Sf9 HCP ELISA Kit

(One-step ELISA)

User Guide

PLEASE READ THE DOCUMENT CAREFULLY BEFORE EXPERIMENT

Product No.: 1301312
Version: A/2
For Research Use Only. Not for diagnostic or therapeutic use.

Huzhou Shenke Biotechnology Co., Ltd.

■ Product Name

Sf9 HCP ELISA Kit (One-step ELISA)

■ Package

96 tests/Kit

■ Intended Use

This kit is intended for use in determining the presence of host cell protein (HCP) contamination in products manufactured with insect Sf9 cells, such as recombinant proteins, vaccines, and recombinant AAV vectors based on baculovirus expression vector systems (BEVS).

The kit is for Research Use Only and is not for use in diagnostic procedures or for therapeutic purposes in humans or animals.

■ 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 Sf9 cells. A sheep polyclonal antibody specific to Sf9 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-Sf9 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.

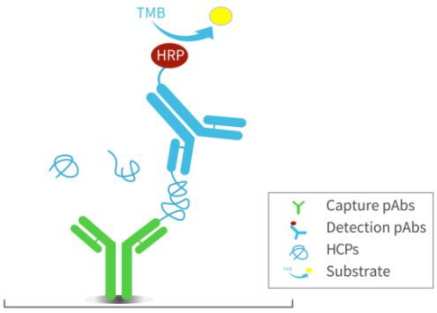


Figure 1. Schematic diagram

■ Kit Contents

Table 1. Kit Components

Reagent	Part No.	Quantity	Note
Sf9 HCP Calibration Standard	PNB011	3 bottles	Lyophilized powder. Dissolve it with 500 μL Reconstitution Solution (PNC002), and let it stand for about 5 minutes until transparent. Please refer to the bottle label for details.
Anti-Sf9 HCP Microtiter Strips	PNA012	8 well ×12 strips	Strips pre-coated with sheep (*Ovis aries*) anti-Sf9 HCP antibody in a vacuum- sealed bag with desiccant. Seal and store immediately after use.
Reconstitution Solution	PNC002	2 × 1.5 mL	Only used for dissolving Sf9 HCP Calibration Standard (PNB011).
Diluent	PNE004	2 × 25 mL	For dilution of Calibration Standard, Anti-Sf9: HRP(100×) (PNN006) and samples.
Wash Buffer Concentrate (10×)	PNF001	2 × 25 mL	Dilute 10 times with freshly prepared ultra-pure water to obtain 1×Wash Buffer.
Anti-Sf9: HRP (100×)	PNN006	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	PND004	1 × 12 mL	Equilibrate to room temperature for 20 minutes before use. Keep sealed and protected from light.
Stop Solution	PNI002	1 × 6 mL	Avoid direct contact with eyes, skin, and clothing.
Sealing Film	PNK001	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℃. Please check the expiration date on the labels. The opened components should be stored as shown in Table 2.

Table 2. Recommended storage conditions for opened components

Component	Stability
Anti-Sf9 HCP Microtiter Strips	Store in the bag with desiccant at 2-8℃ for up to 30 days.
Reconstituted Sf9 HCP Calibration Standard	For long term storage, aliquot and keep the component below -20℃. Avoid frequent freezing-and-thawing, no more than 3 cycles.

■ Materials Required (Not Provided in the Kit)

- Sterile microcentrifuge tubes for dilution
- Absorbent paper for plate drying
- Pipette Tips: 1000 μL, 100 μL, and 10 μL
- Multi-channel reagent reservoirs (50 mL)

■ 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 micropipettes: 1000 μL, 100 μL, and 10 μL
- Microplate thermoshaker
- Incubator (optional)
- Plate washer (optional)

■ Workflow

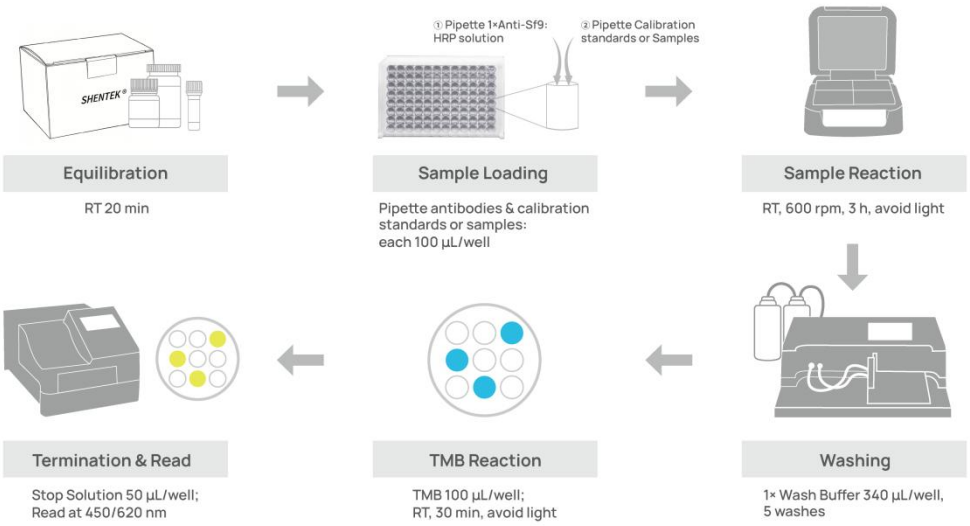


Figure 2. Procedure Flowchart

1. Preparation

(1) Equilibration

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

(2) Preparation of Reagents

- Sf9 HCP Calibration Standard solution: Pipette 500 µL of Reconstitution Solution (PNC002) into the bottle containing Sf9 HCP Calibration Standard (PNB011). Gently invert 3-5 times to mix well 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 applied, combined all after reconstituted, and mix gently before use. Do not use any other volumes of Reconstitution Solution (PNC002) to dissolve the Calibration Standard.*
- 1×Wash Buffer: Dilute 1 volume of Wash Buffer Concentrate (10×) (PNF001) with 9 volumes of ultra-pure water. For example, add 25 mL Wash Buffer

Concentrate (10×) (PNF001) to 225 mL of ultra-pure water to prepare 250 mL of 1×Wash Buffer. Prepare fresh and mix well before use.

Note: *If the Wash Buffer Concentrate (10×) (PNF001) or Diluent (PNE004) is cloudy or contains precipitates, heat at 37℃ until it clears.*

- 1×Anti-Sf9: HRP: Prepare the 1×Anti-Sf9: HRP by diluting the Anti-Sf9: HRP (100×) (PNN006) with Diluent (PNE004) in a sterile centrifuge tube. Prepare fresh 1×Anti-Sf9: HRP, mix gently and use immediately.

(3) Preparation of Calibration Standard solutions

- Prepare Sf9 HCP Calibration Standard solutions as shown in Figure 3 and Table 3.

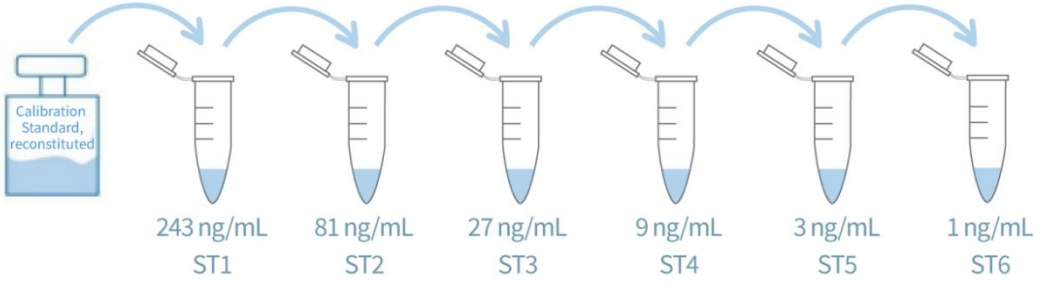


Figure 3.Graphic scheme of Sf9 HCP Calibration Standard solutions

Table 3. Preparation of Sf9 HCP Calibration Standard solutions

Tubes	Dilution Procedure	Conc. (ng/mL)
ST1	Dilute reconstituted Sf9 HCP Calibration Standard to ST1 with Diluent	243
ST2	300 µL ST1 + 600 µL Diluent	81
ST3	300 µL ST2 + 600 µL Diluent	27
ST4	300 µL ST3 + 600 µL Diluent	9
ST5	300 µL ST4 + 600 µL Diluent	3
ST6	300 µL ST5 + 600 µL Diluent	1*
NCS	Diluent	0

*Anchor point

- Calculate the volume of Diluent (PNE004) to prepare the ST1:

$$\frac{(\text{A µg} \times 1000\ \text{ng/µg}) \times \text{C µL}}{\text{B (500 µL)} \times (\text{D ng/mL}/\ 1000\ \text{µL/mL})} - \text{C µL} = \text{Diluent volume (X)}$$

- A = Content of Calibration Standard (µg)
- B = Volume of Reconstitution Solution (PNC002, 500 µL)
- C = Volume of reconstituted calibration standard solution for ST1 preparation (e.g. 243 µL)

- D = Concentration of ST1 calibration standard solution (243 ng/mL)

For example, the label indicates that each bottle of Sf9 HCP Calibration Standard (PNB011) contains 0.72 μg (A). Add (B) volume (500 μL) of Reconstitution Solution (PNC002) into the bottle for reconstitution. Then take (C) volume (recommended 243 μL) of the reconstituted solution and add 1197 μL (X) of Diluent (PNE004) to prepare a ST1 calibration standard solution with a concentration of 243 ng/mL (D).

$$\frac{(0.72\ \mu g \times 1000\ ng/\mu g) \times 243\ \mu L}{500\ \mu L \times (243\ ng/mL\ /\ 1000\ \mu L/mL)} - 243\ \mu L = 1197\ \mu L$$

(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. Avoid repeated freeze-thaw cycles. For long-term storage, -70°C is recommended to avoid degradation.
- Dilute the samples with a suitable diluent to achieve a proper range of HCP concentration within the calibration curve.
- For the first use, a method validation is recommended 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-Sf9: HRP Solution into each designated well according to the experimental design.
- Pipette 100 μL of each Calibration Standard, control, and sample into the corresponding wells. Avoid generating bubbles. Prepare 2-3 replicates per sample.
- Seal the plate and incubate on microplate thermoshaker at 600 rpm for 3 hours at room temperature and protect from light.

Table 4. Example of 96-well plate layout

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

- ✧ "ST1-ST6" indicate 6 concentration gradients, "NCS" as negative control, "S1-S3" as test samples, and "S1+SRC-S3+SRC" as spiked recovery controls for each sample.
- ✧ The number of replicates and the spiked samples can be determined by conducting a method validation study.

(2) Substrate Incubation

- Equilibrate the TMB Substrate (PND004) for 20 min at room temperature.
- Wash the plate with 340 μL of 1×Wash Buffer per well. Wipe off any liquid from the bottom outside of the plate. Repeat washing for 5 times. Do not allow the wells to be completely dried before adding the substrate.
- Add 100 μL of TMB Substrate (PND004) into the wells, and incubate at room temperature for 30 minutes, and protect from light.

Note: *Do not use Sealing Film (PNK001) during this step.*

(3) Termination and Plate Reading

- Add 50 μL of Stop Solution (PNI002) into each well and read absorbance at 450 nm/620-650 nm immediately.

Note*: The adding sequence should be the same as the order of adding the TMB Substrate (PND004). While adding samples, suspend the tips above the liquid to prevent contact with the solution in the wells and minimize the risk of bubble formation.*

3. Calculation and Analysis

- The OD value of each well should be calculated by the difference between OD_{450nm} 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.
- Standard curve analysis can be performed using the software provided with the microplate reader. Alternatively, professional curve fitting software such as CurveExpert or ELISA Calc is recommended.

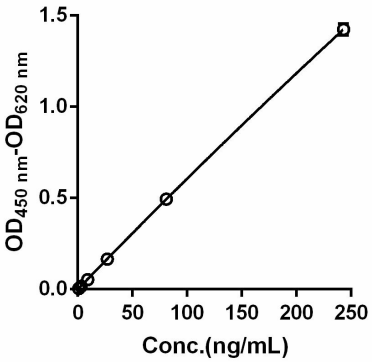
■ Limitations

- The sample pH should be between 6.5 and 8.5. Beyond this range may cause abnormal results.

■ Assay Performance

- Linearity & Range: 3-243 ng/mL, 4-PL, $R^2 \geq 0.990$
- QL: 3 ng/mL
- Specificity: No cross-reactivity was observed with HCPs from MDCK cells, Vero cells, HEK293T cells, CHO cells, *E. coli* and *P. pastoris* .
- Typical calibration curve results for reference:

Calibration Standards(ng/mL)	Abs. at 450nm-620nm	AVG
0	0.066	0.067
	0.069	
	0.067	
1	0.073	0.072
	0.071	
	0.071	
3	0.085	0.083
	0.082	
	0.083	
9	0.121	0.120
	0.120	
	0.119	
27	0.232	0.232
	0.235	
	0.230	
81	0.566	0.562
	0.553	
	0.566	
243	1.489	1.492
	1.525	
	1.460	



4-PL：$Y = \frac{A-D}{1+(\frac{X}{C})^B} + D$

A=16.35315

B=-1.01552

C=2453.39039

D=-0.00148

R^2=1.00000

■ Additional Information

- ✧ This kit is intended for use by qualified technicians only.
- ✧ 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.
- ✧ Users should validate the assay before testing their samples.
- ✧ Dilution should be gentle and thorough to avoid excessive foaming.
- ✧ Stop Solution is 1M HCl. Avoid direct contact with eyes, skin, and clothing.
- ✧ Do not mix the kit reagents with different lot numbers.
- ✧ Use fresh sterile water or ultra-pure water, and ensure the water temperature does not exceed 37℃.
- ✧ Seal or cover the microplate immediately after sample loading to avoid liquid evaporation.
- ✧ Avoid drying the wells before substrate incubation.
- ✧ Store unused microtiter strips in a sealed bag with desiccant to prevent contamination.
- ✧ Centrifuge Anti-Sf9: HRP(100×) (PNN006) before use to avoid any loss of the reagent.
- ✧ To avoid pipetting errors, pipette or sampling accurately for dilution of standards and samples, for example, a minimum volume of 5 μL is recommended.
- ✧ Sf9 HCP Calibration Standard solutions and anti-Sf9 HCP Antibody solution are recommended for single use due to instability issue. Prepare freshly before each experiment.
- ✧ TMB Substrate (PND004) should be colorless. If not, discard it and contact us for assistance.
- ✧ Pipette carefully to avoid any bubbles, and gently shake the plate for thorough mixing. Bubbles can influence optical density values and detection results.
- ✧ Avoid samples containing sodium azide (NaN_3), 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 equipment, including micropipettes and centrifuge	Clean the equipment with 75% ethanol before experiment.
	Environmental contamination	Separate the working bench to avoid contamination
	Insufficient washing	Increase the wash buffer volume or wash 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 (PNK001) and remove it carefully to prevent splashing.

If you have any other questions, please contact us for technical support.

■ References

- USP<1103> Immunological Test Methods Enzyme-Linked Immunosorbent Assay (Elisa)
- USP<1132> Residual Host Cell Protein Measurement in Biopharmaceutical
- Ph.Eur. <2.6.34> Host-Cell Protein Assays
- ChP<9101> Guidance for Analytical Procedures Validation
- JP <G3-9-172> Host Cell Protein Assay

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Support & Contact

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