

## ab326436 – Human CEA SimpleStep ELISA® Kit, Chemiluminescent

For the quantitative measurement of CEA in human serum, plasma (heparin), plasma (EDTA), plasma (citrate), cell culture supernatant, cell extract, and tissue extract.

For research use only - not intended for diagnostic use.

Patent pending.

For overview, typical data and additional information please visit: [www.abcam.com/ab326436](http://www.abcam.com/ab326436)

**Storage and Stability:** Store kit at 2-8°C immediately upon receipt. Refer to list of materials supplied for storage conditions of individual components. Observe the storage conditions for individual prepared components in the Standard Preparation and Reagent preparation sections.

**Limitations:** All data, except typical standard curve and sensitivity were collected using the colorimetric version of this kit (ab264604).

### Materials Supplied

Item	Quantity 1 x 96 tests	Storage Condition
Human CEA Capture Antibody 10X	600 µL	+4°C
Human CEA Detector Antibody 10X	600 µL	+4°C
Human CEA Lyophilized Recombinant Protein	2 Vials	+4°C
Antibody Diluent CPI2	6 mL	+4°C
Cell Extraction Buffer PTR 5X	10 mL	+4°C
Cell Extraction Enhancer Solution 50X	1 mL	+4°C
Sample Diluent NS	12 mL	+4°C
Wash Buffer PT 10X	20 mL	+4°C
ChemiHRP Reagent A	3 mL	+4°C
ChemiHRP Reagent B	3 mL	+4°C
SimpleStep Pre-Coated Black 96-Well Microplate	96 Wells	+4°C
Plate Seal	1	+4°C

**Note:** Antibody Diluent CPI2- This buffer has been reformulated to enhance stability after freeze-thaw cycles while producing data equivalent to the original formulation of antibody diluent CPI previously used in tis kit.

While we run stock down, you may receive kits containing antibody diluent CPI. This does not affect the way you should use the kit.

If you have any questions please contact Abcam Scientific Support.

These materials are not included in the kit, but will be required to successfully utilize this assay: Luminometer with the following settings: 0.5-1 second/well read time; summation mode (all wavelengths).

Method for determining protein concentration (BCA assay recommended).

Deionized water.

Multi- and single-channel pipettes.

Tubes for standard dilution.

Orbital microplate shaker for all incubation steps: capable of 750 rpm shaking speed.

Optional: Phenylmethylsulfonyl Fluoride (PMSF) (or other protease inhibitors).

### Reagent Preparation

Equilibrate all reagents to room temperature (18-25°C) prior to use. The kit contains enough reagents for 96 wells. The sample volumes below are sufficient for 48 wells (6 x 8-well strips); adjust volumes as needed for the number of strips in your experiment.

Prepare only as much reagent as is needed on the day of the experiment. Capture and Detector Antibodies have only been tested for stability in the provided 10X formulations.

**1X Wash Buffer PT:** Prepare 1X Wash Buffer PT by diluting Wash Buffer PT 10X with deionized water. To make 50 mL 1X Wash Buffer PT combine 5 mL Wash Buffer PT 10X with 45 mL deionized water. Mix thoroughly and gently.

**1X Cell Extraction Buffer PTR (For cell and tissue extracts only):** Prepare 1X Cell Extraction Buffer PTR by diluting Cell Extraction Buffer PTR 5X and 50X Cell Extraction Enhancer Solution to 1X with deionized water. To make 10 mL 1X Cell Extraction Buffer PTR combine 7.8 mL deionized water, 2 mL Cell Extraction Buffer PTR 5X and 200 µL Cell Extraction Enhancer Solution 50X. Mix thoroughly and gently. If required protease inhibitors can be added.

**Antibody Cocktail:** Prepare Antibody Cocktail by diluting the capture and detector antibodies in Antibody Diluent CPI2. To make 3 mL of the Antibody Cocktail combine 300 µL 10X Capture Antibody and 300 µL 10X Detector Antibody with 2.4 mL Antibody Diluent CPI2. Mix thoroughly and gently.

**Lumi HRP Development Solution:** Just prior to use, prepare Lumi HRP Development Solution by mixing equal volume of the ChemiHRP Reagent A and the ChemiHRP Reagent B. To make 3 mL of the Lumi HRP Development Solution combine 1.5 mL of ChemiHRP Reagent A and 1.5 mL of ChemiHRP Reagent B. Mix thoroughly and gently by inversion or slow pipetting (Avoid shaking or vortexing). Protect the prepared solution from light until use.

### Standard Preparation

Always prepare a fresh set of standards for every use. Discard working standard dilutions after use as they do not store well. The following section describes the preparation of a standard curve for duplicate measurements (recommended).

1. Reconstitute the **CEA** protein standard by adding the volume indicated on the protein vial label. **For serum, plasma and cell culture supernatant samples measurements**, use Sample Diluent NS. For **cell and tissue homogenate extract samples measurements**, use 1X Cell Extraction Buffer PTR. Hold at room temperature for 10 minutes and mix thoroughly and gently. This is the 40,000 pg/mL **Stock Standard #1** Solution.
1. Label nine tubes, Standards 1– 9.
2. Use the same Sample Diluent as used to resuspend the Stock Standard to prepare the standard curve. Add 150 µL of Sample Diluent into tube numbers 2-9.
3. Use the **Stock Standard #1** to prepare the following dilution series. Standard #9 contains no protein and is the Blank control:

Standard #	Dilution Sample	Volume to Dilute (µL)	Volume of Diluent (µL)	Starting Conc. (pg/mL)	Final Conc. (pg/mL)
1	Stock Standard #1	225	0	40,000	40,000
2	Stock Standard #1	75	150	40,000	13,333
3	Standard#2	75	150	13,333	4,444.4
4	Standard#3	75	150	4,444.4	1,481.5
5	Standard#4	75	150	1,481.5	493.83
6	Standard#5	75	150	493.83	164.61
7	Standard#6	75	150	164.61	54.87
8	Standard#7	75	150	54.87	18.29
9	Blank Control	0	150	0	0

### Sample Preparation

Typical Sample Dynamic Range	
Sample Type	Range
Serum	25 – 50%
Plasma – Citrate	25 – 50%
Plasma – EDTA	25 – 50%
Plasma – Heparin	25 – 50%
Cell Culture Media*	≤ 50%
MCF7 Cell Extract	7.81 – 250 µg/mL
Colon Tissue Homogenate Extract	3.91 – 125 µg/mL

\*Media is RPMI 1640 containing 10% fetal bovine serum, based on spiked data.

**Serum** Samples should be collected into a serum separator tube. After clot formation, centrifuge samples at 2,000 x g for 10 minutes and collect serum. Dilute samples at least 1: 2 into Sample Diluent NS and assay. Store un-diluted serum at -20°C or below. Avoid repeated freeze-thaw cycles.

**Plasma** Collect plasma using citrate, EDTA or heparin. Centrifuge samples at 2,000 x g for 10 minutes. Dilute samples at least 1: 2 into Sample Diluent NS and assay. Store un-diluted plasma samples at -20°C or below for up to 3 months. Avoid repeated freeze-thaw cycles.

**Cell Culture Supernatants** Centrifuge cell culture media at 2,000 x g for 10 minutes to remove debris. Collect supernatants. Collect supernatants and assay. Or dilute samples at least 1: 2 into Sample Diluent NS and assay. Store un-diluted samples at -20°C or below. Avoid repeated freeze-thaw cycles.

**Preparation of extracts from cell pellets** Collect non-adherent cells by centrifugation or scrape to collect adherent cells from the culture flask. Typical centrifugation conditions for cells are 500 x g for 5 minutes at 4°C. Rinse cells twice with PBS. Solubilize pellet at  $2 \times 10^7$  cell/mL in chilled 1X Cell Extraction Buffer PTR. Incubate on ice for 20 minutes. Centrifuge at 18,000 x g for 20 minutes at 4°C. Transfer the supernatants into clean tubes and discard the pellets. Assay samples immediately or aliquot and store at -80°C. The sample protein concentration in the extract may be quantified using a protein assay. Dilute samples to desired concentration in 1X Cell Extraction Buffer PTR.

**Preparation of extracts from adherent cells by direct lysis (alternative protocol)** Remove growth media and rinse adherent cells 2 times in PBS. Solubilize the cells by addition of chilled 1X Cell Extraction Buffer PTR directly to the plate (use 750 µL - 1.5 mL 1X Cell Extraction Buffer PTR per confluent 15 cm diameter plate). Scrape the cells into a microfuge tube and incubate the lysate on ice for 15 minutes. Centrifuge at 18,000 x g for 20 minutes at 4°C. Transfer the supernatants into clean tubes and discard the pellets. Assay samples immediately or aliquot and store at -80°C. The sample protein concentration in the extract may be quantified using a protein assay. Dilute samples to desired concentration in 1X Cell Extraction Buffer PTR.

**Preparation of extracts from tissue homogenates** Tissue lysates are typically prepared by homogenization of tissue that is first minced and thoroughly rinsed in PBS to remove blood (dounce homogenizer recommended). Homogenize 100 to 200 mg of wet tissue in 500 µL – 1 mL of chilled 1X Cell Extraction Buffer PTR. For lower amounts of tissue adjust volumes accordingly. Incubate on ice for 20 minutes. Centrifuge at 18,000 x g for 20 minutes at 4°C. Transfer the supernatants into clean tubes and discard the pellets. Assay samples immediately or aliquot and store at -80°C. The sample protein concentration in the extract may be quantified using a protein assay. Dilute samples to desired concentration in 1X Cell Extraction Buffer PTR.

### Plate Preparation

The 96 well plate strips included with this kit are supplied ready to use. It is not necessary to rinse the plate prior to adding reagents.

Unused plate strips should be immediately returned to the foil pouch containing the desiccant pack, resealed and stored at 4°C.

For each assay performed, a minimum of two wells must be used as the zero control.

For statistical reasons, we recommend each sample should be assayed with a minimum of two replicates (duplicates).

Differences in well absorbance or “edge effects” have not been observed with this assay.

### Assay Procedure

Equilibrate all materials and prepared reagents to room temperature prior to use.

We recommend that you assay all standards, controls and samples in duplicate.

1. Prepare all reagents, working standards, and samples as directed in the previous sections.
2. Remove excess microplate strips from the plate frame, return them to the foil pouch containing the desiccant pack, resealed and return to 4°C storage.
3. Add 50 µL of all sample or standard to appropriate wells.
4. Add 50 µL of the Antibody Cocktail to each well.
5. Seal the plate and incubate for 30 minutes at room temperature on a plate shaker set to 750 rpm.

6. Wash each well with 3 x 350  $\mu$ L 1X Wash Buffer PT. Wash by aspirating or decanting from wells then dispensing 350  $\mu$ L 1X Wash Buffer PT into each well. Wash Buffer PT should remain in wells for at least 30 seconds. Complete removal of liquid at each step is essential for good performance. After the last wash invert the plate and tap gently against clean paper towels to remove excess liquid.
7. Add 50  $\mu$ L of prepared Lumi HRP Development Solution to each well and incubate for 1 minute in the dark on a plate shaker set to 750 rpm. Further optimization of incubation time vs signal strength can be performed if needed. Avoid introducing bubbles into the wells.
8. Measure the produced light of each well using a microplate luminometer with the following settings: 1 second/well read time in summation mode (all wavelengths). Relative light unit (RLU) readings may vary between luminometer models. It is recommended to configure instrument settings according to the manufacturer's specifications. Note: Relative light unit (RLU) values may change over the course of the 15-minute reading window.
9. Analyze the data as described below.

<b>Mode:</b>	Luminescence
<b>Instrument settings:</b>	Endpoint
<b>Detection Mode:</b>	All wavelengths
<b>Read Time:</b>	0.5-1 sec
<b>Read:</b>	Top

**Note** For microplate readers with Pre-Read Optimization option, the Read Height as well as Microplate Optimization is recommended before the first read.

**Download our ELISA guide for technical hints, results, calculation, and troubleshooting tips:**

<https://www.abcam.com/en-us/technical-resources/guides/elisa-guide>

#### Technical Support

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## Additional information

### ASSAY SPECIFICITY

This kit is designed for the quantification of human CEA.

Native signal was detected in serum, plasma (citrate), plasma (EDTA), plasma (heparin), cell culture supernatant, cell extract, and tissue extract sample types.

Spiked protein experiments were used to validate serum, plasma (citrate), plasma (EDTA), plasma (heparin), and cell culture media.

Urine, saliva, milk, and CSF samples have not been tested with this kit.

### SPECIES REACTIVITY

Other species reactivity was determined by measuring 1:2 (dilution) serum samples of various species, interpolating the protein concentrations from the human standard curve, and expressing the interpolated concentrations as a percentage of the protein concentration in human serum assayed at the same dilution.

Interpolated values were below the detectable range of the assay for the following species: Mouse, Rat, Cow

Other species reactivity not determined.

### CALIBRATION

This immunoassay is calibrated against a highly purified human CEA. The NIBSC/WHO unclassified purified human CEA preparation 73/601 was evaluated in this kit.

The dose response curve of the unclassified standard CEA parallels the SimpleStep standard curve. To convert sample values obtained with the SimpleStep Human CEA kit to approximate NIBSC IU (international units), use the equation below.

NIBSC (73/601) approximate value (IU/mL) = 50,100 x SimpleStep Human CEA value (mg/mL).

### CALCULATION

- Preconfigured protocols are available when using SoftMax Pro software from Molecular Devices.
- Calculate the average chemiluminescence value for the blank control (zero) standards. Subtract the average blank control standard chemiluminescence value from all other chemiluminescence values.
- Create a standard curve by plotting the average blank control subtracted chemiluminescence value for each standard concentration (y-axis) against the target protein concentration (x-axis) of the standard. Use graphing software to draw the best smooth curve through these points to construct the standard curve.
- Note: Most chemiluminescence reader software or graphing software will plot these values and fit a curve to the data. A four-parameter curve fit (4PL) is often the best

choice; however, other algorithms (e.g. linear, semi-log, log/log, 4-parameter logistic) can also be tested to determine if it provides a better curve fit to the standard values.

- Determine the concentration of the target protein in the sample by interpolating the blank control subtracted chemiluminescence values against the standard curve. Multiply the resulting value by the appropriate sample dilution factor, if used, to obtain the concentration of target protein in the sample.
- Samples generating chemiluminescence values greater than that of the highest standard should be further diluted and reanalyzed. Similarly, samples which measure at chemiluminescence values less than that of the lowest standard should be retested in a less dilute form.

### TYPICAL DATA

Typical standard curve – data provided for demonstration purposes only. A new standard curve must be generated for each assay performed

Standard Curve Measurements			
Concentration (pg/mL)	RLU		Mean RLU
	1	2	
0	34	34	34
18.29	605	693	649
54.87	4,076	4,201	4,139
164.61	19,076	16,081	17,579
493.83	57,212	52,592	54,902
1,481.4	164,484	171,293	167,889
4,444.4	515,630	497,061	506,346
13,333.3	1,434,893	1,511,609	1,473,251
40,000	4,040,468	4,074,587	4,057,528

Table 1. Example of human CEA standard curve in Sample Diluent NS. The CEA standard curve was prepared as described in the Standard Preparation section. The table shows raw data values.

Standard Curve Measurements			
Concentration (pg/mL)	RLU		Mean RLU
	1	2	
0	148	148	148
18.29	1,959	1,399	1,679
54.87	3,849	3,567	3,708
164.61	12,554	12,550	12,552
493.83	40,593	41,113	40,853
1,481.4	113,973	119,522	116,748
4,444.4	383,127	387,105	385,116
13,333.3	1,118,388	1,123,047	1,120,718
40,000	3,504,725	3,581,171	3,542,948

Table 2. Example of human CEA standard curve in 1X Cell Extraction Buffer PTR. The CEA standard curve was prepared as described in the Standard Preparation section. The table shows raw data values.

## TYPICAL SAMPLE VALUES

### Sensitivity:

The minimal detectable dose (MDD) was determined by calculating the mean of zero standard replicates and adding 2 standard deviations then extrapolating the corresponding concentration.

Sample Diluent Buffer	N=	Minimal Detectable Dose
Sample Diluent NS	12	3.91 pg/mL
1X Cell Extraction Buffer PTR	13	3.53 pg/mL

### Recovery

Three concentrations of CEA were spiked in duplicate to the indicated biological matrix to evaluate signal recovery in the working range of the assay.

Sample Type	Average % Recovery	Range (%)
Serum (50%)	100	92-116
Plasma – Citrate (50%)	105	91-111
Plasma – Heparin (50%)	101	90-110
Plasma – EDTA (50%)	98	91-110
Cell Culture Media* (50%)	93	84-99
MCF7 Cell Extract (31.25 µg/mL)	108	95-122
Colon Tissue Homogenate Extract (15.63 µg/mL)	109	104-117

\*Media is RPMI 1640 containing 10% fetal bovine serum.

## Linearity of Dilution

Linearity of dilution is determined based on interpolated values from the standard curve. Linearity of dilution defines a sample concentration interval in which interpolated target concentrations are directly proportional to sample dilution.

Native CEA was measured in the following biological samples in a 2-fold dilution series. Sample dilutions are made in Sample Diluent NS.

Dilution Factor	Interpolated value	50% Human Serum	50% Human Plasma (Citrate)	50% Human Plasma (EDTA)	50% Human Plasma (Heparin)
Undiluted	pg/mL	245	305	347	273
	% Expected value	100	100	100	100
2	pg/mL	107	160	155	117
	% Expected value	105	102	100	106

Recombinant CEA was spiked into the following biological samples and then diluted in a 2-fold dilution series. Sample dilutions are made in Sample Diluent NS.

Dilution Factor	Interpolated value	50% Human Serum	50% Human Plasma (Citrate)	50% Human Plasma (Heparin)	50% Human Plasma (EDTA)	50% Cell Culture media
Undiluted	pg/mL	2,063	2,652	2,638	2,785	2375
	% Expected value	100	100	100	100	100
2	pg/mL	1,082	1,358	1,403	1,398	1220
	% Expected value	105	102	106	100	103
4	pg/mL	517	639	625	677	635
	% Expected value	100	96	95	97	107
8	pg/mL	250	315	351	332	327
	% Expected value	97	95	107	95	110
16	pg/mL	130	172	177	156	145
	% Expected value	101	104	107	89	97

Native CEA was measured in the following biological samples in a 2-fold dilution series. Sample dilutions are made in 1X Cell Extraction Buffer PTR.

Dilution Factor	Interpolated value	250 µg/mL MCF7 extract	125 µg/mL Human colon homogenate extract
Undiluted	pg/mL	3,475	3,809
	<b>% Expected value</b>	100	100
2	pg/mL	1,722	1,881
	<b>% Expected value</b>	99	99
4	pg/mL	855	941
	<b>% Expected value</b>	98	99
8	pg/mL	459	492
	<b>% Expected value</b>	106	103
16	pg/mL	245	237
	<b>% Expected value</b>	113	99

### Precision

Mean coefficient of variations of interpolated values of CEA from two concentrations of MCF7 cell extract within the working range of the assay.

	Intra-assay	Inter-assay
<b>N=</b>	8	3
<b>CV (%)</b>	5	5.4

Download our ELISA guide for technical hints, results, calculation, and troubleshooting tips:

<https://www.abcam.com/en-us/technical-resources/guides/elisa-guide>

### Technical Support

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