAMPLE INSERT**  
Refer to kit box for  
lot specific instructions