

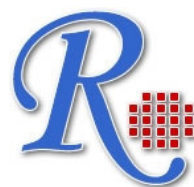
# **RayBio<sup>®</sup> Human/Mouse/Rat Apelin C-Terminus Enzyme Immunoassay Kit**

**Please Read the Manual Carefully  
Before Starting your Experiment**

**User Manual 3.2  
(Revised April 16, 2013)**

**RayBio<sup>®</sup> Apelin C-Terminus  
Enzyme Immunoassay Kit Protocol**

(Cat#: EIA-APC-1)



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**RayBiotech, Inc.**

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**RayBio® Human/Mouse/Rat Apelin C-Terminus Enzyme  
Immunoassay Kit Protocol**

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## I. INTRODUCTION

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.

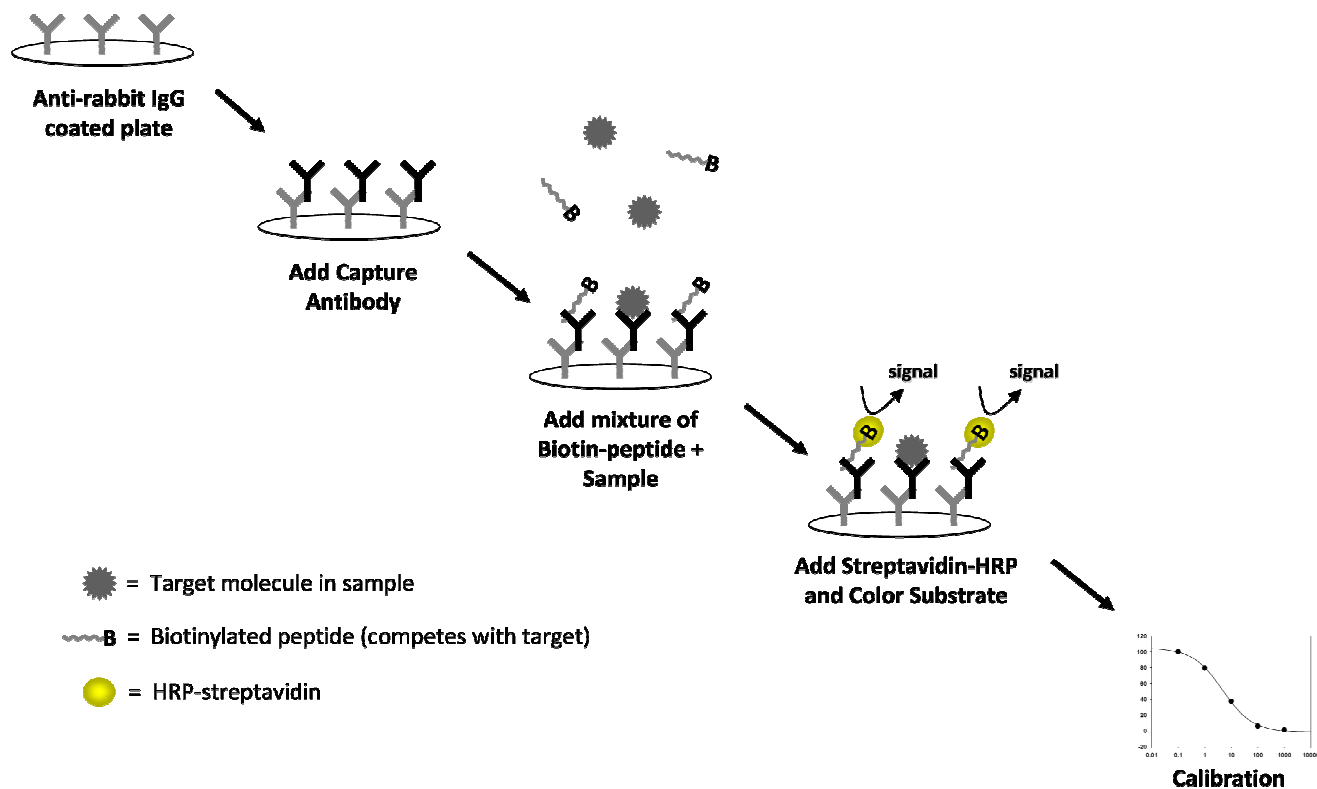
In addition to its role in obesity, apelin acts as a mediator of cardiovascular control, including for blood pressure and blood flow. It is one of the most potent stimulators of cardiac contractility yet identified, and plays a role in cardiac tissue remodeling. Apelin levels are increased in left ventricles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

## II. GENERAL DESCRIPTION

The RayBio® Apelin C-Terminus Enzyme Immunoassay (EIA) Kit is an in vitro quantitative assay for detecting Apelin C-Terminus peptide based on the principle of Competitive Enzyme Immunoassay.

The microplate in the kit is pre-coated with anti-rabbit secondary antibody. After a blocking step and incubation of the plate with anti-Apelin C-Terminus antibody, both biotinylated Apelin C-Terminus peptide and peptide standard or targeted peptide in samples interacts competitively with the Apelin C-Terminus antibody. Uncompeted (bound) biotinylated Apelin C-Terminus peptide then interacts with Streptavidin-horseradish peroxidase (SA-HRP), which catalyzes a color development reaction. The intensity of colorimetric signal is directly proportional to the amount of biotinylated peptide-SA-HRP complex and inversely proportional to the amount of Apelin C-Terminus peptide in the standard or samples. This is due to the competitive binding to Apelin C-Terminus antibody between biotinylated Apelin C-Terminus peptide and peptides in standard or samples. A standard curve of known concentration of Apelin C-Terminus peptide can be established and the concentration of Apelin C-Terminus peptide in the samples can be calculated accordingly.

# Principle of Competitive EIA



### III. REAGENTS

1. Apelin C-Terminus Microplate (Item A): 96 wells (12 strips x 8 wells) coated with secondary antibody.
2. Wash Buffer Concentrate (20X) (Item B): 25 ml.
3. Lyophilized standard Apelin peptide (Item C): 2 vials.
4. Lyophilized anti- Apelin polyclonal antibody (Item N): 2 vials.
5. 1X Assay Diluent E (Item R): 2 vials, 25 ml/vial. Diluent for both standards and samples including serum or plasma, cell culture media or other sample types.
6. Lyophilized biotinylated Apelin peptide (Item F): 2 vials.
7. HRP-Streptavidin concentrate (Item G): 600  $\mu$ l 100x concentrated HRP-conjugated Streptavidin.
8. Lyophilized positive control (Item M): 1 vial.
10. TMB One-Step Substrate Reagent (Item H): 12 ml of 3, 3', 5, 5'- tetramethylbenzidine (TMB) in buffered solution.
11. Stop Solution (Item I): 8 ml of 0.2 M sulfuric acid.
12. Assay Diagram (Item J).
13. User Manual (Item K).

### IV. STORAGE

- Standard, Biotinylated Apelin C-Terminus peptide, and Positive Control should be stored at -20°C after arrival. **Avoid multiple freeze-thaws.**
- The remaining kit components may be stored at 4°C.
- Opened Microplate Wells and antibody (Item N) may be stored for up to 1 month at 2° to 8°C. Return unused wells to the pouch containing desiccant pack and reseal along entire edge.
- If stored in this manner, RayBiotech warrants this kit for 6 months from the date of shipment.

## V. ADDITIONAL MATERIALS REQUIRED

1. Microplate reader capable of measuring absorbance at 450nm.
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. Saran Wrap

## VI. REAGENT PREPARATION

For sample and positive control dilutions, refer to steps 5, 6, 7 and 9 of Reagent Preparation.

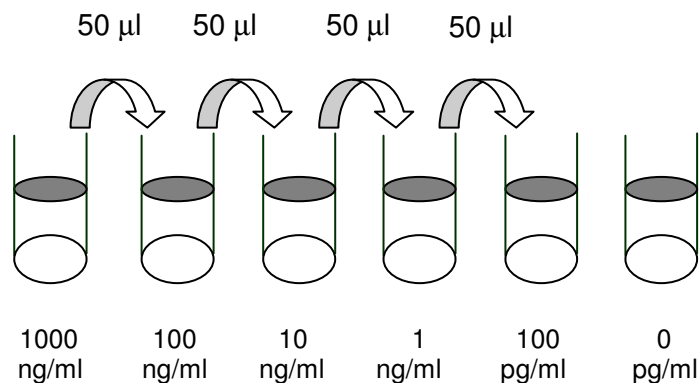
1. Keep kit reagents on ice during reagent preparation steps. Equilibrate plate to room temperature before opening the sealed pouch.
2. Briefly centrifuge the APC Antibody vial (Item N) and reconstitute with 5  $\mu$ l of ddH<sub>2</sub>O before use. Add 50  $\mu$ l of 1x Assay Diluent E into the vial to prepare a detection antibody concentrate. Pipette up and down to mix gently.
3. The antibody concentrate should then be diluted 100-fold with 1x Assay Diluent E. This is your anti-Apelin C-Terminus antibody working solution, which will be used in step 2 of the Assay Procedure.

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

4. Briefly centrifuge the vial of biotinylated Apelin peptide (Item F) and reconstitute with 20  $\mu$ l of ddH<sub>2</sub>O before use. Add 5  $\mu$ l of Item F to 5 ml 1X Assay Diluent E. Pipette up and down to mix gently. *The final concentration of biotinylated Apelin C-Terminus will be 50 ng/ml.* This solution will only be used as the diluent in step 5 of Reagent Preparation.
5. Preparation of Standards: Label 6 microtubes with the following concentrations: 1000 ng/ml, 100 ng/ml, 10 ng/ml, 1 ng/ml, 100 pg/ml and 0 pg/ml. Pipette 450  $\mu$ l of biotinylated Apelin C-Terminus solution into each tube, except for the 1000 ng/ml (leave this one empty). *It is very important to make sure the concentration of biotinylated Apelin C-Terminus is 50 ng/ml in all standards.*
  - a. Briefly centrifuge the vial of standard Apelin peptide (Item C) and reconstitute with 10  $\mu$ l of ddH<sub>2</sub>O. In the tube labeled 1000 ng/ml, pipette 8  $\mu$ l of Item C and 792  $\mu$ l of 50 ng/ml biotinylated Apelin C-Terminus solution (prepared in step 4 above). This is your Apelin C-Terminus stock solution (1000 ng/ml Apelin C-Terminus, 50 ng/ml biotinylated Apelin C-Terminus). Mix thoroughly. This solution serves as the first standard.
  - b. To make the 100 ng/ml standard, pipette 50  $\mu$ l of Apelin C-Terminus stock solution into the tube labeled 100 ng/ml. Mix thoroughly.
  - c. 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 C-Terminus and 50  $\mu$ l of the prior concentration until 100 pg/ml is reached. Mix each tube thoroughly before the next transfer.



- d. The final tube (0 pg/ml Apelin C-Terminus, 50 ng/ml biotinylated Apelin C-Terminus) serves as the zero standard (or total binding).



6. Prepare a 10-fold dilution of Item F. To do this, add 2 µl of Item F to 18 µl of the 1X Assay Diluent E. This solution will be used in steps 7 and 9.
7. Positive Control Preparation: Briefly centrifuge the positive control vial and reconstitute with 100 µl of ddH<sub>2</sub>O before use (Item M). To the tube of Item M, add 101 µl 1x Assay Diluent E. Also add 2 µl of 10-fold diluted Item F (prepared in step 6) to the tube. This is a 2-fold dilution of the positive control. Mix thoroughly. The positive control is a cell culture medium sample with an expected signal between 10% and 30% of total binding (70-90% competition) if diluted as described above. It may be diluted further if desired, but be sure the final concentration of biotinylated Apelin C-Terminus is 50 ng/ml.
8. If Item B (20X Wash Concentrate) contains visible crystals, warm to room temperature and mix gently until dissolved. Dilute 20 ml of Wash Buffer Concentrate into deionized or distilled water to yield 400 ml of 1X Wash Buffer.

9. Sample Preparation: Use 1X Assay Diluent E + biotinylated APC to dilute samples, including serum/plasma, cell culture medium and other sample types.  
*It is very important to make sure the final concentration of the biotinylated Apelin C-Terminus is 50 ng/ml in every sample.*  
EXAMPLE: to make a 4-fold dilution of sample, mix together 2.5 µl of 10-fold diluted Item F (prepared in step 6), 185 µl of 1X Assay Diluent E, and 62.5 µl of your sample; mix gently. The total volume is 250 µl, enough for duplicate wells on the microplate.  
*Do not use Item F diluent from Step 5 for sample preparation.*  
*If you plan to use undiluted samples, you must still add biotinylated Apelin C-Terminus to a final concentration of 50 ng/ml.* EXAMPLE: Add 2.5 µl of 10-fold diluted Item F to 247.5 µl of sample. NOTE: Optimal sample dilution factors should be determined empirically, however you may contact technicalsupport(888-494-8555; techsupport@raybiotech.com) to obtain recommended dilution ranges for serum or plasma.
10. Briefly centrifuge the HRP-Streptavidin vial (Item G) before use. The HRP-Streptavidin concentrate should be diluted 100-fold with 1X Assay Diluent E.

## **VII. ASSAY PROCEDURE:**

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 µl Anti-Apelin C-Terminus antibody (see Reagent Preparation step 3) to each well. Incubate for 1.5 hours at room temperature with gentle shaking (1-2 cycles/sec). You may also incubate overnight at 4 °C.

3. Discard the solution and wash wells 4 times with 1X Wash 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 step 5), positive control (see Reagent Preparation step 7) and sample (see Reagent Preparation step 9) into 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) or overnight 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 10) 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 absorbances at 450 nm immediately.

## VIII. ASSAY PROCEDURE SUMMARY

1. Prepare all reagents, samples and standards as instructed.



2. Add 100  $\mu\text{l}$  anti-Apelin C-Terminus antibody to each well. Incubate 1.5 hours at room temperature or overnight at 4°C.



3. Add 100  $\mu\text{l}$  standard or sample to each well. Incubate 2.5 hours at room temperature or overnight at 4°C.



4. Add 100  $\mu\text{l}$  prepared streptavidin solution. Incubate 45 minutes at room temperature.



5. Add 100  $\mu\text{l}$  TMB One-Step Substrate Reagent to each well. Incubate 30 minutes at room temperature.



6. Add 50  $\mu\text{l}$  Stop Solution to each well. Read at 450 nm immediately

## IX. CALCULATION OF RESULTS

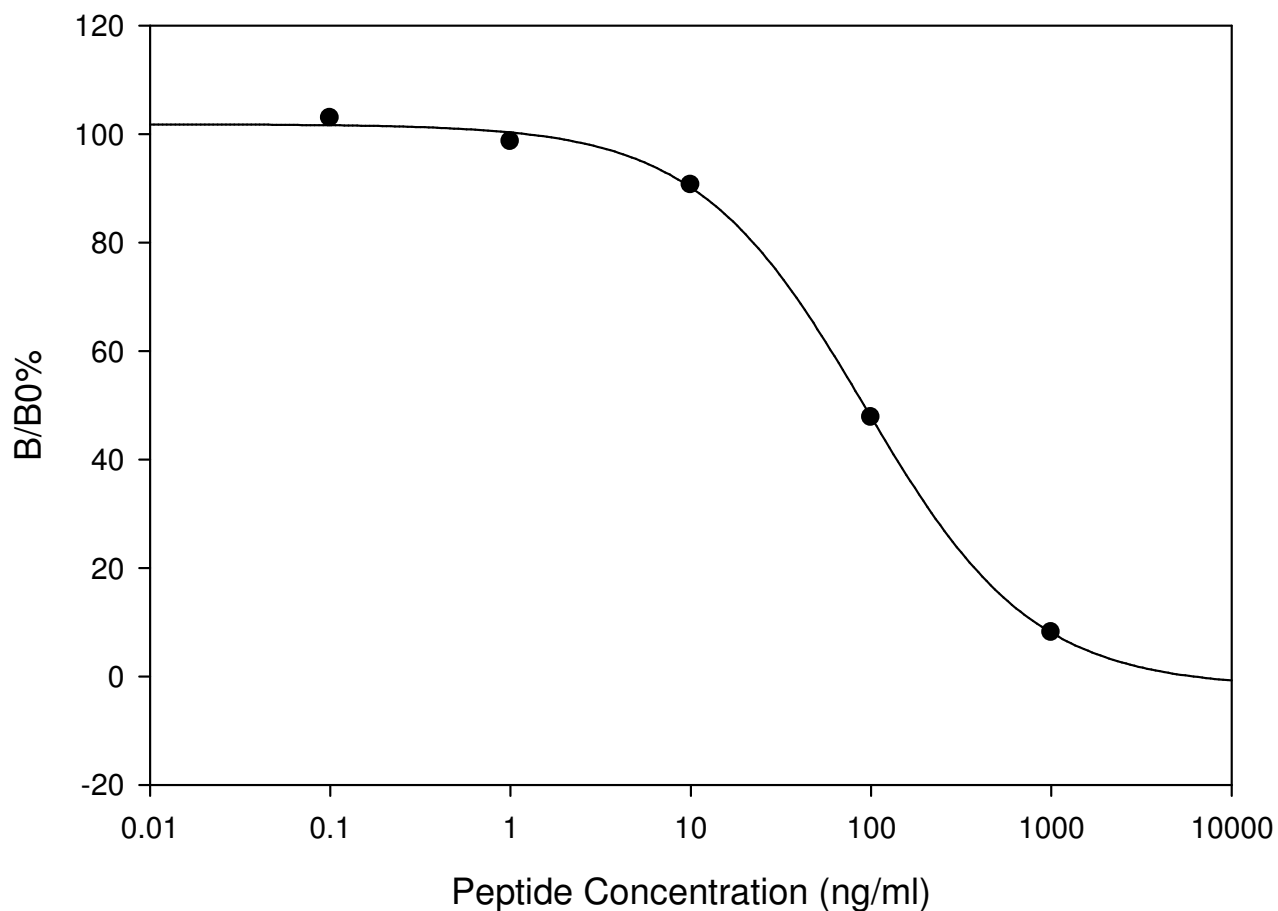
Calculate the mean absorbance for each set of duplicate standards, controls and samples, and subtract the blank optical density. Plot the standard curve using SigmaPlot software (or other software which can perform four-parameter logistic regression models), with standard concentration on the x-axis 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.

Apelin EIA



## **B. SENSITIVITY**

The minimum detectable concentration of Apelin C-Terminus is 29.1 pg/ml.

## **C. DETECTION RANGE**

0.1-1,000 ng/ml

## **D. REPRODUCIBILITY**

Intra-Assay: CV<10%

Inter-Assay: CV<15%

## **X. SPECIFICITY**

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

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.

## **XI. REFERENCES**

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## XII. TROUBLESHOOTING GUIDE

| <b>Problem</b>         | <b>Cause</b>  | <b>Solution</b>   |
|------------------------|---|---|
| 1. Poor standard curve | <ol style="list-style-type: none"> <li>1. Inaccurate pipetting</li> <li>2. Improper standard dilution</li> </ol>                            | <ol style="list-style-type: none"> <li>1. Check pipettes</li> <li>2. Ensure briefly spin the vial of Item C and dissolve the powder thoroughly by a gentle mix.</li> </ol>  |
| 2. Low signal          | <ol style="list-style-type: none"> <li>1. Too brief incubation times</li> <li>2. Inadequate reagent volumes or improper dilution</li> </ol> | <ol style="list-style-type: none"> <li>1. Ensure sufficient incubation time; assay procedure step 2 change to over night</li> <li>2. Check pipettes and ensure correct preparation</li> </ol>                     |
| 3. Large CV            | <ol style="list-style-type: none"> <li>1. Inaccurate pipetting</li> </ol>   | <ol style="list-style-type: none"> <li>1. Check pipettes</li> </ol>   |
| 4. High background     | <ol style="list-style-type: none"> <li>1. Plate is insufficiently washed</li> <li>2. Contaminated wash buffer</li> </ol>                    | <ol style="list-style-type: none"> <li>1. Review the manual for proper wash. If using a plate washer, check that all ports are unobstructed.</li> <li>2. Make fresh wash buffer</li> </ol>                        |
| 5. Low sensitivity     | <ol style="list-style-type: none"> <li>1. Improper storage of the EIA kit</li> <li>2. Stop solution</li> </ol>                              | <ol style="list-style-type: none"> <li>1. Store your standard at <math>\leq -20^{\circ}\text{C}</math> after receipt of the kit.</li> <li>2. Stop solution should be added to each well before measure</li> </ol> |

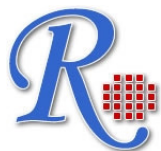
RayBio® EIA kits:

If you are interested in other EIA kits, please visit [www.raybiotech.com](http://www.raybiotech.com) for details.



## Notes:

This product is for research use only.



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