

## COMPONENTS

Kit Component	Amount
96-well plate pre-coated with anti-human CT-1 antibody	1 Plate
Protein Standard: Lyophilized recombinant human CT-1	2 tubes, 10 ng/tube
Sample Diluent Buffer	30 ml
Biotinylated Antibody (Anti-human CT-1)	130 µl (100x)
Antibody Diluent Buffer	12ml
Avidin-Biotin-Peroxidase Complex (ABC) Solution	130 µl (100x)
ABC Diluent Buffer	12 ml
Tetramethylbenzidine (TMB) Color Developing Agent	10 ml
TMB Stop Solution	10 ml

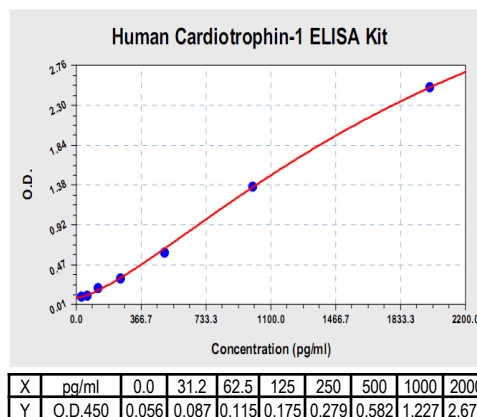
### Washing Buffer (not provided): TBS or PBS

0.01M TBS: Add 1.2g Tris, 8.5g NaCl; 450µl of purified acetic acid or 700µl of concentrated hydrochloric acid to 900ml H<sub>2</sub>O and adjust pH to 7.2-7.6. Adjust the total volume to 1L.

0.01M PBS: Add 8.5g sodium chloride, 1.4g Na<sub>2</sub>HPO<sub>4</sub> and 0.2g NaH<sub>2</sub>PO<sub>4</sub> to 900ml distilled H<sub>2</sub>O and adjust pH to 7.2-7.6. Adjust the total volume to 1L.

### Storage

Store at 4°C. Cell Applications, Inc. recommends using the kit within 6 months of order.



**Figure 1: CT-1 Standard Curve.** Using the Human CT-1 ELISA Kit, O.D. data was graphed against CT-1 protein concentration. The TMB reaction was incubated at 37°C for 21 min.

## BACKGROUND

Cardiotrophin-1 (CT-1) is a naturally occurring protein member of the IL-6 family of cytokines with a molecular mass of 21.5 kDa. Like leukemia inhibitory factor (LIF), CNTF, and oncostatin M (OSM), CT-1 signals via the LIFRβ/gp130 receptor complex and a third specific receptor component (CT-1Rα).<sup>1</sup> gp130 is common to the receptor complex of other members of IL-6 superfamily and is required for both ligand binding and signal transduction. CT-1 was originally identified as a cardiac myocyte hypertrophic factor, which can induce in vitro hypertrophy and survival signals in neonatal and adult cardiomyocytes. It also shares biological activities of the IL-6 members, i.e., on hematopoietic cells, embryonic stem cells, hepatocytes, and neuronal cells. In particular, CT-1 is a very potent neurotrophic factor for spinal motoneurons in long-term culture and protects neonatal sciatic motoneurons from axotomy-induced cell death in rats. Furthermore, CT-1 may be a naturally relevant neurotrophic factor for developing motoneurons, as it is present at high levels in embryonic limb bud in vivo. CT-1 activates cell survival signaling pathways including STAT3, extracellular-regulated kinase (Erk)1/2, and protein kinase B (Akt).<sup>2</sup>

CT-1 mRNA expression has been detected at high levels in heart, skeletal muscle, prostate, ovaries, and liver, as well as fetal heart, lung, and kidney, and in lower amounts in other tissues. It has been reported that CT-1 gene expression is increased in ventricular myocardium after myocardial infarction (MI) and in hypertensive rats. And cardiac CT-1 gene expression is activated in both canine atrial and ventricular myocardium in experimental congestive heart failure. Thus, CT-1 may have an important role in the development of cardiac hypertrophy and heart failure. In addition, Adipose tissue has emerged as a key secretory organ, with the ability to secrete different adipokines, including IL-6. It has been shown that adipocytes express gp130 and LIFR and respond to IL-6 family cytokines, including CT-1. Moreover, CT-1 expression progressively increased, along with differentiation time from preadipocyte to mature adipocyte in 3T3-L1 cells. CT-1 expression was enhanced by glucose in a dose-dependent manner in these cells.<sup>3</sup> Furthermore, CT-1 appears to be a mediator of impaired insulin sensitivity, as chronic administration of CT-1 to 3T3-L1 adipocytes resulted in a decrease in insulin-stimulated glucose uptake.<sup>4</sup>

## References

1. Tsuruda, T. et al: Circulation Res 90:128-34, 2002
2. Iñiguez, M. et al: J. Exp. Med. 203:2809-15, 2006
3. Natal, C. et al: Am. J. Physiol. Endocrinol. Metab. 294:E52-E60, 2008
4. Zvonick, S. et al: J. Biol. Chem. 279:47572-9, 2004

## ELISA OVERVIEW

Cell Applications ELISA Kits are based on standard sandwich enzyme-linked immunosorbent assay technology. Freshly prepared standards, samples, and solutions are recommended for best results.

1. Prepare test samples.
2. Prepare a protein standard of the target protein.
3. Add test samples and standards to the pre-coated 96-well plate. Do not wash.
4. Add biotinylated detection antibodies. Wash.
5. Add Avidin-Biotin-Peroxidase Complex (ABC) Solution. Wash.
6. Add Tetramethylbenzidine (TMB) Color Developing Agent, containing HRP substrate.
7. Add TMB Stop Solution
8. Subject the plate to analysis.

## NOTES:

- Before using the kit, quick spin tubes to bring down all solution to the bottom of tube.
- Duplicate assay wells are recommended for both standard and sample testing.
- Do not let the 96-well plate dry, this will lead to inactivation of plate components.
- When diluting samples and reagents, ensure that they are mixed completely and evenly.
- Pre-warm diluted ABC and TMB solutions at 37°C for 30 min before use to avoid variable temperature effects.
- For washes, use TBS or PBS. Do not touch well walls.
- A protein standard is included in the kit. A protein standard detection curve should be generated with each experiment, no more than 2 hours prior to the experiment.
- The user will determine sample dilution fold by estimation of target protein amount in samples.

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## PROTOCOL

### I. Plate Washing

Discard the solution in the plate without touching the side walls. Blot the plate onto paper towels or other absorbent material. Soak each well with at least 0.3 ml PBS or TBS buffer for 1–2 minutes. Repeat this process two additional times for a total of three washes.

### II. Preparation of Test Samples

#### Test Sample Processing

- **Cell culture supernate, tissue lysate or body fluids:** Remove particulates by centrifugation.
- **Serum:** Allow the serum to clot in a serum separator tube (about 2 hours) at room temperature. Centrifuge at approximately 1000 X g for 10 min.

#### Sample Dilution Guideline

Estimate the concentration of the target protein in the sample and select a proper dilution factor such that the diluted target protein concentration falls within the standard curve range. Depending on the sample, several trial dilutions may be necessary. Dilute the sample using the provided diluent buffer, mixing well. Suggested working dilutions of samples are as follows:

Target Protein Concentration Range	Sample Working Dilution	Sample Vol.	Diluent Buffer Vol.
20-200 ng/ml	1:100	1 µl	99 µl
2-20 ng/ml	1:10	10 µl	90 µl
31.2-2000 pg/ml	1:2	50 µl	50 µl
≤31.2 pg/ml	n/a	100 µl	n/a

If samples will be assayed within 24 hours, store at 2–8°C. For long-term storage, aliquot and freeze samples at -20°C. Avoid repeated freeze-thaw cycles.

**IMPORTANT:** For automated washing, aspirate all wells and wash THREE times with PBS or TBS buffer, overfilling wells with PBS or TBS buffer. Blot the plate onto paper towels or other absorbent material.

### III. Preparation of Reagents

#### Reconstitution of the Standard

The standard solutions should be prepared no more than 2 hours prior to the experiment. Two tubes of the standard are included in each kit. Use one tube for each experiment.

1. 10,000pg/ml of human Cardiotrophin-1 standard solution: Add 1 ml sample diluent buffer into one tube, keep the tube at room temperature for 10 min and mix thoroughly.
2. 2000pg/ml of human Cardiotrophin-1 standard solution: Add 0.2 ml of the above 10ng/ml Cardiotrophin-1 standard solution into 0.8 ml sample diluent buffer and mix thoroughly.
3. 1000pg/ml→31.2pg/ml of human Cardiotrophin-1 standard solutions: Label 6 Eppendorf tubes with 1000pg/ml, 500pg/ml, 250pg/ml, 125pg/ml, 62.5pg/ml, 31.2pg/ml, respectively. Aliquot 0.3 ml of the sample diluent buffer into each tube. Add 0.3 ml of the above 2000pg/ml Cardiotrophin-1 standard solution into 1st tube and mix. Transfer 0.3 ml from 1st tube to 2nd tube and mix. Transfer 0.3 ml from 2nd tube to 3rd tube and mix, and so on.

#### Preparation of Biotinylated Antibody Working Solution

The solution should be prepared no more than 2 hours prior to the experiment.

1. The total volume should be: 0.1ml/well x (the number of wells). (Allowing 0.1-0.2 ml more than total volume)
2. Biotinylated antibody should be diluted in 1:100 with the antibody diluent buffer and mixed thoroughly.

### Preparation of the Avidin-Biotin-Peroxidase Complex (ABC) Working Solution

The solution should be prepared no more than 1 hour prior to the experiment.

1. The total volume should be: 0.1ml/well x (the number of wells). (Allowing 0.1-0.2 ml more than total volume)
2. Avidin- Biotin-Peroxidase Complex (ABC) should be diluted in 1:100 with the ABC dilution buffer and mixed thoroughly.

### IV. ELISA

The ABC working solution and TMB color developing agent must be kept warm at 37°C for 30 min before use. When diluting samples and reagents, they must be mixed completely and evenly. A standard detection curve should be prepared for each experiment. The user will decide sample dilution fold by crude estimation of target protein amount in samples.

1. Aliquot 0.1ml per well of the 2000pg/ml, 1000pg/ml, 500pg/ml, 250pg/ml, 125pg/ml, 62.5pg/ml, 31.2pg/ml human Cardiotrophin-1 standard solutions into the precoated 96-well plate. Add 0.1ml of the sample diluent buffer into the control well (Blank well). Add 0.1ml of each properly diluted sample of rat sera, plasma, body fluids, tissue lysates or cell culture supernatants to each empty well. See “Sample Dilution Guideline” for details. We recommend that each human Cardiotrophin-1 standard solution and each sample is measured in duplicate.
2. Seal the plate with the cover and incubate at 37°C for 90 min.
3. Remove the cover, discard plate content, and blot the plate onto paper towels or other absorbent material. Do NOT let the wells completely dry at any time.
4. Add 0.1ml of biotinylated anti-human Cardiotrophin-1 antibody working solution into each well and incubate the plate at 37°C for 60 min.
5. Wash the plate three times with 0.01M TBS or 0.01M PBS, and each time let washing buffer stay in the wells for 1 min. Discard the washing buffer and blot the plate onto paper towels or other absorbent material.
6. Add 0.1ml of prepared ABC working solution into each well and incubate the plate at 37°C for 30 min.
7. Wash plate 5 times with 0.01M TBS or 0.01M PBS, and each time let washing buffer stay in the wells for 1-2 min. Discard the washing buffer and blot the plate onto paper towels or other absorbent material.
8. Add 90 µl of prepared TMB color developing agent into each well and incubate plate at 37°C for 20-25 min (shades of blue can be seen in the wells with the four most concentrated human Cardiotrophin-1 standard solutions; the other wells show no obvious color).
9. Add 0.1ml of prepared TMB stop solution into each well. The color changes into yellow immediately.
10. Read the O.D. absorbance at 450nm in a microplate reader within 30 min after adding the stop solution.

### V. Calculating Protein Concentration

- For all wells, determine O.D.450(Relative):  
$$\text{O.D.450(Relative)} = \text{O.D.450(Reading)} - \text{O.D.450(Blank)}$$
- Plot the standard curve:  
Plot O.D.450(Relative) of each standard solution (Y) vs. the respective concentration of the standard solution (X). See **Figure 1** for a typical standard curve.
- The target protein concentration in samples can be interpolated from the standard curve. Multiply the interpolated concentration by the dilution factor to obtain the target protein concentration in the sample.

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