



**User's Manual**

# **Human CYFRA21-1/Cytokeratin-19 (CytokeRatin Fragment Antigen 21-1) ELISA Kit**

**REF** DEIA6310-2

**Σ** 96T

**RUO**



This product is for research use only and is not intended for diagnostic use.

For illustrative purposes only. To perform the assay the instructions for use provided with the kit have to be used.

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## PRODUCT INFORMATION

### Intended Use

In vitro quantitative determination of CYFRA21-1 concentrations in serum, plasma, cell culture supernatant and other biological samples.

### General Description

CytokeRatin Fragment Antigen 21-1 (CYFRA 21-1) is a soluble cytokeratin fragment derived from the breakdown of cytokeratin 19, a major intermediate filament protein expressed in epithelial cells, particularly in lung, liver, and gastrointestinal tissues. CYFRA 21-1 is released into the bloodstream in response to epithelial cell damage or turnover, serving as a biomarker for various epithelial-derived cancers such as non- small cell lung cancer (NSCLC) and squamous cell carcinoma. Elevated serum levels of CYFRA 21-1 indicate tumor burden, metastasis, or therapeutic response, facilitating cancer diagnosis, prognosis, and monitoring in clinical oncology.

### Principles of Testing

This kit was based on sandwich enzyme-linked immune-sorbent assay technology. Anti CYFRA21-1 antibody was pre-coated onto the 96-well plate. The biotin conjugated anti CYFRA21-1 antibody was used as the detection antibody. The standards and pilot samples were added to the wells subsequently. After incubation, unbound conjugates were removed by wash buffer. Then, biotinylated detection antibody was added to bind with CYFRA21-1 conjugated on coated antibody. After washing off unbound conjugates, HRP -Streptavidin was added. After a third washing, TMB substrates were added to visualize HRP enzymatic reaction. TMB was catalyzed by HRP to produce a blue color product that turned yellow after adding a stop solution. Read the O. D. absorbance at 450nm in a microplate reader. The concentration of CYFRA21-1 in the sample was calculated by drawing a standard curve. The concentration of the target substance is proportional to the OD450 value.

### Reagents And Materials Provided

1. ELISA Microplate: (Dismountable) 8×12, 2-8°C/-20°C
2. Lyophilized Standard: 2 vial, 2-8°C/-20°C
3. Biotin-labeled Antibody (Concentrated, 100×): 1 vial, 120 µl, 2-8°C (Avoid Direct Light)
4. HRP-Streptavidin Conjugate (SABC, 100×): 120 µl, 2-8°C (Avoid Direct Light)
5. TMB Substrate: 10 ml, 2-8°C (Avoid Direct Light)
6. Sample Dilution Buffer: 20 ml, 2-8°C
7. Antibody Dilution Buffer: 10 ml 2-8°C
8. SABC Dilution Buffer: 10 ml, 2-8°C
9. Stop Solution: 10 ml, 2-8°C
10. Wash Buffer (25×): 30 ml, 2-8°C



11. Plate Sealer: 5 pieces
12. Product Description: 1 copy

Note: The liquid reagent bottle contains slightly more reagent than indicated on the label. Please use pipette accurately measure and do proportional dilution.

## Materials Required But Not Supplied

1. Microplate reader (wavelength: 450 nm)
2. 37°C incubator (CO2 incubator for cell culture is not recommended.)
3. Automated plate washer or multi-channel pipette/5 ml pipettor (for manual washing purpose)
4. Precision single (0.5-10 µL, 5-50 µL, 20-200 µL, 200-1000 µL) and multi-channel pipette with disposable tips (calibration is required before use.)
5. Sterile tubes and Eppendorf tubes with disposable tips
6. Absorbent paper and loading slot
7. Deionized or distilled water

## Storage

2-8°C/-20°C

## Specimen Collection And Preparation

Please refer to the following table of recommended dilution ratio for limited samples for reference

Healthy serum/plasma 1/2 dilution: 40-420 pg/ml

SW620 cell lysate 1/10-1/50: 12.2 ng/mg (total protein)

### 1. Serum

Place whole blood sample at room temperature for 2 hours or at 2-8°C overnight. Centrifuge for 20min at 1000xg and collect the supernatant to detect immediately. Or you can aliquot the supernatant and store it at -20°C or -80°C for future's assay.

### 2. Plasma

EDTA-Na2/K2 is recommended as the anticoagulant. Centrifuge samples for 15 minutes at 1000 ×g 2-8°C within 30 minutes after collection. Collect the supernatant to detect immediately. Or you can aliquot the supernatant and store it at -20°C or -80°C for future's assay. For other anticoagulant types and uses, please refer to the sample preparation guideline.

### 3. Tissue Sample

Generally tissue samples are required to be made into homogenization. Protocol is as below:

3. 1. Place the target tissue on the ice. Remove residual blood by washing tissue with pre-cooling PBS buffer (0.01 M, pH = 7.4). Then weigh for usage.
3. 2. Use lysate to grind tissue homogenates on the ice. The adding volume of lysate depends on the weight of the tissue. Usually, 9 mL PBS would be appropriate to 1 gram tissue pieces. Some protease inhibitors are recommended to add into the PBS (e.g. 1 mM PMSF).

3. Do further process using ultrasonic disruption or freeze-thaw cycles (Ice bath for cooling is required during ultrasonic disruption; Freeze-thaw cycles can be repeated twice.) to get the homogenates.
3. 4. Homogenates are then centrifuged for 5 minutes at 5000 ×g. Collect the supernatant to detect immediately. Or you can aliquot the supernatant and store it at -20°C or -80°C for future's assay.
3. 5. Determine total protein concentration by BCA kit for further data analysis. Usually, total protein concentration for Elisa assay should be within 1-3mg/ml. Some tissue samples such as liver, kidney, pancreas which containing a higher endogenous peroxidase concentration may react with TMB substrate causing false positivity. In that case, try to use 1% H<sub>2</sub>O<sub>2</sub> for 15min inactivation and perform the assay again.

Notes: PBS buffer or the mild RIPA lysis can be used as lysates. While using RIPA lysis, make the PH=7.3. Avoid using any reagents containing NP-40 lysis buffer, Triton X-100 surfactant, or DTT due to their severe inhibition for kits' working. We recommend using 50 mM Tris + 0.9% NaCL+0.1% SDS, PH7.3. You can prepare by yourself or contact us for purchasing.

#### 4. Cell Culture Supernatant

Collect the supernatant: Centrifuge at 2500 rpm at 2-8°C for 5 minutes, then collect clarified cell culture supernatant to detect immediately. Or you can aliquot the supernatant and store it at -80°C for future's assay.

#### 5. Cell Lysate

5. 1. Suspension Cell Lysate: Centrifuge at 2500 rpm at 2-8°C for 5 minutes and collect cells. Then add pre-cooling PBS into collected cell and mix gently. Recollect cell by repeating centrifugation. Add 0.5-1ml cell lysate and appropriate protease inhibitor (e.g. PMSF, working concentration: 1mmol/L). Lyse the cell on ice for 30min-1h or disrupt the cell by ultrasonic disruption.
5. 2. Adherent Cell Lysate: Absorb supernatant and add pre-cooling PBS to wash three times. Add 0.5-1ml cell lysate and appropriate protease inhibitor (e.g. PMSF, working concentration: 1mmol/L). Scrape the adherent cell with cell scraper. Lyse the cell suspension added in the centrifuge tube on ice for 30min-1h or disrupt the cell by ultrasonic disruption.
5. 3. During lysate process, use the tip for pipetting or intermittently shake the centrifugal tube to completely lyse the protein. Mucilaginous product is DNA which can be disrupted by ultrasonic cell disruptor on ice. (3~5 mm probe, 150-300 W, 3~5 s/time, 30s intervals for 1~2s working).
5. 4. At the end of lysate or ultrasonic disruption, centrifuge at 10000rpm at 2-8°C for 10 minutes. Then, the supernatant is added into EP tube to detect immediately. Or you can aliquot the supernatant and store it at -80°C for future's assay.

Notes: Read notes in tissue sample.

#### 6. Other Biological Sample

Centrifuge samples for 15 minutes at 1000 ×g at 2-8°C. Collect the supernatant to detect immediately. Or you can aliquot the supernatant and store it at -80°C for future's assay.

#### Notes for Samples

1. Blood collection tubes should be disposable and non-endotoxin. Avoid to use hemolyzed and lipemia samples.
2. The best sample storage condition: less than 5 days at 2-8°C; within 6 months at -20°C; within 2 years at -80°C. Stored in liquid nitrogen for a longer storage. When melting frozen samples, rapid water bath at 15-25°C can decrease the effect of ice crystal (0°C) on the sample. After melting, centrifuge to remove the precipitate, and then mix well.

3. The detection range of this kit is not equivalent to the concentration of analyze in the sample. For analyses with higher or lower concentration, please properly dilute or concentrate the sample.
4. Pretest is recommended for special samples without reference data to validate the validity.
5. Recombinant protein may not match with the capture or detection antibody in the kit, resulting in the undetectable assay.

The matrix components in serum/plasma will affect the test results, which it need to be diluted at least 1/2 with Sample Dilution Buffer before testing!

If other dilution ratio for your sample model is required, please refer to the universal dilution ratio below. (The ratio is suitable for single-well assay. For duplicate assay, please follow the calculation: volume of sample and diluent x number of duplicate well)

For 2 fold dilution (1/2): One step dilution. Add 60 µl sample into 60 µl sample diluent and mix gently.

For 5 fold dilution (1/5): One step dilution. Add 24 µl sample into 96 µl sample diluent and mix gently.

For 10 fold dilution (1/10): One step dilution. Add 12 µl sample into 108 µl sample diluent and mix gently.

For 20 fold dilution (1/20): One step dilution. Add 6 µl sample into 114 µl sample diluent and mix gently.

For 50 fold dilution (1/50): One step dilution. Add 3 µl sample and 47 µl normal saline (0.9% NaCl) into 100µl sample diluent and mix gently.

For 100 fold dilution (1/100): One step dilution. Add 3 µl sample and 177 µl normal saline into 120 µl sample diluent and mix gently.

For 1000 fold dilution (1/1000): Two step dilution. Create a 50-fold dilution first (normal saline is used throughout the dilution). Then, create a 20-fold dilution and mix gently.

For 10000 fold dilution (1/10000): Two step dilution. Create a 100-fold dilution first (normal saline is used throughout the dilution). Then, create the same dilution again and mix gently.

For 100000 fold dilution (1/100000): Three step dilution. Create a 50-fold dilution and 20-fold dilution respectively (normal saline is used in the first two steps.) Finally, create a 100-fold dilution and mix gently.

Notes 1: The volume in each dilution is not less than 3 µl. Dilution factor should be within 100 fold. Mixing during dilution is required to avoid foaming.

## Reagent Preparation

Take the Elisa kit from the fridge around 20 minutes earlier and equilibrate to room temperature(18-25°C). For repeated assays, please just take the strips and standards required for the current assay, store the rest materials according to the relevant condition.

### 1. Wash Buffer

Dilute 30 ml concentrated wash buffer to 750 ml wash buffer with deionized or distilled water and mix well. (The recommended resistivity of ultrapure water is 18 MΩ.) Alternatively, take appropriate amount of concentrated wash buffer according to the assay requirement, then create a 25-fold dilution and mix well. Store the rest solution at 2-8°C.

Crystals formed in the concentrated wash buffer can be heated by water bath at 40°C till complete dissolution. (Heating temperature should be below 50°C.) Mix well for the next step. It's better to use up the prepared wash buffer in one day. Store the rest buffer at 2-8°C within 48h.

## 2. Standards

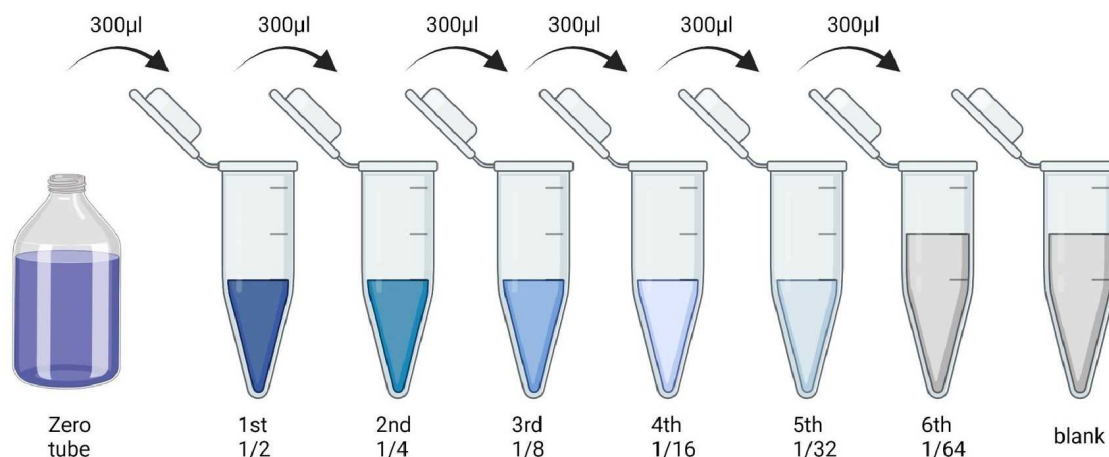
2.1. Centrifuge standards tube for 1 min at 10000 xg. Label it as Zero tube. **Note:** If the standard tube concentration higher than the range of the kit, please dilute it and labeled as zero tube.

2.2. Add 1 ml sample dilution buffer into the standard tube. Tighten the tube cap and Let it stand for 2 min at room temperature. Invert the tube several times to mix gently. (Or you can mix it using a low speed vortex mixer for 3-5 seconds.)

2.3. Centrifuge the tubes for 1min at 1000 xg, making the liquid towards the bottom of tube and removing possible bubbles.

2.4. Standard dilution: Label 7 EP tubes with 1/2, 1/4, 1/8, 1/16, 1/32, 1/64 and blank respectively. Add 0.3 ml of the sample dilution buffer into each tube. Add 0.3 ml solution from zero tube into 1/2 tube and mix them thoroughly. Transfer 0.3 ml from 1/2 tube into 1/4 tube and mix them thoroughly.

Transfer 0.3 ml from 1/4 tube into 1/8 tube and mix them thoroughly, so on till 1/64 tube. Now blank tube only contain 0.3 ml sample dilution buffer.



Notes: It is best to use Standard Solutions within 2 hours.

## 3. Preparation of Biotin-labeled Antibody Working Solution

The working solution should be prepared within 30 min before the assay and can't be stored for a long time.

3.1. Calculate required total volume of the working solution: 100 µl /well x quantity of wells. (It's better to prepare additional 100 µl - 200 µl.)

3.2. Centrifuge for 1min at 1000 xg in low speed and bring down the concentrated biotin-labeled antibody to the bottom of tube.

3.3. Dilute the biotinylated detection antibody with antibody dilution buffer at 1:99 and mix them thoroughly. (e.g. Add 10 µl concentrated biotin-labeled antibody into 990 µl antibody dilution buffer.)

## 4. Preparation of HRP-Streptavidin Conjugate (SABC) Working Solution

The working solution should be prepared within 30 min before the assay and can't be stored for a long time.

4.1. Calculate required total volume of the working solution: 100 µl/well x quantity of wells. (It's better to prepare additional 100 µl - 200 µl.)

4.2. Centrifuge for 1min at 1000 xg in low speed and bring down the concentrated SABC to the bottom of

tube.

4.3. Dilute the concentrated SABC with SABC dilution buffer at 1:99 and mix them thoroughly. (e.g. Add 10 µl concentrated SABC into 990 µl SABC dilution buffer.)

## Assay Procedure

When diluting samples and reagents, they must be mixed completely and evenly. Before adding TMB into wells, equilibrate TMB Substrate for 30 minutes at 37°C. It is recommended to plot a standard curve for each test.

1. Set standard, test samples (diluted at least 1/2 with Sample Dilution Buffer), control (blank) wells on the pre-coated plate respectively, and then, records their positions. It is recommended to measure each standard and sample in duplicate.!
2. Prepare Standards: Aliquot 100 µl of zero tube, 1st tube, 2nd tube, 3rd tube, 4th tube, 5th tube, 6th tube and Sample Dilution Buffer (blank) into the standard wells.
3. Add Samples: Add 100 µl of properly diluted sample into test sample wells.
4. Incubate: Seal the plate with a cover and incubate at 37°C for 90 minutes.
5. Wash: Remove the cover and discard the plate content, and wash plate 2 times with Wash Buffer. Do NOT let the wells dry completely at any time.
6. Biotin-labeled Antibody: Add 100 µl Biotin-labeled antibody working solution into above wells (standard, test sample and blank wells). Add the solution at the bottom of each well without touching the sidewall, cover the plate and incubate at 37°C for 60 minutes.
7. Wash: Remove the cover, and wash plate 3 times with Wash Buffer, and let the Wash Buffer stay in the wells for 1-2 minutes each time.
8. HRP-Streptavidin Conjugate (SABC): Add 100 µl of SABC Working Solution into each well, cover the plate and incubate at 37°C for 30 minutes.
9. Wash: Remove the cover and wash plate 5 times with Wash Buffer, and let the wash buffer stay in the wells for 1-2 minutes each time.
10. TMB Substrate: Add 90 µl TMB Substrate into each well, cover the plate and incubate at 37°C in dark within 10-20 minutes. (Before adding TMB into wells, equilibrate TMB Substrate for 30 minutes at 37°C.). (Note: The reaction time can be shortened or extended according to the actual color change, but not more than 30 minutes. You can terminate the reaction when apparent gradient appeared in standard wells.)
11. Stop: Add 50 µl Stop Solution into each well. The color will turn yellow immediately. The adding order of Stop Solution should be as the same as the TMB Substrate Solution.
12. OD Measurement: Read the O.D. absorbance at 450 nm in Microplate Reader immediately after adding the stop solution.

Regarding calculation, (the relative O.D.450) = (the O.D.450 of each well) – (the O.D.450 of blank well). The standard curve can be plotted as the relative O.D.450 of each standard solution (Y) vs. the respective concentration of the standard solution (X). The target concentration of the samples can be interpolated from the standard curve. It is recommended to use some professional software to do this calculation.

Note: If the samples measured were diluted, multiply the dilution factor to the concentrations from interpolation to obtain the concentration before dilution.

## Summary

Step 1: Set standard, test samples, control (blank) wells on the pre-coated plate respectively, and then, records their positions.

Step 2: Add 100 µl standard or sample to each well and incubate for 90 minutes at 37°C.

Wash step: Aspirate and wash plates 2 times.

Step 3: Add 100 µl Biotin-labeled antibody working solution to each well and incubate for 60 minutes at 37°C.

Wash step: Aspirate and wash plates 3 times.

Step 4: Add 100 µl SABC Working Solution into each well and incubate for 30 minutes at 37°C.

Wash step: Aspirate and wash plates 5 times.

Step 5: Add 90 µl TMB Substrate Solution. Incubate 10-20 minutes at 37°C.

Step 6: Add 50 µl Stop Solution. Read at 450 nm immediately and calculation.

## Calculation

1. Calculate the mean OD450 value (using the original OD450 value or the corrected OD450 value) of the duplicate readings for each standard, control, and sample. Then, obtain the value of calculation by subtracting the OD450 blank.
2. Create a four parameter logistic curve by plotting the mean absorbance for each standard on the y-axis against the concentration on the x-axis. (Remove the OD450 blank during plotting.) Alternatively, you can use the curve fitting software offered by the microplate reader.
3. Calculate the sample concentration by substituting OD450 value into the standard curve. Diluted samples should be multiplied by the relevant dilution ratio.

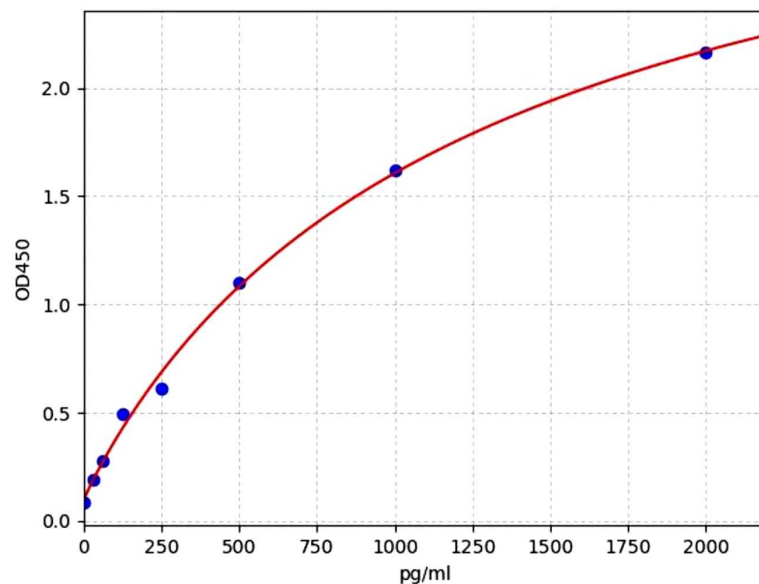
## Typical Standard Curve

This product has been tested by Quality Control Department and meets performance specifications mentioned in the manual. (The humidity in the laboratory is 20%-60%, and the temperature is 18°C - 25°C. TMB was balanced to 37°C before color development, and incubated at 37°C for 15 minutes in the dark after adding the enzyme label plate holes.)

The following assay data are provided for reference, since experimental environment and operation are different. The establishment of standard curve depends on your own assay.



STD.(pg/ml)	OD-1	OD-2	Average	Corrected
0	0.085	0.087	0.086	0
31.25	0.186	0.192	0.189	0.103
62.5	0.271	0.279	0.275	0.189
125	0.486	0.5	0.493	0.407
250	0.603	0.621	0.612	0.526
500	1.082	1.114	1.098	1.012
1000	1.599	1.645	1.622	1.536
2000	2.134	2.196	2.165	2.079



## Precision

Intra-assay Precision: samples with low, medium and high concentration are tested 20 times on same plate.

Inter-assay Precision: samples with low, medium and high concentration are tested 20 times on three different plates.

Item	Intra-assay Precision			Inter-assay Precision		
Sample	1	2	3	1	2	3
n	20	20	20	20	20	20
Mean (pg/ml)	59.34	243.3	985.5	59.82	251.8	972.4
Standard deviation	2.8	13.82	56.47	3.45	15.06	58.83
CV(%)	4.72	5.68	5.73	5.76	5.98	6.05

## Detection Range

31.25 - 2000 pg/ml

## Sensitivity

18.75 pg/ml

## Specificity

UniProt ID P08727

## Linearity

Dilute the sample with a certain amount of CYFRA21-1 at 1:2, 1:4 and 1:8 to get the recovery range.

Sample	1:2	1:4	1:8
Serum(n=5)	82-101%	83-100%	92-100%
EDTA Plasma(n=5)	87-100%	82-99%	85-97%
Heparin Plasma(n=5)	98-104%	81-99%	93-105%

## Recovery

Add a certain amount of CYFRA21-1 into the sample. Calculate the recovery by comparing the measured value with the expected amount of CYFRA21-1 in the sample.

Matrix	Recovery Range (%)	Average (%)
Serum(n=5)	86-99	98
EDTA Plasma(n=5)	89-105	95
Heparin Plasma(n=5)	85-101	93

## Precautions

1. To inspect the validity of experiment operation and the appropriateness of sample dilution proportion, pilot experiment using standards and a small number of samples is recommended.
2. After opening and before using, keep plate dry.
3. Before using the kit, spin tubes and bring down all components to the bottom of tubes.
4. Storage TMB reagents avoid light.
5. Washing process is very important, not fully wash easily cause a false positive and high background.

6. Duplicate well assay is recommended for both standard and sample testing.
7. Don't let microplate dry at the assay, for dry plate will inactivate active components on plate.
8. Don't reuse tips and tubes to avoid cross contamination.
9. Please do not mix the reagents in different kits of our company. Do not mix reagents from other manufacturers.
10. To ensure accurate results, proper adhesion of plate sealers during incubation steps is necessary.