# *P.pastoris* HCP ELISA Kit (One-step ELISA)

**Cat.No.: HYI114**

## Product Description

This kit is based on the solid-phase enzyme-linked immunosorbent assay (ELISA) with a double-antibody sandwich technique to detect residual host cell proteins (HCPs) from *P.pastoris* cells. A sheep polyclonal antibody specific to *P.pastoris* HCPs was employed in the assay to capture any remaining HCPs in the sample. The antibody coverage is assessed by the current mainstream method. Both the Calibration Standard (or test sample) and the HRP (Horseradish Peroxidase) labeled with anti-*P.pastoris* HCP antibody were simultaneously added to the microtiter plate coated with the affinity purified capture antibody, and followed by incubation and washing. Then TMB (3,3',5,5' -tetramethylbenzidine) substrate was added into reaction, HRP catalyzed the oxidation of TMB by $H_2O_2$ to produce a blue colored product (maximum absorption peak at 655 nm). Then the stop solution was added to terminate the enzymatic reaction, resulting in a yellow colored product (maximum absorption peak at 450 nm). The absorbance values at 450 nm wavelength was positively correlated with the HCPs concentration in the Calibration Standard and the samples. The concentration of HCPs in the samples can be calculated using a dose-response curve.

## Applications

This kit is intended for use in determining the presence of host cell protein (HCP) contamination in products manufactured with *Pichia pastoris* (*P.pastoris*) strains such as GS115 and X33 and so on.
The kit is for RESEARCH USE ONLY and is not intended for clinical use.

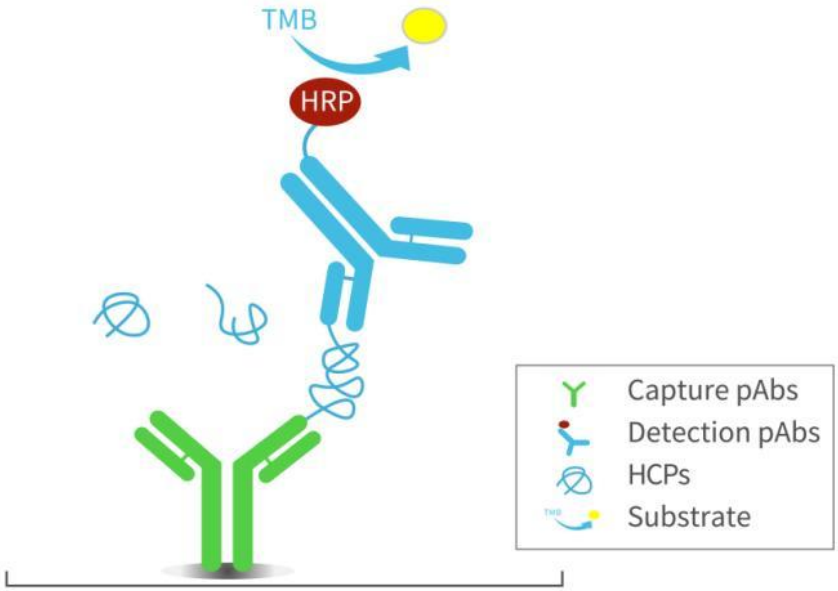



Figure 1. Schematic diagram

## Components

| Reagent | Quantity | Notes |
|---|---|---|
| *P.pastoris* HCP Calibration Standard | 2 bottles | Lyophilized powder. Dissolve it with the reconstitution solution (500 µL), and let it stand for about 5 minutes until transparent. Please refer to the details on the label of the tube. |
| Anti-*P.pastoris* HCP Microtiter Strips | 8 well ×12 strips | Strips pre-coated with sheep anti-*P.pastoris* HCP antibody in a vacuumed bag with desiccant. Seal and store immediately after use. |
| Reconstitution Solution | 1×1.5 mL | Only used to dissolve *P.pastoris* HCP Calibration Standard. |
| Diluent | 2×25 mL | For dilution of Calibration Standard, Anti-*P.pastoris*:HRP(100×) and samples. |
| Wash Buffer Concentrate (10×) | 2×25 mL | Dilute 10 times with freshly prepared ultra-pure water to obtain 1×Wash Buffer Solution. |
| Anti-*P.pastoris* :HRP (100×) | 1×120 µL | Affinity purified sheep antibody conjugated to HRP in a protein matrix with preservative. Dilute 100 times in Diluent before use. |
| TMB Substrate | 1×12 mL | Sealed and keep away from light. Equilibrate to room temperature (RT) for 20 minutes before use. |

| | | |
|---|---|---|
| Stop Solution | 1×6 mL | 1 M hydrochloric acid. Avoid direct contact with eyes, skin, and clothing. |
| Sealing Film | 3 pieces | Cover the strips with it during incubation to prevent contamination and liquid evaporation. |

*Note: Room temperature refers to 25±3℃.*

## Storage Conditions

Store the kit at 2-8℃. Use within the expiration date labeled upon the kit package. The opened components should be stored as follows.

Table 2. Recommended storage conditions for opened components

| Component | Stability |
|---|---|
| Anti-*P.pastoris* HCP microtiter strips | Store in the bag with desiccant at 2-8℃ for up to 60 days. |
| Reconstituted *P.pastoris* HCP Calibration Standard | For short term use, please store at 2-8℃ for up to 7 days. For long term storage, keep the component below -20℃ for up to 60 days. |

## Materials Required But Not Supplied in the Kit

- Sterile centrifuge tubes for dilution
- Absorbent paper for plate drying
- Pipette Tips
- Multi-channel reagent reservoirs (50 mL)

## Related equipment

- Microplate reader capable of measuring absorbance at 450 nm, with the correction wavelength set at 620 nm to 650 nm.
- Single or multi-channel pipettes
- Microplate thermoshaker
- Incubator (optional)
- Plate washer (optional)

## Instructions

# 1. Experiment preparation

### 1) Equilibration

- Before use, allow the kit to equilibrate at room temperature for 20 minutes; Return to 2-8℃ after use.
- Take the appropriate amount of strips to a strip holder according to the experiment design. Please store the remaining strips in the bag with desiccant at 2-8℃.

### 2) Preparation of Reagents

- *P.pastoris* HCP Calibration Standard Solution: Pipette 500 µL of Reconstitution Solution into the bottle containing *P.pastoris* HCP Calibration Standard. Gently invert to mix and let it stand for 5 minutes. Save the remaining solution under the recommended condition. *Note: If two or more vials of calibration standards are applie, combined all after reconstituted, and mix gently before use.*
- 1× Wash Buffer: Dilute the Wash Buffer Concentrate (10×) at 1:10 with ultra-pure water. For example, add 25mL Wash Buffer Concentrate (10×) to 225mL of ultra-pure water to make 250mL of 1×Wash buffer. Mix well before use. *Note: If the Wash Buffer Concentrate (10×) or Diluent is cloudy or contains precipitates, heat at 37℃ until it clears.*
- 1×Anti-*P.pastoris*:HRP: Prepare the 1×Anti-*P.pastoris*:HRP by diluting the Anti-*P.pastoris*:HRP(100×) with Diluent in a sterile centrifuge tube. Gently mix the solution and use it immediately

### 3) Preparation of Calibration Standard Solutions

- Prepare *P.pastoris* HCP Calibration Standard Solutions as shown in Fig 2 and Table 3.

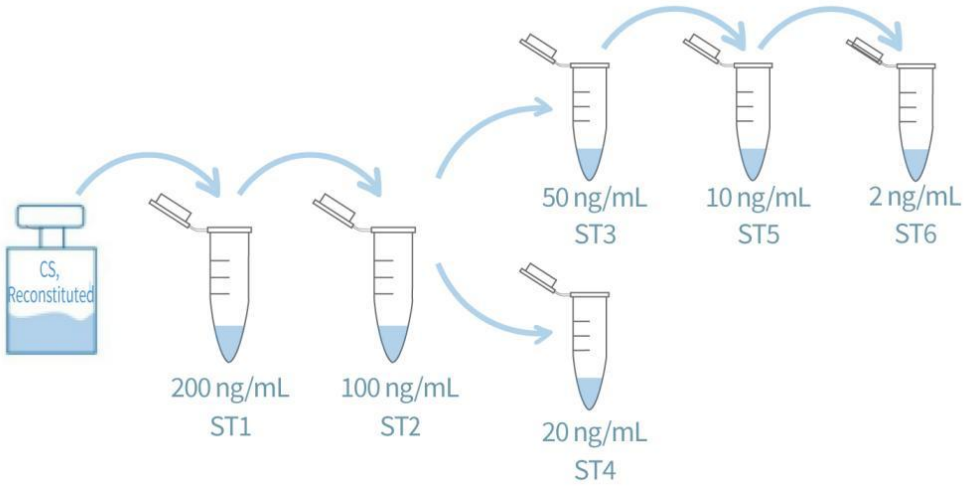



Figure 2.Graphic scheme of *P.pastoris* HCP Calibration Standard Solutions

Table 3. Preparation of *P.pastoris* HCP Calibration Standard Solutions

| Tubes | Dilution procedure | Conc. (ng/mL) |
|---|---|---|
| ST1 | Dilute the reconstituted *P.pastoris* HCP Calibration Standard to ST1 | 200 |
| ST2 | 500 µL ST1 + 500 µL Diluent | 100 |
| ST3 | 400 µL ST2 + 400 µL Diluent | 50 |
| ST4 | 100 µL ST2 + 400 µL Diluent | 20 |
| ST5 | 100 µL ST3 + 400 µL Diluent | 10 |
| ST6 | 100 µL ST5 + 400 µL Diluent | 2 |
| NCS | Diluent | 0 |

**4) Sample preparation**

- Test samples: In-process samples, harvested bulk, drug substance and drug product. Make sure samples are clear and transparent, and insoluble substances need to be removed by centrifugation or filtration.
- Conduct sample stability studies to prevent degradation or denaturation during the experiment. Long-term storage at -70°C is recommended to avoid degradation and avoid repeated freeze-thaw cycles.
- Dilute the samples with a suitable diluent to achieve a proper range of HCP concentration within the calibration curve. Typically, 10-folds or more are recommended.
- For the first use, a method validation is recommend to verify sample suitability before the subsequent routine test. This will help to set up appropriate sample dilution series.

*Note: Please contact us for support of validation protocol.*

## 2. Assay Experiment

**1) Sample Loading**

- Pipette 100 µL of 1×Anti-*P.pastoris*:HRP Solution into each designated well according to the experiment design.
- Pipette 100 µL of Calibration Standard, controls and samples into the corresponding wells as indicated earlier. Avoid foaming bubbles during pipetting. It is recommended to prepare 2-3 parallels for each concentration.
- Seal the plate and incubate on microplate thermoshaker at 500-600 rpm for 3 hours at room temperature.

Table 4. Example of 96-well plate layout

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | ST1 | ST1 | ST1 | | S1 | S1 | S1 | | | | | |
| B | ST2 | ST2 | ST2 | | S2 | S2 | S2 | | | | | |
| C | ST3 | ST3 | ST3 | | S3 | S3 | S3 | | | | | |
| D | ST4 | ST4 | ST4 | | S1+SRC | S1+SRC | S1+SRC | | | | | |
| E | ST5 | ST5 | ST5 | | S2+SRC | S2+SRC | S2+SRC | | | | | |
| F | ST6 | ST6 | ST6 | | S3+SRC | S3+SRC | S3+SRC | | | | | |
| G | | | | | | | | | | | | |
| H | NCS | NCS | NCS | | | | | | | | | |

- "ST1-ST6" means 6 concentration gradients, "NCS" means negative control, "S1-S3" means test samples, and "S1+SRC-S3+SRC" means the spiked test samples.
- The number of replicates and the inclusion of spiked samples can be determined based on the results of method validation.

**2) Substrate Incubation**

- Equilibrate the TMB substrate for 20 min at room temperature.
- Wash the plate with 1× Wash Buffer for about 300 µL each well. Repeat washing for 5 times. Wipe off any liquid from the bottom outside of the plate. Do not allow the wells to dry before adding the substrate
- Add 100 µL of TMB Substrate into wells, and incubate at room temperature for 10 minutes.

*Note : Do not use sealing film for this step.*

**3) Termination**

- Add 50 µL of Stop Solution into each well.

*Note: The adding sequence should be the same as the adding sequence of the TMB solution. Suspend the tips while adding samples to prevent contact with the solution in the wells and minimize the risk of bubble formation.*

**4) Reading**

- Read absorbance at 450/620-650nm

## 3. Calculation and Analysis

- The OD value of each well should be calculated by the difference between $OD_{450\ nm}$ and their respective long wavelength. If the microplate reader is not equipped with long wavelength measurement, this step can be omitted.

- Subtract the OD value of the NCS from each calibration point and samples, and record the mean of the replicate wells.
- Perform a 4-parameter logistic regression model using the Calibration Standard concentration values and OD values to obtain the calibration curve equation. Substitute the average OD value of the sample into the equation to calculate the sample concentration, which should be multiplied by the dilution factor to obtain the actual sample concentration.
- The software for data analysis of the standard curve could be the one that comes with the microplate reader. If not, we recommend to use professional standard curve software such as Curve Expert, ELISA Calc, and so on.

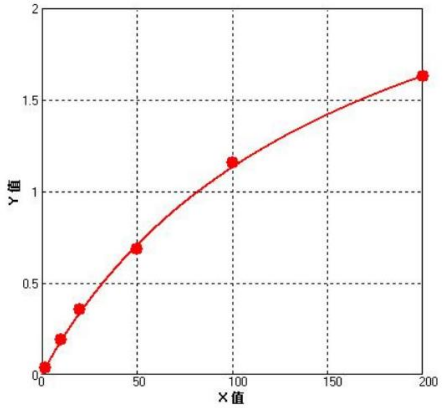
## Limitations

- This product is intended for research use only but not for clinical applications.
- The samples pH should be between 6.5 and 8.5. Beyond this range may cause abnormal results.
- Components in sample buffer or formulation should not be produced by *P.pastoris*. Otherwise, abnormal results may occur due to contamination.
- Protein enzymes in sample should be inactivated by appropriate methods. Otherwise, abnormal results may occur due to enzymatic digestion.

## Assay Performance

- Linearity & Range: 2-200 ng/mL,4-PL, $R^2$>0.990.
- LLOQ: 2 ng/mL.
- Specificity: No cross-reactivity with *E.coli*, CHO and Sf9 cells, cross-reactivity less than 1% with *Saccharomyces cerevisiae* and *Hansenula polymorpha.*
- Typical calibration curve and results:

| Calibration Standards(ng/mL) | Abs. at 450nm-620nm | | | AVG |
|---|---|---|---|---|
| 200 | 1.748 | 1.681 | 1.684 | 1.704 |
| 100 | 1.244 | 1.225 | 1.229 | 1.233 |
| 50 | 0.763 | 0.768 | 0.753 | 0.761 |
| 20 | 0.434 | 0.444 | 0.423 | 0.434 |
| 10 | 0.271 | 0.270 | 0.270 | 0.270 |
| 2 | 0.117 | 0.111 | 0.115 | 0.114 |
| 0 | 0.079 | 0.078 | 0.076 | 0.078 |



## Additional Information

1. This kit is intended for use by qualified technicians only.
2. Consumables, for example sterile disposable tips, tubes and reservoirs are only allowed for single use. It is recommended to wipe with 75% ethanol before and after each use. Follow the specified pipetting procedure carefully.
3. Users should validate the assay before testing their samples.
4. Dilution should be gentle and thorough to avoid excessive foaming.
5. Stop Solution is 1M HCl. Avoid direct contact with eyes, skin, and clothing.
6. Do not mix the kit reagents from different lot numbers.
7. Use fresh sterile water or ultra-pure water, and ensure the water temperature does not exceed 37℃.
8. Seal or cover the microplate immediately after sample loading to avoid liquid evaporation.
9. Avoid drying the wells before substrate incubation.
10. Store unused microtiter strips in a sealed bag with desiccant to prevent contamination.
11. Centrifuge Anti-*P.pastoris* :HRP(100×) before use to avoid any loss of the reagent.
12. To avoid pipetting errors, pipette or sampling accurately for dilution of standards and samples, for example, a minimum volume of 5 μL is recommended.
13. *P.pastoris* HCP Calibration Standard solutions and anti-*P.pastoris* HCP Antibody solution are recommended for single use due to instability issue. Prepare freshly before each experiment.
14. TMB Substrate should be colorless. If not, discard it and contact us for assistance.
15. Pipette carefully to avoid any bubbles, and gently shake the plate for thorough mixing. Bubbles can influence optical density values and detection results.
16. For more stable results, reading should be completed within 10 minutes after terminati on, but no more than 30 minutes.
17. Avoid the samples containing sodium azide (NaN3), which will deactivate the HRP and lead to the underestimation of HCP levels.

## Troubleshooting

| Problem | Possible Cause | Solution |
|---|---|---|
| High background signal (OD) | Cross-contamination of reagents, including distilled water | Freshly prepared prior to experiment. |
| | Cross-contamination of equipments, including pipettes and centrifuge | Clean the equipment with 75% ethanol before experiment. |
| | Environment contamination | Separate the working bench to avoid contamination. |
| | Insufficient washing | Increase the wash buffer volume or wash more times, and remove any remaining liquid before proceeding to the next step. |
| Abnormal values | Improper washing | Swiftly and completely shake off any excess liquid, and avoid reusing paper towels to minimize contamination. |
| | Improper sampling | Add the samples to the bottom of the wells using micropipettes, and avoid splashing to the neighboring wells. |
| | Plate sealing | Promptly cover the plate with the sealing film and remove it carefully to prevent splashing. |

*If any other difficulties, please contact usfor technical support.*

## References


1. ICH. M10. Bioanalytical Method Validation And Study Sample Analysis
2. FDA. Bioanalytical Method Validation
3. ChP<9012>Guidance of Quantitative Method Validation for Biological Samples
4. USP<1103> Immunological Test Methods — Enzyme-Linked Immunosorbent Assay(Elisa)
5. JP<G3-11-171> Enzyme-linked Immunosorbent Assay (ELISA)
6. ChP<3429>Immunochemical Method
7. USP<1132> Residual Host Cell Protein Measurement in Biopharmaceutical
8. EP<2.6.34>HOST-CELL PROTEIN ASSAYS
9. JP<G3-9-172> Host Cell Protein Assay