

# RayBio<sup>®</sup> Human/Mouse/Rat Apelin C-Terminus Enzyme Immunoassay Kit

Catalog #: EIA-APC, EIAM-APC, EIAR-APC

User Manual  
Last revised October 4, 2018

Caution:  
Extraordinarily useful information enclosed



ISO 13485 Certified

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Please read the entire manual carefully before starting your experiment

# I. Introduction

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Apelin, an endogenous ligand for the G-protein-coupled APJ receptor, has been recently extensively studied in obesity research. It is not only expressed in adipocyte tissue, but also widely expressed in various other organs such as the heart, lung, kidney, gastrointestinal tract, brain, adrenal glands, endothelium, and human plasma.

Apelin is derived from a 77-amino-acid prepropeptide that is cleaved into a 55-amino-acid fragment and then into shorter forms. The physiologically active form is thought to be apelin 36, although the pyroglutamylated form of apelin 13, which is also produced endogenously, is more potent.

Studies have shown the association between apelin and obesity. Apelin has higher circulating levels in obesity. Insulin exerts a positive action on adipocyte apelin production. Apelin also regulates fluid homeostasis, playing an important role in the hypothalamic regulation of food and water intake, and pituitary hormone release.

In addition to its role in obesity, apelin acts as a mediator of cardiovascular control, including for blood pressure and blood flow. It is one of the most potent stimulators of cardiac contractility yet identified, and plays a role in cardiac tissue remodeling. Apelin levels are increased in left ventricles of patients with chronic heart failure and also in patients with chronic liver disease.

## II. General Description

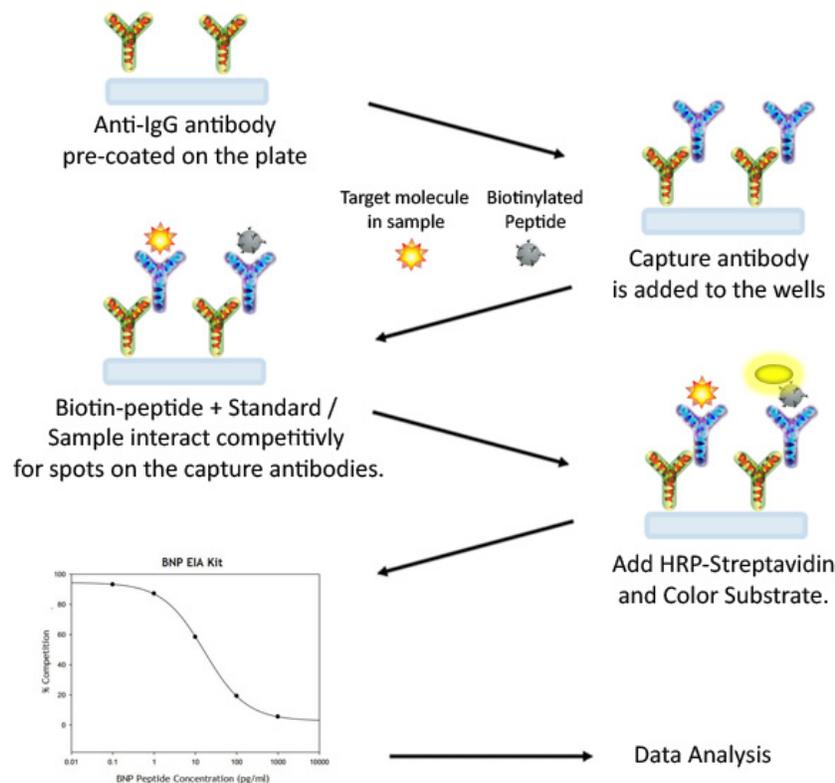
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The RayBio® Apelin Enzyme Immunoassay (EIA) Kit is an in vitro quantitative assay for detecting Apelin peptide based on the competitive enzyme immunoassay principle.

In this assay, a biotinylated Apelin peptide is spiked into the samples and standards. The samples and standards are then added to the plate, where the biotinylated Apelin peptide competes with endogenous (unlabeled) Apelin for binding to the anti-Apelin antibody. After a wash step, any bound biotinylated Apelin then interacts with horseradish peroxidase (HRP)-streptavidin, which catalyzes a color development reaction. The intensity of the colorimetric signal is directly proportional to the amount of captured biotinylated Apelin peptide and inversely proportional to the amount of endogenous Apelin in the standard or samples. A standard curve of known concentration of Apelin peptide can be established and the concentration of Apelin peptide in the samples can be calculated accordingly.

## III. How It Works

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## IV. Storage

The entire kit may be stored at -20°C to -80°C for up to 6 months from the date of shipment. For extended storage, it is recommended to store at -80°C. **Avoid repeated freeze-thaw cycles.** For prepared reagent storage, see table below.

## V. Reagents

Component	Size / Description	Storage / Stability After Preparation
EIA Microplate (Item A)	96 wells (12 strips x 8 wells) coated with secondary antibody.	1 month at 4°C*
Wash Buffer Concentrate (20X) (Item B)	25 ml of 20X concentrated solution.	1 month at 4°C
Standard Apelin Peptide (Item C)	2 vials of Lyophilized Apelin Peptide. 1 vial is enough to run each standard in duplicate.	Do not store and reuse
Anti-Apelin Polyclonal Antibody (Item N)	2 vials of Lyophilized anti-Apelin.	Do not store and reuse
5X Assay Diluent B (Item E)	15 ml of 5X concentrated buffer. Diluent for both standards and samples including serum, plasma, cell culture media or other sample types.	1 month at 4°C
Biotinylated Apelin Peptide (Item F)	2 vials of Lyophilized Biotinylated Apelin Peptide, 1 vial is enough to assay the whole plate.	Do not store and reuse
HRP-Streptavidin Concentrate (Item G)	600 µl 100X concentrated HRP-conjugated streptavidin.	Do not store and reuse
Positive Control (Item M)	1 vial of Lyophilized Positive Control.	Do not store and reuse
TMB One-Step Substrate Reagent (Item H)	12 ml of 3,3,5,5'-tetramethylbenzidine (TMB) in buffer solution.	N/A
Stop Solution (Item I)	8 ml of 0.2 M sulfuric acid.	N/A

\*Return unused wells to the pouch containing desiccant pack, reseal along entire edge.

## VI. Additional Materials Required

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1. Microplate reader capable of measuring absorbance at 450 nm
2. Precision pipettes to deliver 2  $\mu$ l to 1 ml volumes
3. Adjustable 1-25 ml pipettes for reagent preparation
4. 100 ml and 1 liter graduated cylinders
5. Absorbent paper
6. Distilled or deionized water
7. SigmaPlot software (or other software which can perform four-parameter logistic regression models)
8. Tubes to prepare standard or sample dilutions
9. Orbital shaker
10. Aluminum foil
11. Plastic wrap

## VII. Reagent Preparation

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Keep kit reagents on ice during reagent preparation steps.

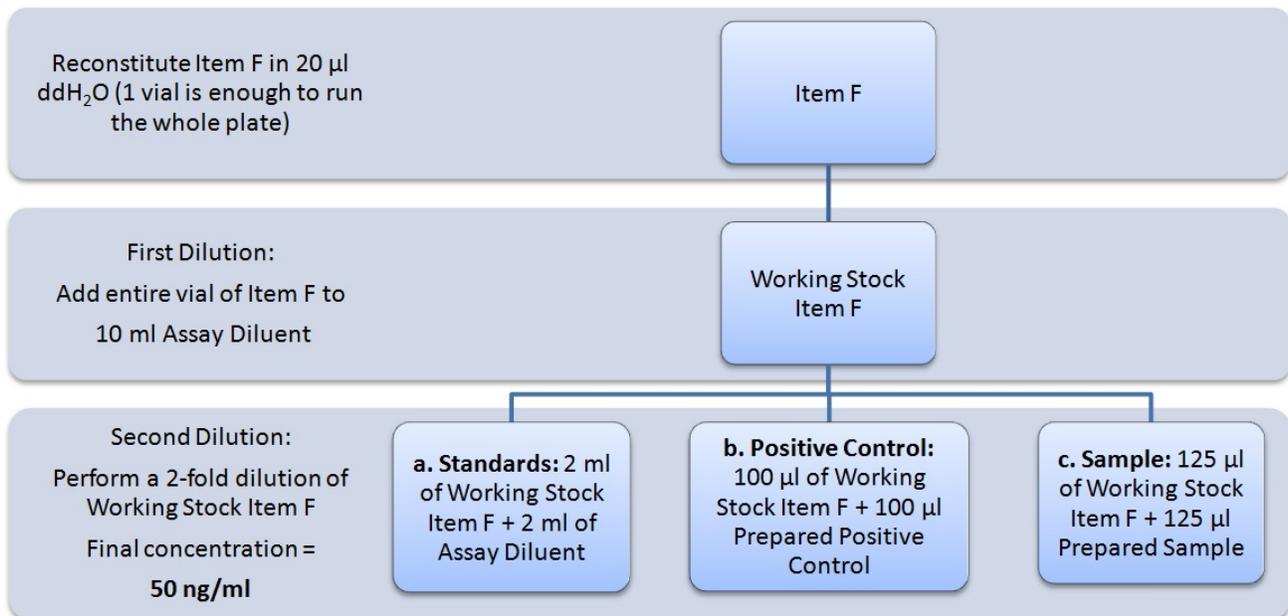
### A. Preparation of Plate and Anti-Apelin Antibody

1. Equilibrate plate to room temperature before opening the sealed pouch.
2. Label removable 8-well strips as appropriate for your experiment.
3. 5X Assay Diluent B (Item E) should be diluted 5-fold with deionized or distilled water.
4. Briefly centrifuge the anti-Apelin antibody vial (Item N) and reconstitute with 55  $\mu$ l of 1X Assay Diluent B to prepare the antibody concentrate. Pipette up and down to mix gently.
5. The antibody concentrate should then be diluted 100-fold with 1X Assay Diluent B. This is your anti-Apelin antibody working solution, which will be used in step 2 of Assay Procedure (Section VIII).

*Note: The following steps may be done during the antibody incubation procedure (step 2 of Assay Procedure)*

## B. Preparation of Biotinylated Apelin (Item F)

6. Briefly centrifuge the vial of Biotinylated Apelin (Item F) and reconstitute with 20  $\mu\text{l}$  of ddH<sub>2</sub>O before use.
7. See the image below for proper preparation of Item F. Transfer the entire contents of the Item F vial into a tube containing 10 ml of 1X Assay Diluent B. This is your Working Stock of Item F. Pipette up and down to mix gently. *The final concentration of biotinylated Apelin will be 100 ng/ml.*
  - a. Second Dilution of Item F for Standards: Add 2 ml of Working Stock Item F to 2 ml of 1X Assay Diluent B. The final concentration of biotinylated Apelin will be **50 ng/ml**.
  - b. Second Dilution of Item F for Positive Control: Add 100  $\mu\text{l}$  of Working Stock Item F to 100  $\mu\text{l}$  of the prepared Positive Control (Item M). (See section D for Positive Control preparation) The final concentration of biotinylated Apelin will be **50 ng/ml**.
  - c. Second Dilution of Item F for samples: Add 125  $\mu\text{l}$  of Working Stock Item F to 125  $\mu\text{l}$  of prepared sample (see section E for sample preparation). This is a 2-fold dilution of your sample. The final concentration of biotinylated Apelin will be **50 ng/ml**.

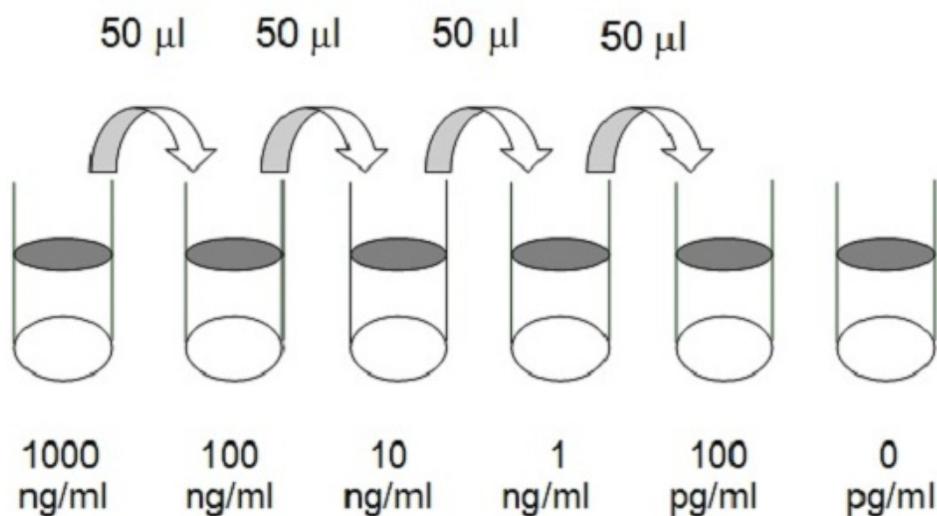


### C. Preparation of Standards

- Label 6 microtubes with the following concentrations: 1,000 ng/ml, 100 ng/ml, 10ng/ml, 1 ng/ml, 100 pg/ml and 0 pg/ml. Pipette 450  $\mu$ l of biotinylated Apelin Item F working solution (prepared in step 7a) into each tube, except the 1,000 ng/ml (leave this one empty).

*It is very important to make sure the concentration of biotinylated Apelin is 50 ng/ml in all standards.*

- Briefly centrifuge the vial of Apelin Standard (Item C). Reconstitute with 10  $\mu$ l of ddH<sub>2</sub>O and briefly vortex if desired. Pipette 8  $\mu$ l of Item C and 792  $\mu$ l of 50 ng/ml biotinylated Apelin working solution (prepared in step 7a) into the tube labeled 1000 ng/ml. Mix thoroughly. This solution serves as the first standard (1,000 ng/ml Apelin standard, 50 ng/ml biotinylated Apelin).
- To make the 100 ng/ml standard, pipette 50  $\mu$ l of the 1000 ng/ml Apelin standard into the tube labeled 100 ng/ml. Mix thoroughly.
- Repeat this step with each successive concentration, preparing a dilution series as shown in the illustration below. Each time, use 450  $\mu$ l of biotinylated Apelin and 50  $\mu$ l of the prior concentration until the 100 pg/ml is reached. Mix each tube thoroughly before the next transfer.



## D. Positive Control Preparation

12. Briefly centrifuge the Positive Control vial (Item M) and reconstitute with 100  $\mu$ l of ddH<sub>2</sub>O.
13. Refer to step 7b. This is a 2-fold dilution of the Positive Control. The final concentration of biotinylated Apelin should still be 50 ng/ml.

The Positive Control is a cell culture media sample that serves as a system control to verify that the kit components are working. The resulting OD will not be used in any calculations; if no positive competition is observed please contact RayBiotech Technical Support. The Positive Control may be diluted further if desired, but be sure the final concentration of biotinylated Apelin is 50 ng/ml.

## E. Sample Preparation

14. If you wish to perform a 2-fold dilution of your sample, proceed to step 7c. If you wish to perform a higher dilution of your sample, dilute your sample with 1X Assay Diluent B before performing step 7c.

EXAMPLE (to make a 4-fold dilution of sample):

- a. Dilute sample 2-fold (62.5  $\mu$ l of sample + 62.5  $\mu$ l of 1X Assay Diluent B.).
- b. Perform step 7c (125  $\mu$ l of working solution Item F + 125  $\mu$ l of sample prepared above).

The total volume is 250  $\mu$ l, enough for duplicate wells on the microplate. It is very important to make sure the final concentration of the biotinylated Apelin is **50 ng/ml**.

Note: Optimal sample dilution factors should be determined empirically, however you may reference below for recommended dilution factors for serum:

Human=2X Mouse=2X Rat=2X.

If you have any questions regarding the recommended dilutions you may contact technical support at 888-494-8555 or [techsupport@raybiotech.com](mailto:techsupport@raybiotech.com).

## **F. Preparation of Wash Buffer and HRP**

15. If Item B (20X Wash Concentrate) contains visible crystals, warm to room temperature and mix gently until dissolved.
16. Dilute 20 ml of Wash Buffer Concentrate into deionized or distilled water to yield 400 ml of 1X Wash Buffer.
17. Briefly centrifuge the HRP-Streptavidin vial (Item G) before use.
18. Dilute the HRP-Streptavidin concentrate 100-fold with 1X Assay Diluent B.

## **VIII. Assay Procedure**

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1. Keep kit reagents on ice during reagent preparation steps. It is recommended that all standards and samples be run at least in duplicate.
2. Add 100  $\mu$ l of Anti-Apelin Antibody (Item N) (See Reagent Preparation step 5) to each well. Incubate for 1.5 hours at room temperature with gentle shaking (1-2 cycle/sec). You may also incubate overnight at 4°C.
3. Discard the solution and wash wells 4 times with 1X Wash Solution Buffer (200-300  $\mu$ l each). Washing may be done with a multichannel pipette or an automated plate washer. Complete removal of liquid at each step is essential to good assay performance. After the last wash, remove any remaining Wash Buffer by aspirating or decanting. Invert the plate and blot it against clean paper towels.
4. Add 100  $\mu$ l of each standard (see Reagent Preparation Section C), Positive Control (see Reagent Preparation Section D) and sample (see Reagent Preparation Section E) to appropriate wells. Be sure to include a blank well (Assay Diluent only). Cover wells and incubate for 2.5 hours at room temperature with gentle shaking (1-2 cycles/sec) overnight or at 4°C.
5. Discard the solution and wash 4 times as directed in Step 3.
6. Add 100  $\mu$ l of prepared HRP-Streptavidin solution (see Reagent Preparation step 18) to each well. Incubate for 45 minutes at room temperature with gentle shaking. It is recommended that incubation time should not be shorter or longer than 45 minutes.

7. Discard the solution and wash 4 times as directed in Step 3.
8. Add 100  $\mu$ l of TMB One-Step Substrate Reagent (Item H) to each well. Incubate for 30 minutes at room temperature in the dark with gentle shaking (1-2 cycles/sec).
9. Add 50  $\mu$ l of Stop Solution (Item I) to each well. Read at 450 nm immediately.

## **IX. Assay Procedure Summary**

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1. Prepare all reagents, samples and standards as instructed.
2. Add 100  $\mu$ l anti-Apelin to each well. Incubate 1.5 hours at room temperature or overnight at 4°C.
3. Add 100  $\mu$ l standard or sample to each well. Incubate 2.5 hours at room temperature or overnight at 4°C.
4. Add 100  $\mu$ l prepared Streptavidin solution. Incubate 45 minutes at room temperature.
5. Add 100  $\mu$ l TMB One-Step Substrate Reagent to each well. Incubate 30 minutes at room temperature.
6. Add 50  $\mu$ l Stop Solution to each well. Read at 450 nm immediately.

## X. Calculation of Results

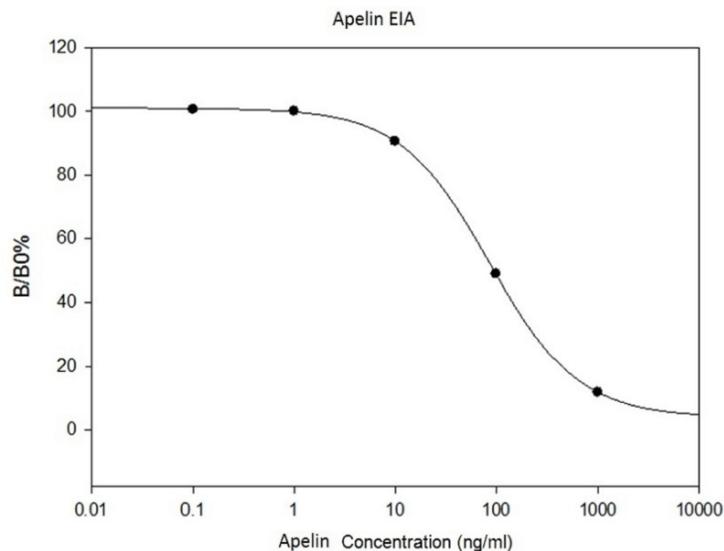
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Calculate the mean absorbance for each set of duplicate stands, controls, and samples and subtract the blank optical density. Plot the standard curve using SigmaPlot software (or other software which can perform four-parameter logistic regression models), with standard concentration on the x-axis and percentage of absorbance (see calculation below) on the y-axis. Draw the best-fit curve through the standard points.

Percentage absorbance =  $(B - \text{blank OD}) / (B_0 - \text{blank OD})$  where  
B = OD of sample or standard and  
B<sub>0</sub> = OD of zero standard (total binding)

### A. Typical Data

These standard curves are for demonstration only. A standard curve must be run with each assay.



### B. Sensitivity

The minimum detectable concentrations of Apelin is 15.8ng/ml.

### C. Standard Curve Range

0.1-1,000 ng/ml

### D. Reproducibility

Intra-Assay: CV<10%

Inter-Assay: CV<15%

## E. Assay Diagram

Recommended Plate Layout:

Blank	Blank	SA1	SA1	SA9	SA9	SA17	SA17	SA25	SA25	SA33	SA33
Total Binding	Total Binding	SA2	SA2	SA10	SA10	SA18	SA18	SA26	SA26	SA34	SA34
Standard1	Standard1	SA3	SA3	SA11	SA11	SA19	SA19	SA27	SA27	SA35	SA35
Standard2	Standard2	SA4	SA4	SA12	SA12	SA20	SA20	SA28	SA28	SA36	SA36
Standard3	Standard3	SA5	SA5	SA13	SA13	SA21	SA21	SA29	SA29	SA37	SA37
Standard4	Standard4	SA6	SA6	SA14	SA14	SA22	SA22	SA30	SA30	SA38	SA38
Standard5	Standard5	SA7	SA7	SA15	SA15	SA23	SA23	SA31	SA31	SA39	SA39
Pos Control	Pos Control	SA8	SA8	SA16	SA16	SA24	SA24	SA32	SA32	SA40	SA40

Key:

Blank = Buffer Only

Total Binding = Biotin- Apelin only

Standard 1 = 1000 ng/ml

Standard 2 = 100 ng/ml

Standard 3 = 10 ng/ml

Standard 4 = 1 ng/ml

Standard 5 = 100 pg/ml

Pos Control = Biotin with Item M

## XI. Specificity

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This kit is designed to target the C-terminus of the 77-aa apelin peptide and therefore is expected to detect all active forms of Apelin including Apelin-36, Apelin-31, Apelin-28 and Apelin 13 can be detected.

Cross Reactivity: This kit shows no cross-reactivity with any of the cytokines tested: Ghrelin, Nesfatin, and NPY.

## XIV. Publications Citing This Product

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1. Gileles-Hillel A., Alonso-Alvares M., Kheirandish-Gozal L., Peris E., et al. Inflammatory markers and obstructive sleep apnea in obese children: The NANOS Study. *Mediators of Inflammation*. Accepted May 2014  
<http://www.hindawi.com/journals/mi/aip/605280/> [Epub ahead of print]  
**Species: Human**  
**Sample Type: Plasma**
2. Than A., Cheng Y., Foh LC., et al. Apelin inhibits adipogenesis and lipolysis through distinct molecular pathways. *Mol Cell Endocrinol*. 2012 Oct 15;362(1-2):227-41. doi: 10.1016/j.mce.2012.07.002.  
**Species: Mouse**  
**Sample Type: Conditioned Media**
3. Samy D., Ismail C., Deif A., et al. Induction of Apelin by Losartan in Renal Ischemia/Reperfusion Injury in Rats - Implication of Endothelial Nitric Oxide Synthase (eNOS) Phosphorylation. *J Phys Pharm Adv* 2014 , 4 (11): 465 - 477 DOI: 10.5455/jppa.20141117043349  
**Species: Rat**  
**Sample Type: Tissue Lysate**

### XIII. Troubleshooting Guide

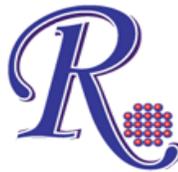
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Poor standard curve	<ul style="list-style-type: none"> <li>○ Inaccurate pipetting</li> <li>○ Improper standard dilution</li> </ul>	<ul style="list-style-type: none"> <li>○ Check pipettes</li> <li>○ Briefly centrifuge Item C and dissolve the powder thoroughly by gently mixing</li> </ul>
Low signal	<ul style="list-style-type: none"> <li>○ Improper preparation of standard and/or biotinylated antibody</li> <li>○ Too brief incubation times</li> <li>○ Inadequate reagent volumes or improper dilution</li> </ul>	<ul style="list-style-type: none"> <li>○ Briefly spin down vials before opening. Dissolve the powder thoroughly.</li> <li>○ Ensure sufficient incubation time; assay procedure step 2 may be done overnight</li> <li>○ Check pipettes and ensure correct preparation</li> </ul>
Large CV	<ul style="list-style-type: none"> <li>○ Inaccurate pipetting</li> <li>○ Air bubbles in wells</li> </ul>	<ul style="list-style-type: none"> <li>○ Check pipettes</li> <li>○ Remove bubbles in wells</li> </ul>
High background	<ul style="list-style-type: none"> <li>○ Plate is insufficiently washed</li> <li>○ Contaminated wash buffer</li> </ul>	<ul style="list-style-type: none"> <li>○ Review the manual for proper wash. If using a plate washer, ensure that all ports are unobstructed.</li> <li>○ Make fresh wash buffer</li> </ul>
Low sensitivity	<ul style="list-style-type: none"> <li>○ Improper storage of the ELISA kit</li> <li>○ Stop solution</li> </ul>	<ul style="list-style-type: none"> <li>○ Follow storage recommendations in sections IV and V. Keep substrate solution protected from light.</li> <li>○ Add stop solution to each well before reading plate</li> </ul>

# RayBio<sup>®</sup> ELISA Kits

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Over 3,000 ELISA kits available, visit [www.RayBiotech.com/ELISA-Kits.html](http://www.RayBiotech.com/ELISA-Kits.html) for details.

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