

# MSD MULTI-ARRAY<sup>®</sup> Assay System

## Total eIF4E Whole Cell Lysate Kit

1-Plate Kit

K150LHD-1

5-Plate Kit

K150LHD-2

25-Plate Kit

K150LHD-4



# MSD<sup>®</sup> Phosphoprotein Assays

## Total eIF4E

## Whole Cell Lysate Kit

*This package insert must be read in its entirety before using this product.*

**FOR RESEARCH USE ONLY.**

**NOT FOR USE IN DIAGNOSTIC PROCEDURES.**

### MESO SCALE DISCOVERY<sup>®</sup>

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# Table of Contents

Introduction .....	4
Principle of the Assay .....	4
Reagents Supplied .....	5
Required Material and Equipment (not supplied) .....	5
Safety .....	6
Reagent Preparation.....	6
Sample Preparation and Storage .....	7
Assay Protocol.....	8
Assay Components .....	9
References.....	9
Appendix: Suggested Cell Lysis Protocols .....	10
Summary Protocol.....	11
Plate Diagrams .....	13

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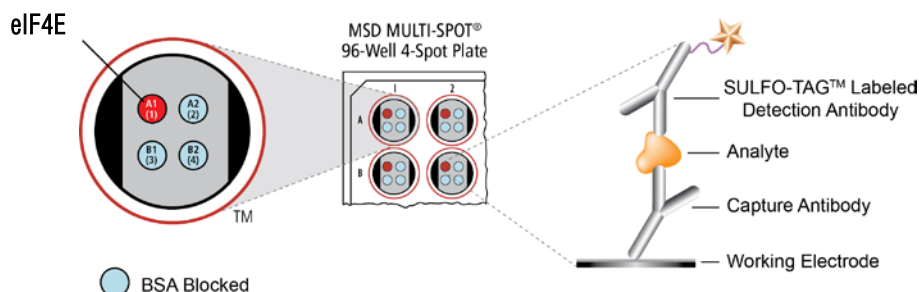
# Introduction

**Eukaryotic translation initiation factor 4E (eIF4E)** is a 24 kDa polypeptide which binds to the 7-methyl guanosine (m7G) 5' end of the mRNA cap structure and directs its association with ribosomes, initiating eukaryotic protein synthesis.<sup>1</sup> A pleiotropic regulator of translation, eIF4E enables the expression of key genes (such as cyclins, c-myc, and vascular endothelial growth factor (VEGF))<sup>1,2</sup> involved in cell proliferation, angiogenesis, and cell survival. Along with eIF4E, the RNA helicase eIF4A and the scaffold protein eIF4G form part of the eIF4F complex. This complex, together with eIF3, loads mRNAs onto the 40S ribosomal subunit. The availability of eIF4E as part of the eIF4F complex is the rate-limiting step in controlling the rate of translation. eIF4E-binding proteins (4E-BPs) block the interactions between eIF4E and eIF4G and negatively regulate eIF4F complex formation. Phosphorylation of the 4E-BPs through the mTOR (molecular target of rapamycin) pathway liberates eIF4E from this inhibition, allowing initiation of translation.<sup>1-3</sup>

Overexpression of eIF4E (pS209) is associated with tumorigenesis, metastasis, recurrence, and poor overall survival in several cancers (breast, colon, lung, prostate, breast, lymphoid).<sup>4</sup> As transformed or malignant cells have larger requirements for the expression of pro-survival factors, targeting eIF4E translation and its associated phosphorylation pathways remains an attractive anticancer strategy.

## Principle of the Assay

MSD phosphoprotein assays provide a rapid and convenient method for measuring biomarkers within a single, small-volume sample. The Total eIF4E assay is a sandwich immunoassay (Figure 1). MSD provides a plate pre-coated with capture antibodies. The user adds the sample and a solution containing detection antibodies conjugated with electrochemiluminescent labels (MSD SULFO-TAG™) over the course of one or more incubation periods. Analytes in the sample bind to capture antibodies immobilized on the working electrode surface; recruitment of the detection antibodies by the bound analytes completes the sandwich. The user adds an MSD buffer that provides the appropriate chemical environment for electrochemiluminescence and loads the plate into a SECTOR® Imager where a voltage applied to the plate electrodes causes the captured labels to emit light. The instrument measures intensity of emitted light to provide a quantitative measure of analytes in the sample.



**Figure 1.** Spot diagram showing placement of analyte capture antibody. The numbering convention for the different spots is maintained in the software visualization tools, on the plate packaging, and in the data files. A unique bar code label on each plate allows complete traceability back to MSD manufacturing records.

# Reagents Supplied

Product Description	Storage	Quantity per Kit		
		K150LHD-1	K150LHD-2	K150LHD-4
MULTI-SPOT 96-Well 4-Spot Total eIF4E Plate N450LHA-1	2–8°C	1 plate	5 plates	25 plates
SULFO-TAG Anti-Total eIF4E Antibody <sup>1</sup> (50X)	2–8°C	1 vial (75 µL)	1 vial (375 µL)	5 vials (375 µL ea)
Tris Lysis Buffer (1X) R60TX-3 (50 mL)	2–8°C	1 bottle (50 mL)	1 bottle (50 mL)	5 bottles (50 mL ea)
Tris Wash Buffer (10X) R61TX-2 (200 mL)	2–8°C	1 bottle (200 mL)	1 bottle (200 mL)	5 bottles (200 mL ea)
Phosphatase Inhibitor I (100X)	2–8°C	1 vial (0.1 mL)	1 vial (0.5 mL)	5 vials (0.5 mL ea)
Phosphatase Inhibitor II (100X)	2–8°C	1 vial (0.1 mL)	1 vial (0.5 mL)	5 vials (0.5 mL ea)
Protease Inhibitor Solution (100X)	2–8°C	1 vial (0.1 mL)	1 vial (0.5 mL)	5 vials (0.5 mL ea)
Blocker A (dry powder) R93BA-4	RT	1 vial (15 g)	1 vial (15 g)	5 vials (15 g ea)
Read Buffer T (4X) R92TC-3 (50 mL)	RT	1 bottle (50 mL)	1 bottle (50 mL)	5 bottles (50 mL ea)

## Required Materials and Equipment (not supplied)

- Deionized water for diluting concentrated buffers
- 500 mL bottle for reagent preparation
- 50 mL tubes for reagent preparation
- 15 mL tubes for reagent preparation
- Microcentrifuge tubes for preparing serial dilutions
- Appropriate liquid handling equipment for desired throughput, capable of dispensing 10 to 150 µL into a 96-well microtiter plate
- Plate washing equipment: automated plate washer or multichannel pipette
- Adhesive plate seals
- Microtiter plate shaker

<sup>1</sup> SULFO-TAG conjugated detection antibodies should be stored in the dark.

# Safety

Use safe laboratory practices and wear gloves, safety glasses, and lab coats when handling kit components. Handle and dispose of all hazardous samples properly in accordance with local, state, and federal guidelines.

## Reagent Preparation

### Prepare Tris Wash Buffer

Dilute the 10X stock of Tris Wash Buffer provided to 1X as shown below. Tris Wash Buffer (1X) will be used throughout the assay to make additional reagents and wash plates. Approximately 350 mL per plate is required—more if using an automatic plate washer.

For 1 plate, combine:

- 35 mL of Tris Wash Buffer (10X)
- 315 mL deionized water

Excess Tris Wash Buffer may be stored at room temperature in a tightly sealed container.

### Prepare Blocking Solution

For 1 plate, combine:

- 600 mg Blocker A (dry powder)
- 20 mL 1X Tris Wash Buffer

### Prepare Antibody Dilution Buffer

For 1 plate, combine:

- 1 mL blocking solution
- 2 mL 1X Tris Wash Buffer

Set aside on ice.

### Prepare Complete Lysis Buffer

*Prepare complete lysis buffer just prior to use.*

For 2–3 plates (1X concentration) of complete lysis buffer, combine:

- 100  $\mu$ L Protease Inhibitor Solution (100X stock)
- 100  $\mu$ L Phosphatase Inhibitor Solution I (100X stock)
- 100  $\mu$ L Phosphatase Inhibitor Solution II (100X stock)
- 9.7 mL of 1X Tris Lysis Buffer

Immediately place the complete lysis buffer on ice; it should be ice cold before use.

## Prepare Detection Antibody Solution

MSD provides detection antibody in a 50X stock solution. The working detection antibody solution is 1X.

For 1 plate, combine:

- ❑ 60  $\mu$ L 50X SULFO-TAG Anti-Total eIF4E Antibody
- ❑ 2.94 mL antibody dilution buffer

## Prepare Read Buffer

MSD provides Read Buffer T as a 4X stock solution. The working solution is 1X.

For 1 plate, combine:

- ❑ 5 mL Read Buffer T (4X)
- ❑ 15 mL deionized water

You may prepare diluted 1X read buffer in advance and store it room temperature in a tightly sealed container.

## Prepare MSD Plate

MSD plates are pre-coated with capture antibodies (see Figure 1) and exposed to a proprietary stabilizing treatment to ensure the integrity and stability of the immobilized antibodies. Plates can be used as delivered; no additional preparation (e.g., pre-wetting) is required.

# Sample Preparation and Storage

We developed the Total eIF4E assay using cell lysates from a human colorectal cell line treated with an MNK inhibitor (negative lysate) or DMSO vehicle (positive lysate).

Most lysis buffers and sample matrices are compatible with MSD plates, although high concentrations of denaturing reagents should be avoided. Keep SDS and other ionic detergents to a concentration of 0.1% or less in the sample applied to the well and avoid reducing agents (DTT >1mM). Please contact MSD Scientific Support if you have any questions about lysate preparation options.

Analysis of proteins in their activated state (i.e. phosphorylated) usually requires stimulation prior to cell lysis. Verify cell stimulation and sample preparation prior to using this kit.

Perform all manipulations on ice; keep PBS wash buffer and complete lysis buffer ice cold. Cell concentrations for lysis can range from 0.5–5 x 10<sup>7</sup> cells per mL of lysis buffer. Protein yields will vary by cell line. To get your desired final protein concentration, you will need to optimize the number of cells used and the amount of complete lysis buffer added. Depending on the stability of the target in the matrix, you may need additional protease and phosphatase inhibitors in the matrix or diluent.

MSD provides suggested cell lysis protocols in the appendix; however, specific cell types or targets may benefit from alternative buffer components or techniques, depending upon the particular research application.

# Assay Protocol

## 1. Block Plate and Prepare Samples:

- a. Add 150  $\mu\text{L}$  of blocking solution to each well. Seal the plate with an adhesive plate seal, and incubate for 1 hour with vigorous shaking (300–1000 rpm) at room temperature.
- b. Prepare complete lysis buffer just prior to sample dilution. See the Sample Preparation and Storage section above for recommended sample handling procedures.
- c. Prepare positive and negative cell lysates.
  - Thaw cell lysate samples on ice and dilute them immediately before use. Keep on ice during all manipulations and discard all remaining thawed, unused material.
  - Dilute cell lysate in complete lysis buffer to a final concentration of 0.8  $\mu\text{g}/\mu\text{L}$ . This will deliver 20  $\mu\text{g}$  of lysate in 25  $\mu\text{L}$  per well. You may prepare a dilution series at this point if desired.

## 2. Wash and Add Samples:

Wash the plate 3 times with 300  $\mu\text{L}$ /well of Tris Wash Buffer. Add 25  $\mu\text{L}$  of sample per well. Seal the plate with an adhesive plate seal, and incubate for 3 hours with vigorous shaking (300–1000 rpm) at room temperature.

You may prepare detection antibody solution during incubation.

## 3. Wash and Add Detection Antibody Solution:

Wash the plate 3 times with 300  $\mu\text{L}$ /well of Tris Wash Buffer. Add 25  $\mu\text{L}$  of detection antibody solution to each well of the MSD plate. Seal the plate with an adhesive plate seal, and incubate for 1 hour with vigorous shaking (300–1000 rpm) at room temperature.

You may prepare 1X read buffer during incubation.

## 4. Wash and Read:

Wash the plate 3 times with 300  $\mu\text{L}$ /well of Tris Wash Buffer. Add 150  $\mu\text{L}$  of 1X Read Buffer T to each well of the MSD plate.

Analyze the plate on the SECTOR Imager. No incubation in read buffer is required before reading the plate.

## Notes

*Shaking a 96-well MSD MULTI-SPOT plate typically accelerates capture at the working electrode.*

*Solutions containing MSD Blocker A should be stored at 2–8°C and discarded after 14 days.*

*Complete lysis buffer should be kept ice-cold during all experiment manipulations.*

*If working with purified protein, only a few nanograms per well will generally provide a strong assay signal. Purified recombinant proteins may exhibit differences in both signal and background as compared to native proteins in cell lysates.*

*Samples, including cell lysates, may be used neat or diluted.*

*It is not possible to prepare serial dilutions in the MSD plate. Use microcentrifuge tubes or a separate 96-well polypropylene plate to prepare serial dilutions.*

*The sensitivity of MSD immunoassays rivals that of ELISAs and Western blots. The amount of sample required for a given assay will depend on the abundance of the analyte in the matrix and the affinities of the antibodies used.*

*You may keep excess diluted read buffer in a tightly sealed container at room temperature for later use.*

*Bubbles introduced when adding read buffer will interfere with imaging of the plate and produce unreliable data. Use reverse pipetting technique to avoid creating bubbles.*

*Due to the varying nature of each research application, you should investigate assay stability before allowing plates to sit with read buffer for extended periods.*



# Assay Components

The capture and detection antibodies used in this assay are listed below. They cross-react with human cell lysates.

Analyte	Source Species	
	MSD Capture Antibody	MSD Detection Antibody
eIF4E	Mouse Monoclonal	Rabbit Polyclonal

## References

1. Sonenberg N. eIF4E, the mRNA cap-binding protein: from basic discovery to translational research. *Biochem Cell Biol.* 2008 Apr;86(2):178-83.
2. Topisirovic I, Siddiqui N, Borden KL. The eukaryotic translation initiation factor 4E (eIF4E) and HuR RNA operons collaboratively regulate the expression of survival and proliferative genes. *Cell Cycle.* 2009 Apr;8(7):960-1.
3. Whalen SG, Gingras A, Amankwa L, Mader S, Branton PE, Aebersold R, Sonenberg N. Phosphorylation of eIF-4E on serine 209 by protein kinase C is inhibited by the translational repressors, 4E-binding proteins. *J. Biol. Chem.* 1996 271(20): 11831-7.
4. Graff JR, Konicek BW, Carter JH, Marcusson EG. Targeting the eukaryotic translation initiation factor 4E for cancer therapy. *Cancer Res.* 2008 Feb;68(3):631-4.

# Appendix: Suggested Cell Lysis Protocols

## Preparation in Culture Flask or Petri Dish

**Suspension Cells.** Pellet cells by centrifugation at 500 x g for 3 minutes at 2–8°C. Discard supernatant and wash the pellet once with cold PBS. Pellet cells again, discard supernatant, and resuspend in complete lysis buffer at 1–5 x 10<sup>7</sup> cells per mL. Incubate on ice for 30 minutes. (A shorter incubation time of 15 minutes may be adequate for many targets.) Clear cellular debris from the lysate by centrifuging (≥10 000 x g) for 10 minutes at 2–8°C. Discard the pellet and determine the protein concentration in the lysate using a detergent-compatible protein assay such as a bicinchoninic acid (BCA) assay. Unused lysates should be aliquoted, quickly frozen in a dry ice-ethanol bath, and stored at ≤-70°C.

**Adherent Cells.** All volumes given are for cells plated on 15 cm dishes. Remove media from the dish and wash cells one time with 5 mL cold PBS. Add 2 mL PBS to each dish, scrape the cells from the surface of the dish, and transfer into 15 mL conical tubes. Pellet the cells by centrifugation at 500 x g for 3 minutes at 2–8°C. Discard supernatant and resuspend cells in 0.5–2 mL of complete lysis buffer per dish. (Alternatively, cells can be lysed by adding 1–2 mL of complete lysis buffer per 15 cm dish after completely removing the PBS wash buffer. Cell lysate can be collected by snapping the dish surface prior to the clarifying spin.) Incubate on ice for 30 minutes. A shorter incubation time of 15 minutes may be adequate for many targets. Clear cellular debris from the lysate by centrifuging (≥10 000 x g) for 10 minutes at 2–8°C. Discard the pellet and determine protein concentration in the lysate using a detergent compatible protein assay such as BCA. Unused lysates should be aliquoted, quickly frozen in a dry ice-ethanol bath, and stored at ≤-70°C.

## Preparation in 96-well Culture Plate

Successful adaptation to a 96-well culture format depends on cell type and target. First, determine the number of cells of each cell type to be plated per well. MSD generally recommends plating concentrations ranging from 1 x 10<sup>4</sup>–10<sup>5</sup> cells per well; however, the optimal concentrations will vary depending on cell line used.

**Suspension Cells.** You may lyse many cell types without removing growth medium. For flat bottom plates, design the experiment so that the final suspension cell volume per well is such that a concentrated complete lysis buffer (prepared by the user) can be added to the well to achieve a final 1X lysis buffer concentration in the well. For example, 40 µL of 5X complete lysis buffer added to a well containing 160 µL of cell culture medium would provide a 1X concentration of complete lysis buffer.

For conical microwell plates, perform lysis by pelleting the cells, removing most of the growth medium, and adding a constant amount of 1X complete lysis buffer.

**Adherent Cells.** Plate cells on coated tissue culture plates to reduce variability due to cells lost as growth medium is removed. Treat cells as desired. Gently aspirate growth medium from the microwell plate to avoid disrupting the cell monolayer. A PBS wash step is not required and can introduce variability as cells may detach during the wash step. Add 100 µL of 1X complete lysis buffer per well. You may modify lysis volume for different cell types or applications.

You will need to determine the optimum cell lysis time. Some targets are immediately available for detection. Other targets may require an incubation step at room temperature or on ice with gentle agitation.

Carefully pipet cell lysate onto prepared plate and proceed with assay protocol. Note: It is important to transfer a constant volume and to avoid introducing air bubbles by pipetting too vigorously.

**Summary Protocol**  
**MSD 96-well Total eIF4E Kit**

*MSD provides this summary protocol for your convenience.  
Please read the entire detailed protocol prior to performing the  
Total eIF4E assay.*

## **Reagent Preparation**

Prepare Tris Wash Buffer.

Prepare blocking solution.

Prepare antibody dilution buffer.

Prepare detection antibody solution by diluting 50X detection antibody 50-fold in antibody dilution buffer.

Prepare 1X Read Buffer T by diluting 4X Read Buffer T 4-fold with deionized water.

## **Step 1: Block Plate and Prepare Samples**

Add 150  $\mu$ L/well of blocking solution.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 1 hour.

Prepare complete lysis buffer just prior to sample dilution.

Prepare positive and negative cell lysates and keep on ice until use.

## **Step 2: Wash and Add Sample**

Wash the plate 3 times with 300  $\mu$ L/well of Tris Wash Buffer.

Add 25  $\mu$ L/well of sample.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 3 hours.

## **Step 3: Wash and Add Detection Antibody Solution**

Wash the plate 3 times with 300  $\mu$ L/well of Tris Wash Buffer.

Add 25  $\mu$ L/well of 1X detection antibody solution.

Incubate at room temperature with vigorous shaking (300–1000 rpm) for 1 hour.

## **Step 4: Wash and Read Plate**

Wash the plate 3 times with 300  $\mu$ L/well of Tris Wash Buffer.

Add 150  $\mu$ L/well of 1X Read Buffer T.

Analyze plate on SECTOR Imager within 5 minutes of adding read buffer.



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