

**LSBio™ Mouse/Human/Rat  
CARTPT / CART  
Enzyme Immunoassay Kit**

**Catalog No. LS-F4**

**User Manual**

**(Version 2.2 Revised April 8, 2014)**

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



**For research use only. Not approved for use in humans or for clinical diagnosis.**



**Human/Mouse/Rat CART Enzyme  
Immunoassay Kit Protocol**

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## I. INTRODUCTION

Cocaine-and amphetamine-regulated transcript (CART) codes for a neuropeptide system with a number of biological roles. The high conservation of CART across species suggests that it has an important role in mammalian physiology. CART is widely expressed in the central nervous system and the periphery, but is particularly concentrated in the hypothalamus.

CART peptides appear to have an important function in the regulation of energy homeostasis. CART interacts with a number of central appetite circuits. Hypothalamic CART expression is regulated by a number of peripheral factors, including the adipose hormone leptin. Several research groups have shown that intracerebroventricular administration of CART (55–102) reduces appetite and stimulates energy expenditure. Animal studies show that CART knockout mice demonstrate small but significant increases in weekly food consumption, body weight and fat mass compared with their wild-type littermates when on a high-fat diet. These reports suggest that CART peptide acts as an endogenous inhibitor of food intake. On the other hand, hypothalamic CART may also play an orexigenic role under specific circumstances, as injection of CART (55–102) into specific hypothalamic nuclei increases food intake.

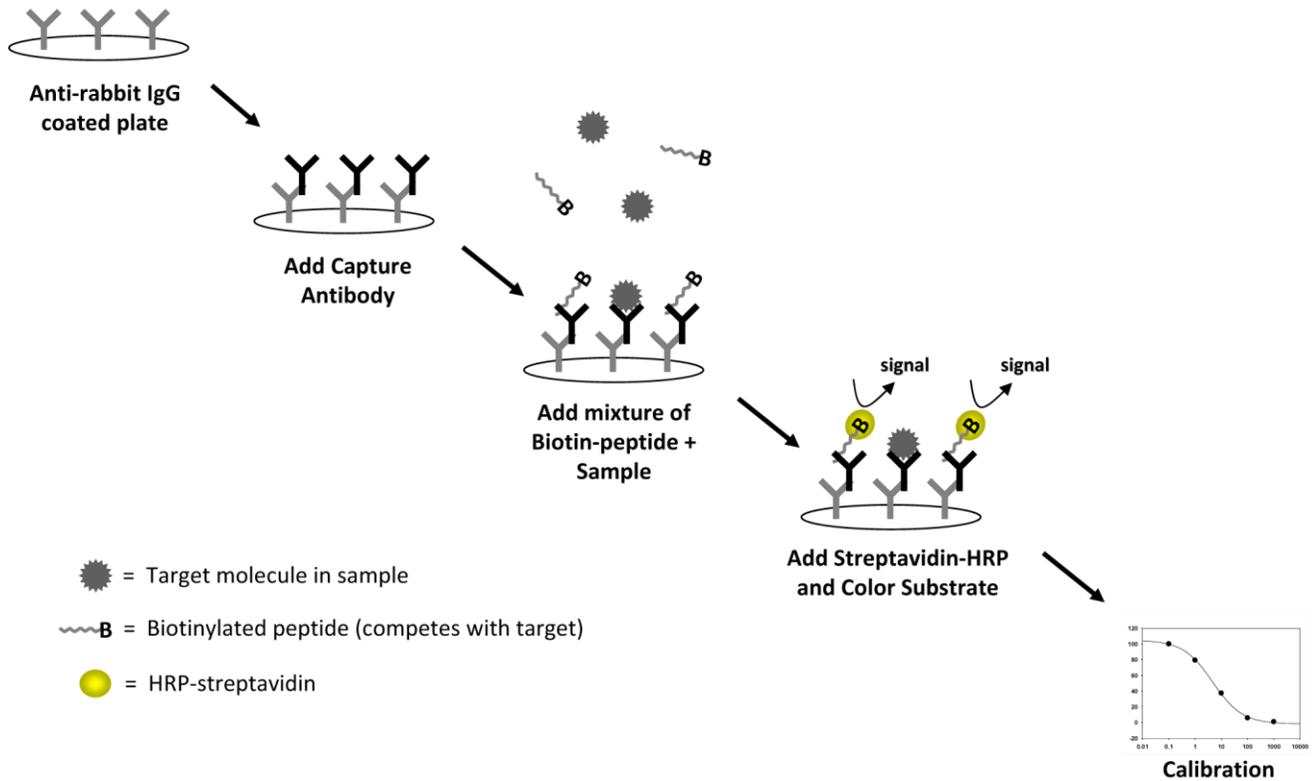
The CART system demonstrates multiple roles in energy homeostasis, depending on the internal and external milieu. The development of specific CART antagonists would be very useful in dissecting these multiple roles.

## II. GENERAL DESCRIPTION

The CART Enzyme Immunoassay (EIA) Kit is an in vitro quantitative assay for detecting CART 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-CART antibody, both biotinylated CART peptide and peptide standard or targeted peptide in samples interacts competitively with the CART antibody. Uncompeted (bound) biotinylated CART 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 CART peptide in the standard or samples. This is due to the competitive binding to CART antibody between biotinylated CART peptide and peptides in standard or samples. A standard curve of known concentration of CART peptide can be established and the concentration of CART peptide in the samples can be calculated accordingly.

# Principle of Competitive EIA



### III. REAGENTS

1. CART Microplate (Item A): 96 wells (12 strips x 8 wells) coated with secondary antibody.
2. Wash Buffer Concentrate (20x) (Item B): 25 ml
3. Standard CART Peptide (Item C): 2 vials, 10  $\mu$ l/vial
4. Anti- CART polyclonal antibody (Item N): 2 vials, 5  $\mu$ l/vial
5. Assay Diluent A (Item D): 30 ml, contains 0.09% sodium azide as preservative. Diluent for standards and serum or plasma samples.
6. Assay Diluent B (Item E): 15 ml of 5x concentrated buffer. Diluent for standards and cell culture media or other sample types.
7. Biotinylated CART peptide, (Item F): 2 vials, 20  $\mu$ l/vial
8. HRP-Streptavidin concentrate (Item G): 600  $\mu$ l 80x concentrated HRP-conjugated Streptavidin.
9. Positive control (Item M): 1 vial, 100  $\mu$ l
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 CART peptide, and Positive Control should be stored at -20°C or -80°C (recommended at -80°C) after arrival. **Avoid multiple freeze-thaws.**
- The remaining kit components may be stored at -20°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, Lifespan warranties this kit for 6 months from the date of shipment.



## **V. ADDITIONAL MATERIALS REQUIRED**

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. Saran Wrap

## **VI. REAGENT PREPARATION**

If testing plasma or serum samples, use Assay Diluent A to dilute Item F and Item C. If testing cell culture media or other sample types, use Assay Diluent B to dilute Item F and Item C. For sample and positive control dilutions, refer to steps 6, 7, 8 and 10 of Reagent Preparation.

1. Keep kit reagents on ice during reagent preparation steps. Equilibrate plate to room temperature before opening the sealed pouch.
2. Assay Diluent B (Item E) should be diluted 5-fold with deionized or distilled water.
3. Briefly centrifuge the Anti-CART Antibody vial (Item N) before use. Add 50  $\mu$ l of 1x Assay Diluent B into the vial to prepare a



detection antibody concentrate. Pipette up and down to mix gently.

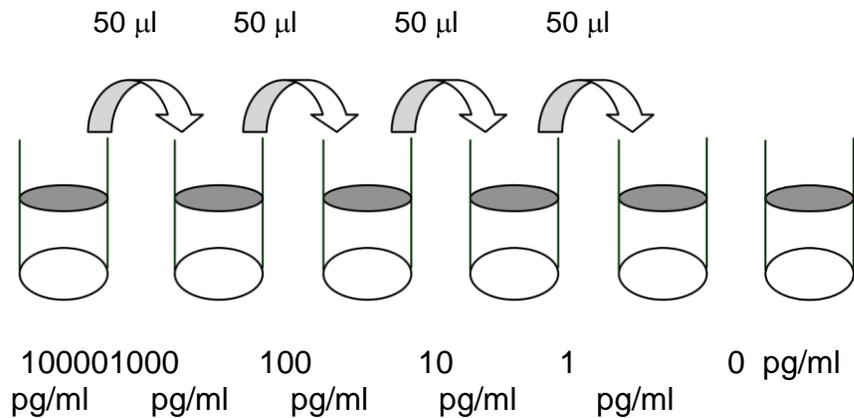
4. The antibody concentrate should then be diluted 100-fold with 1x Assay Diluent B. This is your anti-CART antibody working solution, which will be used in step 2 of the Assay Procedure.

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

5. Briefly centrifuge the vial of Biotinylated CART (Item F) before use. Add 5  $\mu$ l of Item F to 5 ml of the appropriate Assay Diluent. Pipette up and down to mix gently. *The final concentration of biotinylated CART will be 100 pg/ml.* This solution will only be used as the diluent in step 6 of Reagent Preparation.
6. Preparation of Standards: Label 6 microtubes with the following concentrations: 10000 pg/ml, 1000 pg/ml, 100 pg/ml, 10 pg/ml, 1 pg/ml and 0 pg/ml. Pipette 450  $\mu$ l of biotinylated CART solution into each tube, except for the 10000 pg/ml (leave this one empty). *It is very important to make sure the concentration of biotinylated CART is 100 pg/ml in all standards.*
  - a. Briefly centrifuge the vial of CART (Item C). In the tube labeled 10000 pg/ml, pipette 8  $\mu$ l of Item C and 792  $\mu$ l of 100 pg/ml biotinylated CART solution (prepared in step 5 above). This is your CART stock solution (10000 pg/ml CART, 100 pg/ml biotinylated CART). Mix thoroughly. This solution serves as the first standard.
  - b. To make the 1000 pg/ml standard, pipette 50  $\mu$ l of CART stock solution the tube labeled 1000 pg/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 CART and 50  $\mu$ l of the

prior concentration until 1 pg/ml is reached. Mix each tube thoroughly before the next transfer.

- d. The final tube (0 pg/ml CART, 100 pg/ml biotinylated CART) serves as the zero standard (or total binding).



7. Prepare a 10-fold dilution of Item F. To do this, add 2 µl of Item F to 18 µl of the appropriate Assay Diluent. This solution will be used in steps 8 and 10.
8. Positive Control Preparation: briefly centrifuge the positive control vial (Item M). To the tube of Item M, add 101 µl 1x Assay Diluent B. Also add 2 µl of 10-fold diluted Item F (prepared in step 7) to the tube. This is a 2-fold dilution of the positive control. Mix thoroughly. The positive control is a cell culture medium sample that is meant to be a system control (to verify that the detection & kit components are working). The resulting OD will not be used in any calculations; if no positive competition is observed please contact Lifespan Technical Support. It may be diluted further if desired, but be sure the final concentration of biotinylated CART is 100 pg/ml.
9. 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.

10. Sample Preparation: Use Assay Diluent A + biotinylated CART to dilute serum/plasma samples. For cell culture medium and other sample types, use 1X Assay Diluent B + biotinylated CART as the diluent. *It is very important to make sure the final concentration of the biotinylated CART is 100 pg/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 7), 185 µl of appropriate Assay Diluent, 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 CART to a final concentration of 100 pg/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 technical support (888-494-8555;

techsupport@raybiotech.com) to obtain recommended dilution ranges for serum or plasma.

11. Briefly centrifuge the HRP-Streptavidin vial (Item G) before use. The HRP-Streptavidin concentrate should be diluted 80-fold with 1X Assay Diluent B.

Note: Do not use Assay Diluent A for HRP-Streptavidin preparation in Step 11.

## **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  $\mu$ l anti-CART antibody (see Reagent Preparation step 4) 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 degrees 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 6), positive control (see Reagent Preparation step 8) and sample (see Reagent Preparation step 10) 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 11) to each well. Incubate for 45 minutes with gentle shaking at room temperature. 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  $\mu\text{l}$  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-CART antibody to each well. Incubate 1.5 hours at room temperature.



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

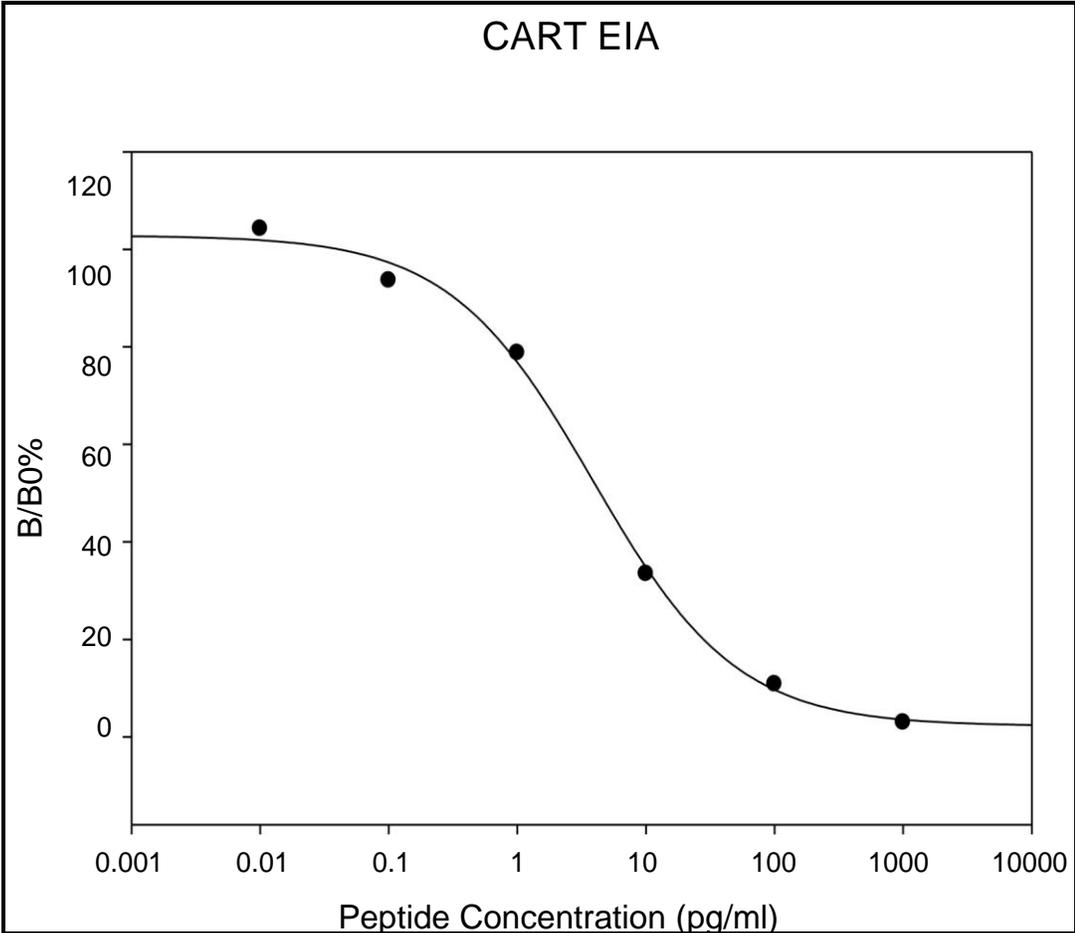
Calculate the mean absorbance for each set of duplicate standards, controls and samples, and subtract the blank optical density. Plot the standard curve using SigmaPlot software (or other software which can perform four-parameter logistic regression models), with standard

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  
 $B_0$  = 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 concentration of CART is 13.5 pg/ml.

## **C. DETECTION RANGE**

1-10,000 ng/ml

## **D. REPRODUCIBILITY**

Intra-Assay: CV<10%

Inter-Assay: CV<15%

## **X. SPECIFICITY**

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

## **XI. REFERENCES**

Murphy, KG. (2005). "Dissecting the role of cocaine and amphetamine-regulated transcript (CART) in the control of appetite". *Briefings in Functional Genomics and Proteomics*. 4(2) 95–111

## 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>

**Important Note:** During shipment, small volumes of product will occasionally become entrapped in the seal of the product vial. We recommend briefly centrifuging the vial to dislodge any liquid in the container's cap prior to opening.

**Warning:** This reagent may contain sodium azide and sulfuric acid. The chemical, physical, and toxicological properties of these materials have not been thoroughly investigated. Standard Laboratory Practices should be followed. Avoid skin and eye contact, inhalation, and ingestion. Sodium azide forms hydrazoic acid under acidic conditions and may react with lead or copper plumbing to form highly explosive metal azides. On disposal, flush with large volumes of water to prevent accumulation.

**Returns, Refunds, Cancellations:** Any problems with LifeSpan products must be reported to LifeSpan within 10 days of product receipt. The customer must obtain written authorization from LifeSpan before returning items. To request that goods be returned, please contact LifeSpan Technical Support. If an error by LifeSpan BioSciences results in shipment of an incorrect order, LifeSpan will, at its option, either ship a replacement order at no charge, or credit the customer's account for the original product shipped in error. Returns and cancellations may be subject to a 30% restocking fee.

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