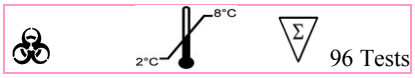
Diagnostic Automation / Cortez Diagnostics, Inc.
IMMUNO DIAGNOSTICS

AccuDiag™ Crustacean Tropomyosin ELISA

REF 5161-8



Test	Crustaceans Tropomyosin ELISA
Recovery	84 - 97%
Incubation Time	60 min
Sensitivity	0.9 ppb

INTENDED USE

Not only by reason of their cross-reactivity to house dust mites do crustaceans represent an important group of food allergens. In this regard tropomyosin, which can be found in all common crustacean species, is the most important protein. In cooked crustacean extracts this protein represents approximately 20% of total protein.

For crustacean allergic persons hidden crustacean proteins in food are a critical problem. Already very low amounts of the allergen can cause allergic reactions, which may lead to anaphylactic shock in severe cases. Because of this, crustacean allergic persons must strictly avoid the consumption of crustacean containing food. Cross-contamination, mostly in consequence of the production process, is often noticed. This explains why in many cases the existence of crustacean residues in food cannot be excluded. For this reason sensitive detection systems for crustacean residues in foodstuffs are required.

The DAI Crustaceans Tropomyosin ELISA represents a highly sensitive detection system for tropomyosin (from *penaeus indicus*) and is particularly capable of the quantification of crustacean residues in fish products, soups, dressings, bakery products and meat products.

TEST PRINCIPLE

The DAI Crustaceans Tropomyosin quantitative test is based on the principle of the enzyme linked immunosorbent assay. An antibody directed against tropomyosin is bound on the surface of a microtiter plate. Tropomyosin containing samples or standards are given into the wells of the microtiter plate. After 20 minutes incubation at room temperature, the wells are washed with diluted washing solution to remove unbound material. A peroxidase conjugated second antibody directed against tropomyosin is given into the wells and after 20 minutes of incubation the plate is washed again. A substrate solution is added and incubated for 20 minutes, resulting in the development of a blue color. The color development is inhibited by the addition of a stop solution, and the color turns yellow. The yellow color is measured photometrically at 450 nm. The concentration of tropomyosin is directly proportional to the color intensity of the test sample.

MATERIALS AND COMPONENTS

Materials provided with the test kits

The kit contains reagents for 96 determinations. They have to be stored at 2-8°C. Expiry data are found on the labels of the bottles and the outer package.

1. Microtiter plate consisting of 12 strips with 8 breakable wells each, coated with anti-tropomyosin antibodies.
2. Tropomyosin Standards (0, 20, 60, 200, 400 ppb of tropomyosin): 5 vials with 4.0 mL each, dyed red, ready-to-use.
3. Conjugate (anti-tropomyosin-peroxidase): 15 mL, dyed red, ready-to-use.
4. Substrate Solution (TMB): 15 mL, ready-to-use.
5. Stop Solution (0.5 M H_2SO_4): 15 mL, ready-to-use.
6. Extraction and sample dilution buffer (Tris): 2 x 120 mL as 10x concentrate, dyed red. Dilute 1+9 with distilled water. Stored at 4°C the diluted buffer is stable for at least one week. If during the cold storage crystals precipitate, the concentrate should be warmed up to 37°C for 15 minutes.
7. Washing Solution (PBS + Tween 20): 60 mL as 10x concentrate. Dilute 1+9 with distilled water. Stored at 4°C the diluted buffer is stable for at least 4 weeks. If during the cold storage crystals precipitate, the concentrate should be warmed up to 37°C for 15 minutes.
8. Plastic bag to store unused microtiter strips.
9. Instruction Manual.

Materials required but not provided

Instrumentation

1. 100 - 1000 µL micropipettes
2. Volumetric flask
3. Analytical balance
4. Mortar, mixer
5. Water bath
6. Centrifuge
7. ELISA reader (450 nm)

Reagents

Double-distilled water

SAMPLE PREPARATION

Due to the high risk of cross-contamination all applied instruments like applicator, mortar, glass vials etc. have to be **cleaned thoroughly** before and after each sample. To identify possible cross-contamination caused by previous extractions it is strongly recommended to note the sequence of the extractions.

The following sample preparation should be applied for **solid** samples:

1. To maximize homogeneity and representative-ness of the sample drawing, a minimum of 5 g sample should be pulverized finely in a mortar, impact mill, etc.
2. 1 g of the homogenized mixture is suspended in 20 mL of pre-diluted extraction and sample dilution buffer. Afterwards the suspension is incubated for 15 min in a preheated water bath at **40°C**. To ensure good homogeneity, the samples should be shaken every two minutes.
3. The samples are centrifuged for 10 minutes at 2000 g. If it is not possible to separate the supernatant from the precipitate completely, the suspension should be filtrated if necessary.
4. 100 µL of particle-free solution are applied per well. If the results of a sample are out of the measuring range, further dilution with the pre-diluted extraction and sample dilution buffer is necessary. The additional dilution has to be considered when calculating the concentration.

The following sample preparation should be applied for **liquid** samples:

1 mL of liquid sample is diluted in 19 mL of pre-diluted extraction and sample dilution buffer. Afterwards the suspension is incubated for 15 min in a preheated water bath at **40°C**. To ensure good homogeneity, the samples should be shaken every two minutes. The process is continued at point 3 of solid sample extraction process.

PRECAUTION

Full compliance of the following good laboratory practices (GLP) will determine the reliability of the results:

1. Prior to beginning the assay procedure, bring all reagents to room temperature (20-25°C).
2. All reagents should be mixed by gentle inversion or swirling prior to use. Do not induce foaming.
3. Once the assay has been started, all subsequent steps should be completed without interruption and within the recommended time limits.
4. Replace caps in all the reagents immediately after use. Do not interchange vial stoppers.
5. Use a separate disposable tip for each specimen to prevent cross-contamination.
6. All specimens and standards should be run at the same time, so that all conditions of testing are the same.
7. Do not mix components from different batches.
8. Do not use reagents after expiration date.
9. Check both precision and accuracy of the laboratory equipment used during the procedure (micropipettes, ELISA reader etc.).

HEALTH & SAFETY INSTRUCTIONS

1. Do not smoke or eat or drink or pipet by mouth in the laboratory.
2. Wear disposable gloves whenever handling patient specimens.
3. Avoid contact of substrate and stop solution with skin and mucosa (possible irritation, burn or toxicity hazard). In case of contact, rinse the affected zone with plenty of water.
4. Handling and disposal of chemical products must be done according to good laboratory practices (GLP).

ASSAY PROCEDURE

The washing solution is supplied as 10x concentrate and has to be **diluted** 1+9 with double distilled water before use.

In any case the **ready-to-use** standards should be determined twofold. When samples in great quantities are determined, the standards should be pipetted once before the samples and once after the samples. For final interpretation the arithmetic mean is used for calculation.

In consideration of GLP and quality control requirements a duplicate measurement of samples is recommended.

The procedure is according to the following scheme:

1. Prepare samples as described above.
2. Pipet 100 µL ready-to-use standards or prepared samples in duplicate into the appropriate wells of the microtiter plate.
3. Incubate for 20 minutes at room temperature.
4. Wash the plate three times as follows: Discard the contents of the wells (dump or aspirate). Pipet 300 µL of diluted washing solution into each well. After the third repetition empty the wells again and remove residual liquid by striking the plate against a paper towel. The wash procedure is critical. Insufficient washing will result in poor precision and falsely elevated absorbencies.
5. Pipet 100 µL of conjugate (anti-tropomyosin-peroxidase) into each well.
6. Incubate for 20 minutes at room temperature.
7. Wash the plate as outlined in 4.
8. Pipet 100 µL of substrate solution into each well.
9. Allow the reaction to develop in the dark (e.g. cupboard or drawer; the chromogen is light-sensitive) for 20 minutes at room temperature.
10. Stop enzyme reaction by adding 100 µL of stop solution (0.5 M H_2SO_4) into each well. The blue color will turn yellow upon addition.
11. After thorough mixing, measure absorbance at 450 nm (reference wavelength 620 nm), using an ELISA reader. The color is stable for 30 minutes.

RESULTS

The ready-to-use standards are prepared for a direct determination of sample concentrations. The dilution of samples in the extraction process as described in the above stated sample preparation procedure is already considered. Additional dilution due to high sample concentration has to be accounted for.

1. Calculate the average optical density (OD 450 nm) for each set of reference standards or samples.
2. Construct a standard curve by plotting the mean optical density obtained for each reference standard against its concentration in ppb on semi-log graph paper with the optical density on the vertical (y) axis and the concentration on the horizontal (x) axis. Alternatively the evaluation can be carried out by software. In this case the 4-parameter method should be preferred.
3. Using the mean optical density value for each sample, determine the corresponding concentration of tropomyosin in ppb from the standard curve. Depending on experience and/or the availability of computer capability, other methods of data reduction may be employed.

The determined amount of tropomyosin [ppb] can be used to calculate the amount of the corresponding crustacean raw product (dry weight). Therefore the amount of tropomyosin has to be multiplied with a conversion factor (F).

The following conversion factors were determined by validation experiments:

Black tiger prawns, raw	60
Black tiger prawns, cooked	260
Lobster, raw	290
Lobster, cooked	270
Crawfish, raw	50
Crawfish, cooked	490
Spiny lobster, raw	8620
Spiny lobster, cooked	210
Shrimp, raw	70
Shrimp, cooked	70
Crab, blanched	230
Crab, cooked	520

Typical Standard Values

The following table contains an example for a typical standard curve. The binding is calculated as percent of the absorption of the 400 ppb standard. These values are only

an example and should not be used instead of the standard curve which has to be measured in each new test.

Tropomyosin (ppb)	% binding of 400 ppb
400	100
200	64
60	22
20	9
0	3

PERFORMANCE CHARACTERISTICS

Sensitivity

The limit of detection (LOD) of the **DAI Crustaceans Tropomyosin ELISA** test is 0.9 ppb (Tropomyosin, *penaeus indicus*).

Validation experiments with common matrices resulted in the following LODs (ppb).

Soy sauce	1.7
Vegetable soup	3.6
Bakery products	0.9
Fish	8.5
Meat	10.3

The limit of quantification (LOQ) of the **DAI Crustaceans Tropomyosin ELISA** test is 20 ppb.

Due to the variety of sample matrices and their influence on the blank, results less than the LOQ should be treated as negative.

Cross-reactivity

For the following foods no cross-reactivity could be detected:

Milk	Fish	Macadamia nut
Egg	Oyster	Chestnut
Wheat	Sunflower seeds	Pine nut
Rye	Pumpkin seeds	Soy
Oats	Cashew	Lecithin (soy)
Barley	Peanut	Pea
Rice	Hazelnut	Bean
Corn	Almond	Potato
Buckwheat	Pecan	Carrot
Sesame	Coconut	Leek
Pork meat	Brazil nut	Celery
Chicken meat	Pistachio	

The following cross reactions were determined.

Cockroach (protein)	0.01%

Precision

Intra-assay Precision	6-8%
Inter-assay Precision	5-12%

Linearity

The serial dilution of spiked samples (soy sauce, vegetable soup, bakery products, fish, and meat) resulted in a dilution linearity of 74%-114%.

Recovery

Mean recovery was determined by spiking samples with different amounts of tropomyosin:

Soy sauce	84%
Vegetable soup	93%
Bakery products	90%
Fish	93%
Meat	97%

REFERENCES

1. Fuller H, et al. (2006) – An enzyme-linked immunosorbent assay (ELISA) for the major crustacean allergen, tropomyosin, in food. Food and Agric Immun, 17(1):43-52
2. Niamnuy C, et al. (2007) – Changes in protein compositions and their effects on physical changes of shrimps during boiling in salt solution. Food Chem, 108(1):165-175
3. Marianne T, et al. (2007) – Quantitative sandwich ELISA for the determination of tropomyosin from crustaceans in food. J Agric Food Chem, 55(20):8025-8032
4. Jeoung BJ, et al. (1997) – Quantification of the major brown shrimp allergen Pen a 1 (tropomyosin) by a monoclonal antibody-based sandwich ELISA. J All Clin Immunol, 100(2):229-234
5. Seiki K, et al. (2007) – A reliable and sensitive immunoassay for the determination of crustacean protein in processed foods. J Agric Food Chem, 55(23):9345-9350
6. Reese G, et al. (2006) – Structural, immunological and functional properties of natural recombinant Pen a 1, the major allergen of brown shrimp, penaeus aztecus. Clin Exp Allergy, 36(4):517-24
7. Walter M (2008) – Krebstiere (Crustaceae) – Biologie, Vorkommen, Haltung und Erkrankungen, sowie ihre Bedeutung als Zootierobjekte und Lebensmittelresourcen – eine Literaturstudie. Dissertation, Justus-Liebig-Universität, Gießen, Germany
8. Ayuso R, et al. (2002) – Identification of continous, allergenic regions of the major shrimp allergen Pen a 1 (tropomyosin). Int Arch allergy Immunol, 127(1):27-37

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