



Correlate-EIA™

human Gastrin I (1-17)

Enzyme Immunoassay Kit

Catalog No. 900-026

96 Well Kit

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Description

The Assay Designs' Correlate-EIA™ human Gastrin I kit is a competitive immunoassay for the quantitative determination of Gastrin in samples. The kit uses a polyclonal antibody to Gastrin I to bind, in a competitive manner, the Gastrin in the sample or an alkaline phosphatase molecule which has Gastrin I covalently attached to it. After a simultaneous incubation at room temperature the excess reagents are washed away and substrate is added. After a short incubation time the enzyme reaction is stopped and the yellow color generated read on a microplate reader at 405nm. The intensity of the bound yellow color is inversely proportional to the concentration of Gastrin I in either standards or samples. The measured optical density is used to calculate the concentration of Gastrin I. For further explanation of the principles and practice of immunoassays please see the excellent books by Chard¹ or Tijssen².

Introduction

Gastrins are a family of sequence-related carboxyamided peptides produced by endocrine G Cells of the antrum mucosa in response to a number of stimuli associated with digestion³. Antral distension, partially digested proteins, amino acids, and vagal stimulation resulting from smelling, tasting, chewing or swallowing food all contribute to gastrin release from G Cell storage³⁻⁶. In addition, caffeine, alcohol, hypoglycemia, antacids and elevated calcium levels will also stimulate gastrin release^{4,7}. Increased serum gastrin levels are associated with duodenal ulcers⁶, Helicobacter pylori infections⁹, colorectal carcinomas¹⁰⁻¹², and other tumors and cancerous lesions¹³. Gastrin is the most potent stimulator of gastric acid secretion.

Gastrin-I (G17) H₂N-Glu-Gly-Pro-Trp-Leu-Glu-Glu-Glu-Glu-Ala-Tyr-Gly-Trp-Met-Asp-Phe-NH₂

Gastrin is synthesized as a 101 residue pre-pro-peptide on the rough endoplasmic reticulum, then post-translationally modified by cleavage and alpha-amidation to result in the active forms G34, G17 and G13/14; Big, Little and Mini-Gastrins respectively^{3,6}. Other forms also exist, but are not considered biologically significant. There are two types of G17 and G34, type II is sulfated at the tyrosine¹² residue, while type I is not. Both G34 and G17 circulate and contribute to the stimulation of gastric acid secretion, but have different clearance rates¹³. In man, G17 has a circulating half-life of about 9 minutes while G34 has a half-life of about 35 minutes^{3,4,14}. G34 is the major circulating gastrin in fasting serum, but with G17, increases two to three-fold after feeding until both are present in approximately equal amounts. Fasting gastrin concentration is usually less than 30 pmol/L (equivalent to 62.9 pg/mL) while patients with Zollinger-Ellison Syndrome and gastrinomas have levels exceeding 1,000 pg/mL³.

Precautions

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1. Some kit components contain azide, which may react with lead or copper plumbing. When disposing of reagents always flush with large volumes of water to prevent azide build-up.
2. Stop Solution is a solution of trisodium phosphate. This solution is caustic; care should be taken in use.
3. The activity of the alkaline phosphatase conjugate is dependent on the presence of Mg²⁺ and Zn²⁺ ions. The activity of the conjugate is affected by concentrations of chelators (>10 mM) such as EDTA and EGTA.

4. We test this kit's performance with a variety of samples, however it is possible that high levels of interfering substances may cause variation in assay results.
5. The Gastrin Standard provided, Catalog No. 80-0283, is supplied in ethanolic buffer at a pH optimized to maintain Gastrin integrity. Care should be taken in handling this material because of the known and unknown effects of Gastrin.

Materials Supplied

1. **Goat anti-Rabbit IgG Microtiter Plate, One Plate of 96 wells, Catalog No. 80-0060**
A plate using break-apart strips coated with goat antibody specific to rabbit IgG.
2. **Gastrin I Conjugate, 6 mL, Catalog No. 80-0281**
A blue solution of alkaline phosphatase conjugated with Gastrin I.
3. **Gastrin I Antibody, 6 mL, Catalog No. 80-0282**
A yellow solution of a rabbit polyclonal antibody to Gastrin I.
4. **Assay Buffer, 30 mL, Catalog No. 80-0010**
Tris buffered saline containing proteins and sodium azide as preservative.
5. **Wash Buffer Concentrate, 30 mL, Catalog No. 80-1286**
Tris buffered saline containing detergents.
6. **human Gastrin I Standard, 0.5 mL, Catalog No. 80-0283**
A solution of 100,000 pg/mL human Gastrin I.
7. **pNpp Substrate, 20 mL, Catalog No. 80-0075**
A solution of p-nitrophenyl phosphate.
8. **Stop Solution, 5 mL, Catalog No. 80-0247**
A solution of trisodium phosphate in water. Keep tightly capped. Caution: **Caustic.**
9. **Gastrin Assay Layout Sheet, 1 each, Catalog No. 30-0081**
10. **Plate Sealer, 1 each, Catalog No. 30-0012**

Storage

All components of this kit are stable at 4 °C until the kit's expiration date.

Materials Needed but Not Supplied

1. Deionized or distilled water.
2. Precision pipets for volumes between 5 µL and 1,000 µL.
3. Repeater pipets for dispensing 50 µL and 200 µL.
4. Disposable beakers for diluting buffer concentrates.
5. Graduated cylinders.
6. A microplate shaker.
7. 37 °C Incubator.
8. Adsorbent paper for blotting.
9. Microplate reader capable of reading at 405 nm, preferably with correction between 570 and 590 nm.

Sample Handling

Assay Designs' Correlate-EIA™ human Gastrin I enzyme immunoassay is compatible with human Gastrin samples in a number of matrices after dilution in Assay Buffer. Sufficient dilution of samples in this Assay Buffer may allow them to be read directly without extraction. Samples in the majority of tissue culture media, including those containing fetal bovine serum, can also be read in the assay, provided the standards have been diluted into the tissue culture media instead of Assay Buffer. There may be a small change in binding associated with running the standards and samples in media. Users should only use standard curves generated in media or buffer to calculate concentrations of Gastrin in the appropriate matrix. Please refer to the Sample Recovery recommendations on page 11 for details of suggested dilutions. However, the end user **must verify** that the recommended dilutions are appropriate for their samples. **Samples containing rabbit IgG may interfere with the assay.**

We recommend extraction of samples for accurate determinations of human Gastrin I if the sample cannot be sufficiently diluted without being too dilute to measure. An extraction protocol is outlined below. Because of the labile nature of Gastrin, we recommend several precautions in collecting and analyzing samples.

Blood samples should be drawn into chilled EDTA (1mg/mL blood) or serum tubes containing Aprotinin (500 KIU/mL or 10.6 TIU/mL of blood). Centrifuge the samples at 1,600 x g for 15 minutes at 0 °C. Transfer the plasma or serum to a plastic tube and store at -70 °C or lower for long term storage. Avoid repeated freeze/thaw cycles. The stability of some peptides is improved by the addition of a protease inhibitor cocktail to the sample before freezing.

Extraction of the sample should be carried out using a similar protocol to the one described below.

1. Add an equal volume of 1% trifluoroacetic acid (TFA) in water to the sample. Centrifuge at 17,000 x g for 15 minutes at 4 °C to clarify and save the supernatant.
2. Equilibrate a 200 mg C₁₈ Sep-Pak column with 1 mL of acetonitrile, followed by 10-25 mL of 1% TFA in water.
3. Apply the supernatant to the Sep-Pak column and wash with 10-20 mL of 1% TFA in water. Discard wash.
4. Elute the sample slowly by applying 3 mL of acetonitrile: 1% TFA in water 60:40. Collect the eluant in a plastic tube.
5. Evaporate to dryness using a centrifugal concentrator under vacuum. Store at -20 °C.
6. Reconstitute with Assay Buffer and measure immediately.

Please note that recovery of peptides from extraction processes can be variable. It is important to optimize any process to obtain optimum recoveries. Extraction efficiencies can be determined by a number of methods, including the use of radioactive peptide, or by spiking into paired samples and determining the recovery of this known amount of added Gastrin.

Procedural Notes

1. Do not mix components from different kit lots or use reagents beyond the kit expiration date.
2. Allow all reagents to warm to room temperature for at least 30 minutes before opening.
3. Standards can be made up in either glass or plastic tubes.
4. Pre-rinse the pipet tip with reagent, use fresh pipet tips for each sample, standard and reagent.
5. Pipet standards and samples to the bottom of the wells.
6. Add the reagents to the side of the well to avoid contamination.
7. This kit uses break-apart microtiter strips, which allow the user to measure as many samples as desired. Unused wells must be kept desiccated at 4 °C in the sealed bag provided. The wells should be used in the frame provided.
8. **Care must be taken to minimize contamination by endogenous alkaline phosphatase.** Contaminating alkaline phosphatase activity, especially in the substrate solution, may lead to high blanks. Care should be taken not to touch pipet tips and other items that are used in the assay with bare hands.
9. **Prior to addition of substrate, ensure that there is no residual wash buffer in the wells. Any remaining wash buffer may cause variation in assay results.**

Reagent Preparation

1. human Gastrin I Standard

Allow the 100,000 pg/mL human Gastrin I standard solution to warm to room temperature. Label five 12 x 75 mm glass tubes #1 through #5. Pipet 1 mL of standard diluent (Assay Buffer or Tissue Culture Medium) into tube #1. Pipet 750 µL of standard diluent into tubes #2 through #5. Remove 100 µL of diluent from tube #1. Add 100 µL of the 100,000 pg/mL standard to tube #1. Vortex thoroughly. Add 250 µL of tube #1 to tube #2 and vortex thoroughly. Add 250 µL of tube #2 to tube #3 and vortex. Continue this for tubes #4 and #5.

The concentration of human Gastrin I in tubes #1 through #5 will be 10,000, 2,500, 625, 156.25 and 39.1 pg/mL, respectively. See human Gastrin I Assay Layout Sheet for dilution details.

Diluted standards should be used within 60 minutes of preparation.

2. Gastrin I Conjugate 1:10 Dilution for Total Activity Measurement

Prepare the Conjugate 1:10 Dilution by diluting 50 µL of the supplied conjugate with 450 µL of Assay Buffer. The dilution should be used within 3 hours of preparation. **This is intended for use in the Total Activity wells only.**

3. Wash Buffer

Prepare the Wash Buffer by diluting 5 mL of the supplied concentrate with 95 mL of deionized water. This can be stored at room temperature until the kit expiration date, or for 3 months, whichever is earlier.

Assay Procedure

Bring all reagents to room temperature for at least 30 minutes prior to opening.

All standards and samples should be run in duplicate.

1. Refer to the Assay Layout Sheet to determine the number of wells to be used and put any remaining wells with the desiccant back into the pouch and seal the ziploc. Store unused wells at 4 °C.
2. Pipet 100 µL of Standard Diluent (Assay Buffer or Tissue Culture Medium) into the NSB and the Bo (0 pg/mL Standard) wells.
3. Pipet 100 µL of Standards #1 through #5 into the appropriate wells.
4. Pipet 100 µL of the Samples into the appropriate wells
5. Pipet 50 µL of Assay Buffer into the NSB wells.
6. Pipet 50 µL of blue Conjugate into each well, except the Total Activity (TA) and Blank wells.
7. Pipet 50 µL of yellow Antibody into each well, except the Blank, TA and NSB wells.

NOTE: Every well used should be **Green** in color except the NSB wells which should be **Blue**. The Blank and TA wells are empty at this point and have no color.

8. Incubate the plate at room temperature on a plate shaker for 2 hours at ~500 rpm. The plate may be covered with the plate sealer provided, if so desired.
9. Empty the contents of the wells and wash by adding 200 µL of wash solution to every well. Repeat the wash 2 more times for a total of **3 Washes**.
10. After the final wash, empty or aspirate the wells, and firmly tap the plate on a lint free paper towel to remove any remaining wash buffer.
11. Add 5 µL of the light blue Conjugate 1:10 dilution (see step 3, Reagent Preparation, on page 5) to the TA wells.
12. Add 200 µL of the pNpp Substrate solution to every well. Seal plate and incubate at 37 °C for 3 hours.
13. Add 50 µL of Stop Solution to every well. This stops the reaction and the plate should be read immediately.
14. Blank the plate reader against the Blank wells, read the optical density at 405 nm, preferably with correction between 570 and 590 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 human Gastrin I in the samples. We recommend that the data be handled by an immunoassay software package utilizing a weighted 4 parameter logistic curve fitting program. If this type of data reduction software is not readily available, the concentration of human Gastrin I can be calculated as follows:

1. Calculate the average net Optical Density (OD) bound for each standard and sample by subtracting the average NSB OD from the average OD bound:

$$\text{Average Net OD} = \text{Average Bound OD} - \text{Average NSB OD}$$

2. Calculate the binding of each pair of standard wells as a percentage of the maximum binding wells (Bo), using the following formula:

$$\text{Percent Bound} = \frac{\text{Net OD}}{\text{Net Bo OD}} \times 100$$

3. Using Logit-Log paper plot Percent Bound (B/Bo) versus Concentration of human Gastrin I for the standards. Approximate a straight line through the points. The concentration of human Gastrin I in the unknowns can be determined by interpolation.

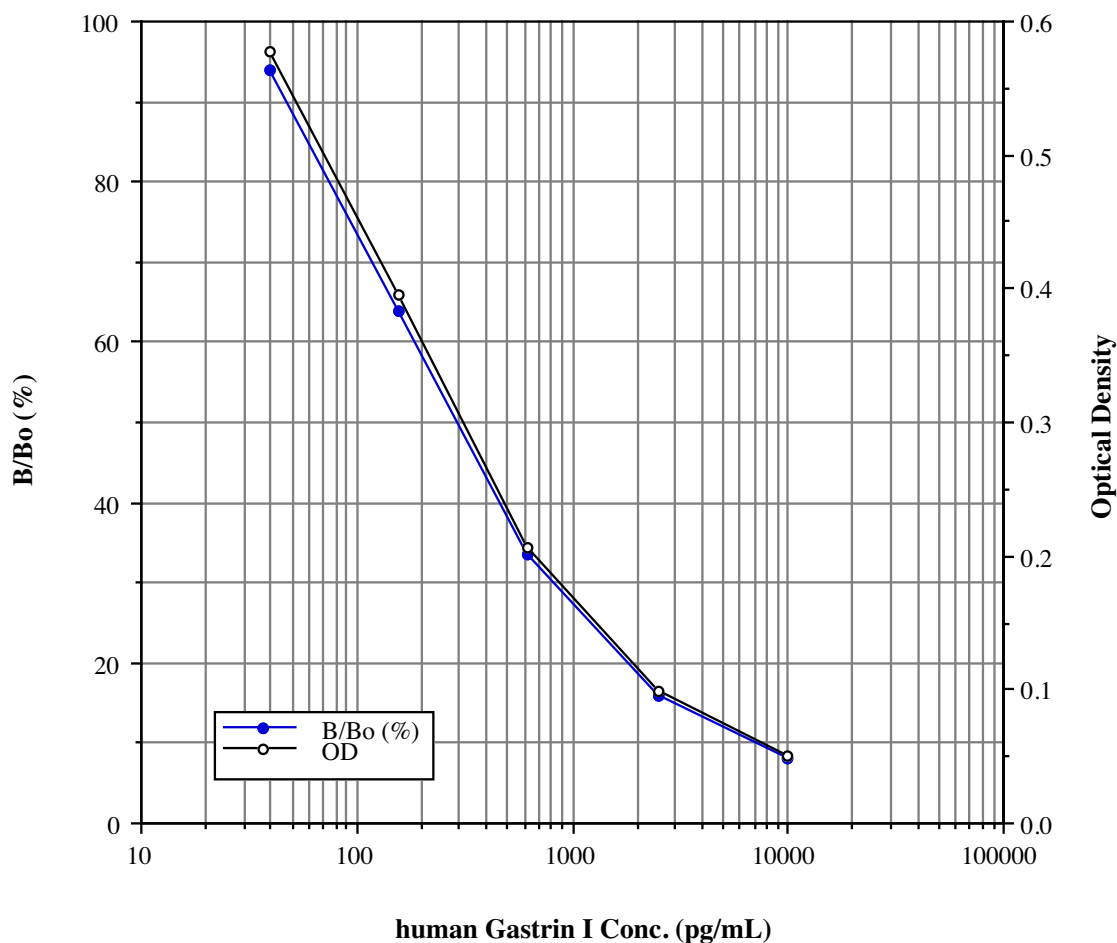
Typical Results

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

<u>Sample</u>	<u>Mean OD (-Blank)</u>	<u>Average Net OD</u>	<u>Percent Bound</u>	<u>human Gastrin I (pg/mL)</u>
Blank OD	(0.093)			
TA	0.274	0.274		
NSB	0.000	0.000		
Bo	0.616	0.616	100%	0
S1	0.051	0.051	8.2%	10,000
S2	0.098	0.098	15.9%	2,500
S3	0.207	0.207	33.5%	625
S4	0.395	0.395	64.0%	156.25
S5	0.578	0.578	93.8%	39.1
Unknown 1	0.250	0.250	40.6%	439
Unknown 2	0.153	0.153	24.8%	1,068

Typical Standard Curves

Typical standard curves are shown below. These curves **must not** be used to calculate human Gastrin I concentrations; each user must run a standard curve for each assay.



Typical Quality Control Parameters

Total Activity Added = $0.274 \times 10 \times 10 = 27.4$
 %NSB = 0.0%
 %Bo/TA = 2.2%
 Quality of Fit = 1.0000 (Calculated from 4 parameter logistics curve fit)

20% Intercept = 1,605 pg/mL
 50% Intercept = 282 pg/mL
 80% Intercept = 78 pg/mL

Performance Characteristics

The following parameters for this kit were determined using the guidelines listed in the National Committee for Clinical Laboratory Standards (NCCLS) Evaluation Protocols¹⁵.

Sensitivity

Sensitivity was calculated by determining the average optical density bound for sixteen (16) wells run as Bo, and comparing to the average optical density for sixteen (16) wells run with Standard #5. The detection limit was determined as the concentration of human Gastrin I measured at two (2) standard deviations from the zero along the standard curve.

Average Optical Density for the Bo = 0.474 ± 0.004 (0.82%)
Average Optical Density for Standard #5 = 0.431 ± 0.011 (2.51%)

Delta Optical Density (0-39.1 pg/mL) = 0.474 - 0.431 = 0.043

2 SD's of the Zero Standard= 2 x 0.004 = 0.008

Sensitivity = $\frac{0.008}{0.043}$ x 39.1 pg/mL = **7.27 pg/mL**

Linearity

A sample containing 4,576 pg/mL human Gastrin I was serially diluted 6 times 1:2 in the kit Assay Buffer and measured in the assay. The data was plotted graphically as actual human Gastrin I concentration versus measured human Gastrin I concentration.

The line obtained had a slope of 0.9734 with a correlation coefficient of 0.999.

Precision

Intra-assay precision was determined by taking samples containing low, medium and high concentrations of human Gastrin I 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 human Gastrin I in multiple assays (n=8).

The precision numbers listed below represent the percent coefficient of variation for the concentrations of human Gastrin I determined in these assays as calculated by a 4 parameter logistic curve fitting program.

	<u>human Gastrin I</u> (pg/mL)	<u>Intra-Assay</u> %CV	<u>Inter-Assay</u> %CV
Low	278	8.8	
Medium	471	3.7	
High	920	5.7	
Low	278		4.4
Medium	328		6.5
High	1,065		3.4

Cross Reactivities

The cross reactivities for a number of related compounds was determined by dissolving the cross reactant (purity checked by N.M.R. and other analytical methods) in Assay Buffer at concentrations from 100,000 to 1 pg/mL. These samples were then measured in the human Gastrin I assay, and the measured Gastrin concentration at 50% B/Bo calculated. The % cross reactivity was calculated by comparison with the actual concentration of cross reactant in the sample and expressed as a percentage.

<u>Compound</u>	<u>Cross Reactivity</u>
Gastrin I (G17-1)	100%
Minigastrin (G13-I)	74.6%
rat Gastrin I	70.7%
Gastrin II (G17-II, sulfated)	9.3%
Cholesystokinin 26-33 (CCK-8)	2.67%
Gastrin Tetrapeptide (CCK-4)	1.6%
Big Gastrin (G34-I)	0.8%
Gastrin Releasing Peptide (GRP)	<0.001%
Gastrin Inhibitory Polypeptide (GIP)	<0.001%
Glucagon	<0.001%
Bombesin	<0.001%
Pancreatic Polypeptide	<0.001%
Vasoactive Intestinal Peptide (VIP)	<0.001%
Somatostatin-14	<0.001%

Sample Recoveries

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

Human Gastrin I concentrations were measured in a variety of different samples including tissue culture media, and human serum and plasma. Human Gastrin I was spiked into the undiluted samples which were diluted with the appropriate diluent and then assayed in the kit. The following results were obtained:

<u>Sample</u>	<u>% Recovery*</u>	<u>Recommended Dilution*</u>
Tissue Culture Media	100.6	None
human Serum	101.9	≥1:8
human Citrate Plasma	107.9	≥1:8

* 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.

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