# NEK9 (Human) Cell-Based ELISA Kit

Catalog Number KA5639

96 assays

Version: 01

Intended for research use only

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# Table of Contents

**Introduction ..... 3**

Intended Use ..... 3

Principle of the Assay ..... 3

**General Information ..... 6**

Materials Supplied ..... 6

Storage Instruction ..... 6

Materials Required but Not Supplied ..... 6

Precautions for Use ..... 7

**Assay Procedure ..... 8**

Reagent Preparation ..... 8

Sample Preparation ..... 9

Assay Procedure ..... 10

**Data Analysis ..... 12**

Calculation of Results ..... 12

**Resources ..... 13**

Troubleshooting ..... 13

Plate Layout ..... 14

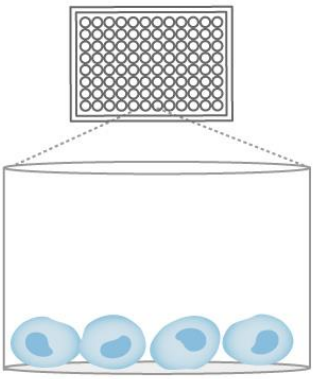
## Introduction

### Intended Use

The NEK9 (Human) Cell-Based ELISA Kit is a convenient, lysate-free, high throughput and sensitive assay kit that can monitor NEK9 protein expression profile in cells. The kit can be used for measuring the relative amounts of NEK9 in cultured cells as well as screening for the effects that various treatments, inhibitors (ie. siRNA or chemicals), or activators have on NEK9.

### Principle of the Assay

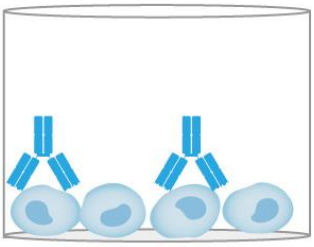
The Colorimetric Cell-Based ELISA Kit allows for the detection of various target proteins and the effects that certain stimulation conditions have on target protein expression in different cell lines. Qualitative determination of target protein concentration is achieved by an indirect ELISA format. In essence, the target protein is captured by target-specific primary (1°) antibodies while the HRP-conjugated secondary (2°) antibodies bind the Fc region of the 1° antibody. Through this binding, the HRP enzyme conjugated to the 2° antibody can catalyze a colorimetric reaction upon substrate addition. Due to the qualitative nature of the Cell-Based ELISA, multiple normalization methods are described: 1) a monoclonal antibody specific for human GAPDH is included to serve as an internal positive control in normalizing the target absorbance values. 2) Following the colorimetric measurement of HRP activity via substrate addition, the crystal violet whole-cell staining method is used to determine cell density. After staining, the results can be analyzed by normalizing the absorbance values to cell amounts, by which the plating difference can be adjusted. 3) If a phosphorylated target is being detected, an antibody against the non- phosphorylated counterpart will be provided for normalization purposes. The absorbance values obtained for the non-phosphorylated target can be used to normalize the absorbance values for the phosphorylated target.



α-Target

Primary Antibody

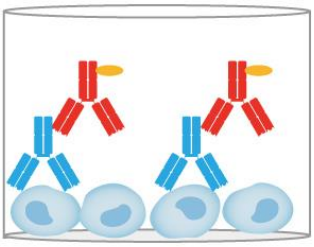
Cells are seeded onto the bottom of each well. The cells are quenched, fixed and the well is blocked.



α-Primary IgG

Secondary Antibody

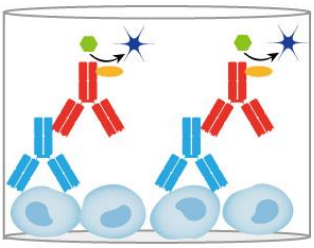
Primary antibodies specific for the target antigen are added and allowed to bind to their respective epitopes.



HRP Conjugate

Unreacted TMB

HRP-conjugated secondary antibodies specific for the primary antibody are added and allowed to bind to their respective epitopes.



Blue TMB

Diimine Product

TMB substrate is converted to the blue TMB diimine via the HRP enzyme. Upon addition of acid, the reaction terminates and the wells can be read at 450 nm.

- Antibody Specificity

Anti-NEK9 Antibody

The Anti-NEK9 Antibody is a rabbit polyclonal antibody. It was tested on Western Blots for specificity. The data in Figure 1 shows that a single protein band was detected. This protein band can be blocked by the synthesized immunogen peptide.

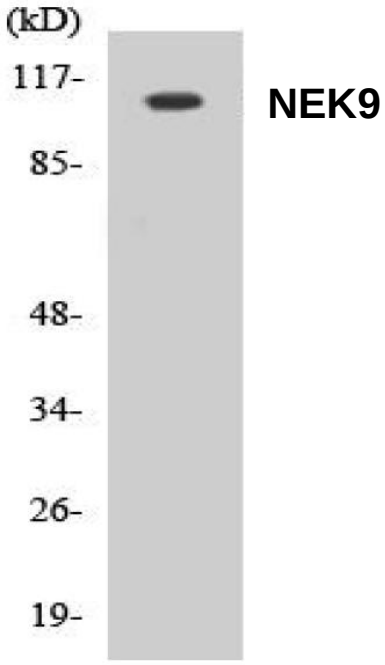



Figure 1. Western blot analysis of extracts from A549 cells, using Anti-NEK9 Antibody.

Anti-GAPDH Antibody

The Anti-GAPDH Antibody is a mouse monoclonal antibody. It was tested on Western Blots with the tissue lysates from human, mouse, and rat for specificity. The data in Figure 2 shows that a single protein band was detected from all three lysates.

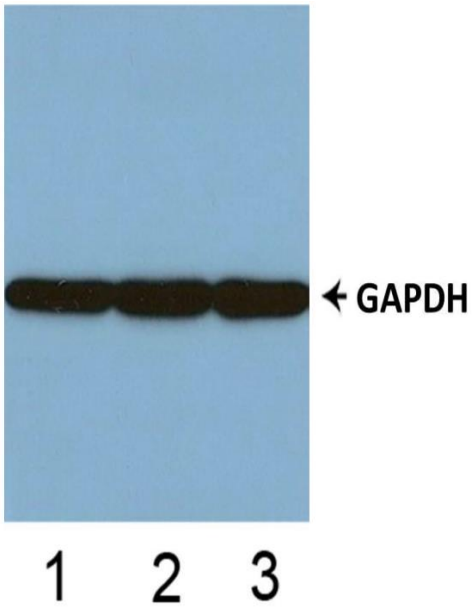



Figure 2. Western blot analysis of tissue lysates from human (1), mouse (2) and rat (3)

## General Information

### Materials Supplied

List of component

| Component | Amount |
|---|---|
| 96-Well Cell Culture Clear-Bottom Microplate | 1 Plate |
| 10x TBS | 24 mL |
| Quenching Buffer | 24 mL |
| Blocking Buffer | 50 mL |
| 15x Wash Buffer | 50 mL |
| 100x Anti-NEK9 Antibody (Rabbit Polyclonal) | 60 µL |
| 100x Anti-GAPDH Antibody (Mouse Monoclonal) | 60 µL |
| HRP-Conjugated Anti-Rabbit IgG Antibody | 6 mL |
| HRP-Conjugated Anti-Mouse IgG Antibody | 6 mL |
| Primary Antibody Diluent | 12 mL |
| Ready-to-Use Substrate | 12 mL |
| Stop Solution | 12 mL |
| Crystal Violet Solution | 6 mL |
| SDS Solution | 24 mL |
| Adhesive Plate Seals | 2 Seals |

### Storage Instruction

Upon receipt, the kit should be stored at 4°C. The un-opened kit will be stable for up to 6 months from the date of shipment if stored at 4°C. Diluted Anti-NEK9 Antibody and diluted Anti-GAPDH Antibody can each be stored at 4°C for up to two weeks. HRP-Conjugated Anti-Rabbit IgG Antibody and HRP-Conjugate Anti-Mouse IgG Antibody will be stable at 4°C for up to six months. The SDS Solution should be stored at room temperature or warmed up to room temperature if stored at 4°C

### Materials Required but Not Supplied

The following materials and equipment are NOT provided in this kit but are necessary to successfully conduct the experiment:

- ✓ Microplate reader able to measure absorbance at 450 nm and/or 595 nm for Crystal Violet Cell Staining (Optional).
- ✓ Micropipettes with capability of measuring volumes ranging from 1 µL to 1 mL.
- ✓ 37% formaldehyde (Sigma Cat# F-8775) or formaldehyde from other sources.
- ✓ Deionized or sterile water.

- ✓ Squirt bottle, manifold dispenser, multichannel pipette reservoir or automated microplate washer.
- ✓ Graph paper or computer software capable of generating or displaying logarithmic functions.
- ✓ Absorbent papers or vacuum aspirator.
- ✓ Test tubes or microfuge tubes capable of storing ≥1 mL.
- ✓ Orbital shaker.
- ✓ Poly-L-Lysine (Sigma Cat# P4832 for suspension cells).

**Precautions for Use**

- Assay Restrictions

- ✓ This ELISA kit is intended for research purposes only, NOT diagnostic or clinical procedures of any kind.
- ✓ Materials included in this kit should NOT be used past the expiration date on the kit label.
- ✓ Reagents or substrates included in this kit should NOT be mixed or substituted with reagents or substrates from any other kits.
- ✓ Variations in pipetting technique, washing technique, operator laboratory technique, kit age, incubation time or temperature may cause differences in binding affinity of the materials provided.
- ✓ The assay is designed to eliminate interference and background by other cellular macromolecules or factors present within any biological samples. However, the possibility of background noise cannot be fully excluded until all factors have been tested using the assay kit.

- Health and Safety Precautions

- ✓ Reagents provided in this kit may be harmful if ingested, inhaled or absorbed through the skin.
- ✓ Fixing Solution contains formaldehyde. Formaldehyde is known to be a highly toxic reagent. Personal protection is strongly recommended while working with this chemical.
- ✓ Stop Solution contains 2 N Sulfuric Acid ($H_2SO_4$) and is an extremely corrosive agent. Please wear proper eye, hand and face protection when handling this material. When the experiment is finished, be sure to rinse the plate with copious amounts of running water to dilute the Stop Solution prior to disposing the plate or strips.
- ✓ Crystal Violet is an intense stain reagent. Avoid contact stain and clothing.

## Assay Procedure

### Reagent Preparation

*Note: Please remember to allow all solutions to warm up to room temperature prior to use.*

- 1x TBS

  1x TBS is used to wash cells seeded on the plate. 1x TBS can be prepared by adding 1 volume of 10x TBS provided in the kit to 9 volumes of $ddH_2O$.
- Fixing Solution

  This solution is NOT provided. Fixing Solution is used to fix cells after cell culture. It is prepared by adding formaldehyde to 1x PBS (not included) with light mixing. The 4% formaldehyde is used for adherent cells and 8% formaldehyde is used for suspension cells and loosely attached cells. 37% formaldehyde can be purchased from Sigma Cat# F-8775.
- Quenching Buffer

  This solution is provided as ready-to-use. Quenching Buffer is used to inactivate the endogenous peroxidase activity of the seeded cells.
- Blocking Buffer

  This solution is provided as ready-to-use. Blocking Buffer is used to block additional binding sites in each well.
- 1x Wash Buffer

  This buffer is provided as a 15x solution. 1x Wash Buffer can be prepared by adding 1 volume of 15x Wash Buffer provided in the kit to 14 volumes of $ddH_2O$.
- 100x Anti-NEK9 Antibody

  This antibody is a rabbit polyclonal antibody. This antibody was tested to be specific for the NEK9 protein. The supplied antibody is a 100x solution. Make 1:100 dilutions in Primary Antibody Diluent prior to use. The diluted primary antibody can be stored at 4°C for up to two weeks.
- 100x Anti-GAPDH Antibody

  This antibody is a mouse monoclonal antibody. This antibody was tested to be specific for GAPDH. The supplied antibody is a 100x solution. Make 1:100 dilutions in Primary Antibody Diluent prior to use. The diluted primary antibody can be stored at 4°C for up to two weeks.
- HRP-Conjugated Anti-Rabbit IgG Antibody

  This solution is provided as ready-to-use. HRP-Conjugated Anti-Rabbit IgG Antibody is used as the secondary antibody to detect the target-bound, primary rabbit antibodies.
- HRP-Conjugated Anti-Mouse IgG Antibody

  This solution is provided as ready-to-use. HRP-Conjugated Anti-Mouse IgG Antibody is used as the secondary antibody to detect the target-bound, primary mouse antibodies.
- Primary Antibody Diluent

  This solution is provided as ready-to-use. Use this solution to dilute the provided antibodies.

- Ready-to-Use Substrate

  This solution is provided as ready-to-use. Ready-to-Use Substrate must be warmed to room temperature before use. Keep away from light as this solution is light-sensitive.
- Stop Solution

  This solution is provided as ready-to-use. Stop Solution must be handled with caution as it contains 2 N Sulfuric Acid ($H_2SO_4$) and is corrosive. Wear eye protection and gloves when handling.
- Crystal Violet Solution

  This solution is provided as ready-to-use. Crystal Violet is an intense stain used to stain cell nuclei. Avoid contact with skin and clothing.
- SDS Solution

  This solution is provided as ready-to-use. SDS is used to solubilize the crystal violet in preparation for cell staining. Store this solution at room temperature or warm up to room temperature if stored at 4°C.
- Adhesive Plate Sealers

  Provided for long term storage of plate if necessary.

**Sample Preparation**

- Cell Line

  The cell line must express the target protein. This protocol can be used directly for adherent cells. For suspension cells and loosely attached cells, two steps are required: 1) Coat the plates with 100 µL of 10 µg/mL Poly-L-Lysine (Sigma Cat# P4832, not included) to each well of the 96-well plate for 30 minutes at 37°C before proceeding to Step 1 of Assay Procedure. Use 8% formaldehyde to fix the cells on Step 5 of Assay Procedure.
- Cell Number and Sensitivity

  The number of cells plated onto the 96-well plates depends on the expression level of NEK9 protein in the cells, cell size, treatment conditions and incubation time. The cells used for testing should be around 75-90% confluent. Typically for HeLa cells, seed 30,000 cells per well overnight for treatment the following day. The NEK9 (Human) Cell-Based ELISA Kit can detect NEK9 expression in as little as 5,000 HeLa cells.
- Cell Treatment

  The cells can be treated with inhibitors, activators, stimulators (ie. chemicals, proteins/peptides) or a combination of the substances listed above. The cells can be treated with UV and serum starvation to meet the needs of the end-user.
- Positive and Negative Controls

  Mouse Anti-GAPDH Antibody (included) should be used to detect the internal positive controls for normalization of OD values of the target protein. The negative controls are HRP-Conjugated Anti-Rabbit IgG Antibody and HRP-Conjugated Anti-Mouse IgG Antibody alone in different wells (without the primary antibodies). Both positive and negative controls should be performed in the same plate with the NEK9 target experiments.

- Accuracy and Precision
  Each condition should be performed in duplicate or in triplicate.

**Assay Procedure**

*Note: Please read the whole manual before performing the experiment.*

1. Seed 200 µL of 20,000 adherent cells in culture medium in each well of a 96-well plate. The plates included in the kit are sterile and treated for cell culture. For suspension cells and loosely attached cells, coat the plates with 100 µL of 10 µg/mL Poly-L-Lysine (not included) to each well of a 96-well plate for 30 minutes at 37°C prior to adding cells.
2. Incubate the cells for overnight at 37°C, 5% $CO_2$.
3. Treat the cells as desired.
4. Remove the cell culture medium and rinse with 200 µL of 1x TBS, twice.
5. Fix the cells by incubating with 100 µL of Fixing Solution for 20 minutes at room temperature. The 4% formaldehyde is used for adherent cells and 8% formaldehyde is used for suspension cells and loosely attached cells. During the incubation, the plates should be sealed with Parafilm. *Note: Fixing Solution is volatile. Wear appropriate personal protection equipment (mask, gloves and glasses) when using this chemical.*
6. Remove the Fixing Solution and wash the plate 3 times with 200 µL 1x Wash Buffer for five minutes each time with gentle shaking on the orbital shaker. The plate can be stored at 4°C for a week. *Note: For all wash steps, tap the plate gently on absorbent papers to remove the solution completely.*
7. Add 100 µL Quenching Buffer and incubate for 20 minutes at room temperature.
8. Wash the plate 3 times with 1x Wash Buffer for 5 minutes at a time, with gentle shaking on the shaker.
9. Add 200 µL of Blocking Buffer and incubate for 1 hour at room temperature.
10. Wash 3 times with 200 µL of 1x Wash Buffer for 5 minutes at a time, with gentle shaking on the shaker.
11. Add 50 µL of 1x primary antibodies (Anti-NEK9 Antibody and/or Anti-GAPDH Antibody) to the corresponding wells, cover with parafilm and incubate for 16 hours (overnight) at 4°C. If the target expression is known to be high, incubate for 2 hours at room temperature with gentle shaking on the shaker.
12. Wash 3 times with 200 µL of 1x Wash Buffer for 5 minutes at a time, with gentle shaking on the shaker.
13. Add 50 µL of 1x secondary antibodies (HRP-Conjugated Anti-Rabbit IgG Antibody and/or HRP-Conjugated Anti-Mouse IgG Antibody) to corresponding wells and incubate for 1.5 hours at room temperature with gentle shaking on the shaker. *Note: Add HRP-Conjugated Anti-Rabbit IgG* Antibody *to the wells incubated with Anti-NEK9 (rabbit, polyclonal) and add HRP-Conjugated Anti-Mouse IgG* Antibody *to the wells incubated with Anti-GAPDH Antibody (mouse, monoclonal)*.
14. Wash 3 times with 200 µL of 1x Wash Buffer for 5 minutes at a time, with gentle shaking on the shaker.
15. Add 50 µL of Ready-to-Use Substrate to each well and incubate for 30 minutes at room temperature in the dark with gentle shaking on the shaker. *Note: Ready-to-Use Substrate is a light-sensitive reagent. Keep away from light*.

16. Add 50 µL of Stop Solution to each well and read OD at 450 nm immediately using the microplate reader.

- Optional: Crystal Violet Cell Staining

Crystal violet binds to cell nuclei and gives absorbance readings proportional to cell counts at 595 nm.

1. After finishing reading the absorbance at 450 nm, wash the plate twice with 200 µL of Wash Buffer and twice with 200 µL of 1x TBS for 5 minutes each. Tap the plates on paper towel to remove the excess liquid. Let plate air dry for 5 minutes at room temperature.
2. Add 50 µL of Crystal Violet Solution to each well, incubate for 30 minutes at room temperature on the shaker. *Note: Crystal Violet is an intense stain. Avoid contact with skin and clothing*.
3. Tip off Crystal Violet solution into beaker. Wash plate by dipping into bucket of water in the sink with the water continuing to run. Carefully rinse the wells in distilled water until no more color comes off the wells. Allow the plate to dry for 30 minutes.
4. Add 100 µL of SDS solution into each well and incubate on the shaker at room temperature for 1 hour.
5. Read absorbance at 595 nm with microplate reader. If absorbance is too high, the solubilized Crystal Violet Solution can be diluted 10 times with $H_2O$ on a separate 96-well plate.

Short Protocol

1. Seed cells into wells and incubate overnight at 37°C, 5% $CO_2$.
2. Apply desired treatment conditions.
3. Add 100 µL of Fixing Solution and incubate 20 minutes at room temperature.
4. Add 100 µL of Quenching Buffer and incubate 20 minutes at room temperature.
5. Add 200 µL of Blocking Buffer and incubate for 1 hour at room temperature.
6. Add 50 µL of 1x Primary Antibodies and incubate overnight at 4°C.
7. Add 50 µL of HRP-Conjugated Secondary Antibodies and incubate for 1.5 hours at room temperature.
8. Add 50 µL of Ready-to-Use Substrate and incubate for 30 minutes at room temperature.
9. Add 50 µL of Stop Solution and read OD at 450 nm.
10. Crystal Violet Cell Staining Procedure (Optional).

## Data Analysis

### Calculation of Results

- GAPDH Normalization
  The $OD_{450}$ values obtained for the target protein can be normalized using the $OD_{450}$ values obtained for GAPDH.
- Crystal Violet Staining Normalization
  The measured $OD_{450}$ readings can be normalized using the $OD_{595}$ values via the proportion, $OD_{450}/OD_{595}$.

## Resources

### Troubleshooting

| Problem | Cause | Solution |
|---|---|---|
| Low Signal | Storage and Expiration | Read Manual for storage condition and expiration. |
| | Antibody Dilution | Dilute antibody 1:100 with Antibody Diluent. |
| | Low Cell Number | Seed more cells. |
| | Cells Detach from Well-Bottoms | Add solutions slowly from the side wall of the wells. Use Poly-L-Lysine to coat the plate period seeding the cells, if necessary. |
| High Background | Washing | Remove Wash Buffer completely. |
| | High Cell Number | Reduce the amount of seeded cells. |
| Variation | Pipetting | Check and/or calibrate pipettes. |
| | Washing | Remove Wash Buffer completely. |
| | Cells Detach from Well-Bottoms | Add solutions slowly from the side wall of the wells. Use Poly-L-Lysine to coat the plate period seeding the cells, if necessary. |

**Plate Layout**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 12 | | | | | | | | |
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| 3 | | | | | | | | |
| 2 | | | | | | | | |
| 1 | | | | | | | | |
| | A | B | C | D | E | F | G | H |