CARCINOEMBRYONIC ANTIGEN (CEA)

ENZYME IMMUNOASSAY TEST KIT
Catalog Number: 10106

Enzyme Immunoassay for the Quantitative Determination of Carcinoembryonic Antigen (CEA) in Human Serum

Intended use

CEA enzyme immunoassay test kit is intended for the quantitative determination of CEA concentration in human serum.

Introduction

Carcinoembroyonic antigen (CEA) is a cell-surface 200-kd glycoprotein. In 1969, it was reported that plasma CEA was elevated in 35 of 36 patients with adenocarcinoma of the colon and that CEA titers decreased after successful surgery. Normal levels were observed in all patients with other forms of cancer or benign diseases. Subsequent studies have not confirmed these initial findings, and it is now understood that elevated levels of CEA are found in many cancers. Increased levels of CEA are observed in more than 30% of patients with cancer of the lung, liver, pancreas, breast, colon, head or neck, bladder, cervix, and prostate. Elevated plasma levels are related to the stage and extent of the disease, the degree of differentiation of the tumor, and the site of metastasis. CEA is also found in normal tissue.

Principle of the test

The CEA Quantitative Test Kit is based on a solid phase enzyme-linked immunosorbent assay. The assay system utilizes one monoclonal anti-CEA antibody for solid phase (microtiter wells) immobilization and another mouse monoclonal anti-CEA antibody in the antibody-enzyme (horseradish peroxidase) conjugate solution. The standards and test specimen (serum) are added to the CEA antibody coated microtiter wells. Then CEA antibody labeled with horseradish peroxidase (conjugate) is added. If human CEA is present in the specimen, it will combine with the antibody on the well and the enzyme conjugate resulting in the CEA molecules being sandwiched between the solid phase and enzyme-linked antibodies. After a 1 hour incubation at room temperature, the wells are washed to remove unbound labeled antibodies. A solution of TMB is added and incubated for 20 minutes, resulting in the development of a blue color. The color development is stopped with the addition of 2N HCl. The color is changed to yellow and measured spectrophotometrically at 450 nm. The concentration of CEA is directly proportional to the color intensity of the test sample.

Materials and components

Materials provided with the test kits:

- Antibody-coated microtiter plate,96 wells
- Enzyme Conjugate Reagent 12 mL
- TMB Substrate 12 mL
- Stop Solution 12 mL
- Reference standards, containing 0, 3, 12, 30, 60, and 120ng/mL of CEA, in liquid form (ready to use) or lyophilized Form
- Wash Buffer Concentrate(50X,15mL)

Materials required but not provided:

- Precision pipettes: 40µL-200µL, 200-1000µL
- Disposable pipette tips
- Distilled water
- Vortex mixer or equivalent
- Absorbent paper or paper towel
- Graph paper
- Microtiter plate reader

Specimen collection and preparation

1. Blood should be drawn using standard venipuncture techniques and the serum should be separated from the red blood cells as soon as possible. Avoid grossly hemolytic, lipemic or turbid samples.
2. Plasma samples collected in tubes containing EDTA, heparin, or oxalate may interfere with the test procedures and should be avoided.
3. Specimens should be capped and may be stored up to 48 hours at 2-8°C,prior to assaying. Specimens held for a longer time can be frozen at -20°C.Thawed samples must be mixed prior to testing.

Storage of test kits and instrumentation

Unopened test kits should be stored at 2-8°C upon receipt. The microtiter plate should be stored at 2-8°C, in a sealed bag with desiccants, to minimize exposure to damp air. Opened test kits will remain stable until the expiration date, provided they are stored as described above. A microtiter plate reader with a bandwidth of 10nm or less and an optical density range of 0-2 OD or greater, at 450nm wavelength, is acceptable for use in the absorbance measurement.

Reagent preparation

1. All reagents should be brought to room temperature(18-22°C) and mixed by gently inverting or swirling prior to use. Do not induce foaming.
2. If reference standards are lyophilized , reconstitute each standard with 0.5mL distilled water. Allow the reconstituted material to stand for at least 20 minutes. Reconstituted Standards should be sealed and stored at 2-8°C.
3. Dilute 1 volume of Wash Buffer (50x) with 49 volumes of distilled water. For example, dilute 15 mL of Wash Buffer (50x) into 735 mL of distilled water to prepare 750 mL of Washing buffer (1x). Mix well before use.

Assay procedures

1. Secure the desired number of coated wells in the holder.
2. Dispense 50µL of standard, specimens, and controls into appropriate wells.
3. Dispense 100µLof enzyme conjugate reagent to each well.
4. Thoroughly mix for 10 seconds. It is very important to have a complete mixing in this step.
5. Incubate at room temperature (18-22°C) for 60 minutes.
6. Remove the incubation mixture by emptying plate content into a waste container.
7. Rinse and empty the microtiter wells 5 times with washing Buffer(1X).
8. Strike the wells sharply onto absorbent paper or paper towels to remove all residual water droplets.
9. Dispense 100µL of TMB substrate into each well. Gently mix for 5 seconds.
10. Incubate at room temperature for 20 minutes.
11. Stop the reaction by adding100µL of Stop Solution to each well.
12. Gently mix for 30 seconds to ensure that the blue color completely changes to yellow.
13. Read the optical density at 450nm with a microtiter plate Reader within 15 minutes.

Important Note

1. The wash procedure is critical. Insufficient washing will result in poor precision and falsely elevated absorbance readings.
2. It is recommended that no more than 32 wells be used for each assay run if manual pipetting is used since pipetting of all standard, specimens and controls should be competed within 3 minutes. A full plate of 96 well may be used if automated pipetting is available.
3. Duplication of all standards and specimens, although not required is recommended.

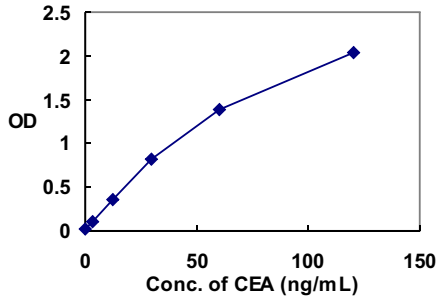
Calculation of results

Calculate the mean absorbance value (A450) for each set of reference standards, controls and patient samples. Construct a standard curve by plotting the mean absorbance obtained from each reference standard against its concentration in ng/mL on graph paper, with absorbance values on the vertical or Y-axis and concentrations on the horizontal or X-axis. Use the mean absorbance values for each specimen to determine the corresponding concentration of CEA in ng/mL from the standard curve.

Example of standard curve

Results of a typical standard run with optical density reading at 450nm shown in the Y-axis against CEA concentrations shown in the X-axis.

CEA (ng/mL)	Absorbance (450nm)
0	0.019
3	0.105
12	0.362
30	0.814
60	1.390
120	2.032



This standard curve is for the purpose of illustration only, and should not be used to calculate unknowns. Each user should obtain his or her own standard curve and data.

Expected values and sensitivity

The most complete study of CEA is a compilation of collaborative studies in which CEA values in 35,000 samples from more than 10,000 patients and controls were analyzed. Of 1425 normal persons who did not smoke, 98.7% had values less than 5.0 ng/mL. It is recommended that each laboratory establish its own normal range. The minimum detectable concentration of CEA by this assay is estimated to be 1.0 ng/mL.

Performance characteristics

1.Accuracy: Comparison between Our kits and commercial available kits provide the following data
N = 46
Correlation Coefficient = 0.946
Slope = 0.788
Intercept = 0.74
Mean (Ours) = 7.59
Mean (Abbott) = 6.03

2.Precision.

1].Intra-Assay:

Concentrations	Replicates	Mean	S.D.	% CV
Level	24	5.07	0.173	3.4
Level I	24	20.3	0.744	3.7
LevelII	24	35.44	1.09	3.1

2].Inter-Assay:

Concentrations	Replicates	Mean	S.D.	% CV
Level	20	4.94	0.243	4.9
Level I	20	19.82	1.24	6.3
LevelII	20	35.36	1.33	3.8

3.Linearity
A patient serum were serially diluted with 0 ng/mL standard In a linearity study. The average recovery was 99.7 %.

Sample			
Dilution	Expected	Observed	% Recov.
Undiluted	103.50	103.50	
2x	51.75	50.89	98.3
4x	25.88	26.26	101.5
8x	12.94	13.22	102.2
16x	6.47	6.25	96.6
32x	3.23	3.51	108.5
Average Recovery: 99.7 %			

4.Recovery
Various patient serum samples of known CEA levels were mixed and assayed in duplicate. The average recovery was 100.7 %.

Expected Concentration	Observed Concentration	% Recovery
54.28	53.21	98.0
28.42	29.13	102.5
23.85	22.98	96.4
16.53	15.99	96.7
20.90	21.36	102.2
18.62	19.65	105.5
28.77	29.78	103.5
Average Recovery: 100.7 %		

5.Sensitivity
The minimum detectable concentration of this assay is estimated to be 1.0 ng/mL.

6.Cross-reactivity
The following human materials were tested for crossreactivity Of the assay:

Antigens	Concentration	Equivalent CEA	% Cross-reactivity
HCG	400 IU/mL	0.00	0.00
PAP	1,000 ng/mL	0.00	0.00
PSA	1,000 ng/mL	0.00	0.00
AFP	1,000 ng/mL	0.00	0.00

7.Hook Effect
No hook effect was observed up to 40,000 ng/mL CEA in this Assay.

Limitations of the Procedure

There are some limitation of the assay. We should let our customers know about that.

1)As with all diagnostic tests, a definite clinical diagnosis should not be based on the results of a single test, but should only be made by the physician after all clinical and laboratory findings have been evaluated.

2)Studies have implicated possible interference in immunoassay results in some patients with known rheumatoid factor and antinuclear antibodies. Serum samples from patients who have received infusions containing mouse monoclonal antibodies for diagnostic or therapeutic purposes, may contain antibody to mouse protein (HAMA). Although we have added some agents to avoid the interferences, we cannot guarantee to eliminate all the effects of that.

3)The wash procedure (steps 6-8) is critical. Insufficient washing will result in poor precision and falsely elevated absorbance. The use of tap water for washing could result in a higher background absorbance.

References

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