

# DuoSet<sup>®</sup> IC

## Human/Mouse/Rat Total ERK2

Catalog Number DYC1230-2

DYC1230-5

**For the development of sandwich ELISAs to measure total ERK2 in cell lysates.**

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

**FOR RESEARCH USE ONLY.  
NOT FOR USE IN DIAGNOSTIC PROCEDURES.**

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## PRINCIPLE OF THE ASSAY

This DuoSet<sup>®</sup> IC ELISA contains the basic components required for the development of sandwich ELISAs to measure extracellular signal-regulated kinase 2 (ERK2), also known as mitogen-activated protein kinase 1 (MAPK1) and p42 MAPK, in cell lysates. An immobilized capture antibody specific for ERK2 binds both phosphorylated and unphosphorylated ERK2. After washing away unbound material, a biotinylated detection antibody specific for total ERK2 is used to detect both phosphorylated and unphosphorylated protein, utilizing a standard Streptavidin-HRP format. Cross-reactivity with ERK1 and other MAPKs was not detected (see page 8).

## MATERIALS PROVIDED

Store the unopened kit at 2 - 8° C. Do not use past kit expiration date.

Description	Part #	Storage Conditions	Vials Provided	
			Cat. # DYC1230-2	Cat. # DYC1230-5
Total ERK2 Capture Antibody	841234	2 - 8° C	1	2
Total ERK2 Detection Antibody	841235	2 - 8° C	1	2
Total ERK2 Standard	841236	2 - 8° C	3	5
Streptavidin-HRP	890803	2 - 8° C	1	1

DYC1230-2 contains sufficient materials to run ELISAs on at least two 96 well plates.\*

DYC1230-5 contains sufficient materials to run ELISAs on at least five 96 well plates.\*

\*Provided the following conditions are met:

- The reagents are prepared as described in this package insert.
- The assay is run as described in the General ELISA Protocol on page 6.
- The recommended microplates, buffers, diluents, substrates, and solutions are used.

## OTHER MATERIALS REQUIRED

- Aprotinin (Sigma # A6279)
- Leupeptin (Sigma # L8511)
- Pepstatin (Sigma # P4265)
- Phenylmethylsulfonylfluoride (PMSF) (Sigma # P7626)
- Sodium Orthovanadate ( $\text{Na}_3\text{VO}_4$ ) (Sigma # S6508), activated
- Sodium Pyrophosphate ( $\text{Na}_4\text{P}_2\text{O}_7$ ) (Sigma # P8010)
- Sodium Fluoride (NaF) (Sigma # 201154)
- Triton X-100 (Sigma # T9284)
- Urea
- Heat-inactivated normal rabbit serum (for dilution of Detection Antibody, see page 6)
- Pipettes and pipette tips
- Deionized or distilled water
- 96 well microplates [Costar EIA Plates (Catalog # 2592 or R&D Systems Catalog # DY990) are suggested]
- Plate sealers (R&D Systems, Catalog # DY992)
- Squirt bottle, manifold dispenser, or automated microplate washer

## SOLUTIONS REQUIRED

**PBS** - 137 mM NaCl, 2.7 mM KCl, 8.1 mM  $\text{Na}_2\text{HPO}_4$ , 1.5 mM  $\text{KH}_2\text{PO}_4$ , pH 7.2 - 7.4, 0.2  $\mu\text{m}$  filtered.

**Wash Buffer** - 0.05% Tween<sup>®</sup> 20 in PBS, pH 7.2 - 7.4 (R&D Systems, Catalog # WA126).

**Block Buffer** - 1% BSA\*, 0.05%  $\text{NaN}_3$ , in PBS, pH 7.2 - 7.4.

**IC Diluent #1** - 1% BSA\* in PBS, pH 7.2 - 7.4, 0.2  $\mu\text{m}$  filtered. (R&D Systems, Catalog # DY995)

**IC Diluent #8\*\*** - 1 mM EDTA, 0.5% Triton X-100, 5 mM NaF in PBS, pH 7.2 - 7.4.

**Note:** *IC Diluent #8 is also the base diluent for IC Diluent #3, IC Diluent #7, and Lysis Buffer #6. Approximately 50 mL of this diluent is required to run the assay on one plate.*

**IC Diluent #3\*\*** - 1 mM EDTA, 0.5% Triton X-100, 5 mM NaF, 1 M urea in PBS, pH 7.2 - 7.4.

**IC Diluent #7\*\*** - 1 mM EDTA, 0.5% Triton X-100, 5 mM NaF, 6 M urea in PBS, pH 7.2 - 7.4.

**Lysis Buffer #6\*\*** - 1 mM EDTA, 0.5% Triton X-100, 5 mM NaF, 6 M urea, 1 mM activated sodium orthovanadate, 2.5 mM sodium pyrophosphate, 10  $\mu\text{g}/\text{mL}$  Leupeptin, 10  $\mu\text{g}/\text{mL}$  Pepstatin, 100  $\mu\text{M}$  PMSF, 3  $\mu\text{g}/\text{mL}$  Aprotinin in PBS, pH 7.2 - 7.4.

**Substrate Solution** - 1:1 mixture of Color Reagent A ( $\text{H}_2\text{O}_2$ ) and Color Reagent B (Tetramethylbenzidine) (R&D Systems, Catalog # DY999).

**Stop Solution** - 2 N  $\text{H}_2\text{SO}_4$  (R&D Systems, Catalog # DY994).

\*The use of R&D Systems Reagent Diluent Concentrate 2 (Catalog # DY995) or Sigma Bovine Serum Albumin (Catalog # A7030) is recommended. All buffers containing BSA must be stored at 2 - 8° C.

\*\*Sample Diluent Concentrate 1 (5X) (R&D Systems, Catalog # DYC001), supplemented as per the package insert.

Tween is a registered trademark of ICI Americas.

## REAGENT PREPARATION

Bring all reagents to room temperature before use.

**Total ERK2 Capture Antibody** (Part 841234) - 720  $\mu\text{g/mL}$  of rabbit anti-human ERK2 antibody when reconstituted with 200  $\mu\text{L}$  of PBS. After reconstitution, store at 2 - 8° C for up to 30 days or aliquot and store at  $\leq -20^\circ\text{C}$  in a manual defrost freezer or at  $\leq -70^\circ\text{C}$  for up to 3 months.\*

**Total ERK2 Detection Antibody** (Part 841235) - 27  $\mu\text{g/mL}$  of biotinylated mouse anti-human ERK2 antibody when reconstituted with 1.0 mL of IC Diluent #1. After reconstitution, store at 2 - 8° C for up to 30 days or aliquot and store at  $\leq -20^\circ\text{C}$  in a manual defrost freezer or at  $\leq -70^\circ\text{C}$  for up to 3 months.\*

**Total ERK2 Standard** (Part 841236) - 600 ng/mL of recombinant human ERK2 when reconstituted with 500  $\mu\text{L}$  of IC Diluent #7. **Use within 1 hour of reconstitution. A fresh standard should be used for each assay.** Immediately before use, an initial 6-fold dilution should be made in IC Diluent #8. Additional dilutions should be made in IC Diluent #3. A seven point standard curve using 2-fold serial dilutions and a high standard of 40 ng/mL is recommended.

**Streptavidin-HRP** (Part 890803) - 1 mL of Streptavidin conjugated to horseradish-peroxidase. Store at 2 - 8° C. **DO NOT FREEZE.**

\*Provided this is within the expiration date of the kit.

## PREPARATION OF SAMPLES

**Cell lysates** - Rinse cells two times with PBS, making sure to remove any remaining PBS after the second rinse. Solubilize cells at  $1 \times 10^7$  cells/mL in Lysis Buffer #6. Vortex lysates briefly and allow to sit on ice for 15 minutes before use or store at  $\leq -20^\circ\text{C}$  in a manual defrost freezer. Sample protein concentration may be quantified using a total protein assay. Before use, centrifuge at 2000 x g for 5 minutes and transfer the supernate into a clean test tube. For assaying, dilute lysates 6-fold with IC Diluent #8 and make further serial dilutions in IC Diluent #3.

**Note:** *The final concentration of urea in all samples and standards should be 1 M prior to addition to the plate.*

## **PRECAUTION**

The Stop Solution suggested for use with this kit is an acidic solution. Wear eye, hand, face, and clothing protection when using this material.

## **TECHNICAL HINTS AND LIMITATIONS**

- This DuoSet IC ELISA should not be used beyond the expiration date on the kit label.
- Individual results may vary due to differences in technique, plasticware and water sources.
- It is important that the diluents selected for reconstitution and for dilution of the standard reflect the environment of the samples being measured. The diluents suggested in this protocol should be suitable for most cell lysates.
- The type of enzyme and substrate and the concentrations of capture/detection antibodies used can be varied to create an immunoassay with a different sensitivity and dynamic range. A basic understanding of immunoassay development is required for the successful use of these reagents in immunoassays.
- A thorough and consistent wash technique is essential for proper assay performance. Wash Buffer should be dispensed forcefully and removed completely from the wells by aspiration or decanting. Remove any remaining Wash Buffer by inverting the plate and blotting it against clean paper towels.
- Use a fresh reagent reservoir and pipette tips for each step.
- It is recommended that all standards and samples be assayed in duplicate.
- Avoid microbial contamination of reagents and buffers. This may interfere with the sensitivity of the assay. Buffers containing protein should be made under aseptic conditions and stored at 2 - 8° C or be prepared fresh daily.

# GENERAL ELISA PROTOCOL

A plate layout is provided to record standards and samples assayed.

## Plate Preparation

1. Dilute the Capture Antibody to the working concentration of 2.0  $\mu\text{g}/\text{mL}$  in PBS without carrier protein. Immediately coat a 96 well microplate with 100  $\mu\text{L}$  per well of the diluted Capture Antibody. Seal the plate and incubate overnight at room temperature.
2. Aspirate each well and wash with Wash Buffer, repeating the process two times for a total of 3 washes. Wash by filling each well with Wash Buffer (400  $\mu\text{L}$ ) using a squirt bottle, manifold dispenser or autowasher. Complete removal of liquid at each step is essential for good performance. After the last wash, remove any remaining Wash Buffer by aspirating or by inverting the plate and blotting it against clean paper towels.
3. Block plates by adding 300  $\mu\text{L}$  of Block Buffer to each well. Incubate at room temperature for 1 - 2 hours.
4. Repeat the aspiration/wash as in step 2. The plates are now ready for sample addition.

## Assay Procedure

1. Add 100  $\mu\text{L}$  of sample or standards in IC Diluent #3 per well. Use IC Diluent #3 as the zero standard. Cover with a plate sealer and incubate 2 hours at room temperature.  
**Note:** *A seven point standard curve using 2-fold serial dilutions and a high standard of 40 ng/mL is recommended.*
2. Repeat the aspiration/wash as in step 2 of Plate Preparation.
3. Dilute the Detection Antibody to a working concentration of 0.75  $\mu\text{g}/\text{mL}$  in IC Diluent #1\*. Add 100  $\mu\text{L}$  of the diluted Detection Antibody to each well. Cover with a new plate sealer and incubate 2 hours at room temperature.
4. Repeat the aspiration/wash as in step 2 of Plate Preparation.
5. Immediately before use, dilute the Streptavidin-HRP to the working concentration specified on the vial label using IC Diluent #1. Add 100  $\mu\text{L}$  of the diluted Streptavidin-HRP to each well. Incubate for 20 minutes at room temperature. Avoid placing the plate in direct light.
6. Repeat the aspiration/wash as in step 2 of the Plate Preparation.
7. Add 100  $\mu\text{L}$  of Substrate Solution to each well. Incubate for 20 minutes at room temperature. Avoid placing the plate in direct light.
8. Add 50  $\mu\text{L}$  of Stop Solution to each well. Gently tap the plate to ensure thorough mixing.
9. Determine the optical density of each well immediately, using a microplate reader set to 450 nm. If wavelength correction is available, set to 540 nm or 570 nm. If wavelength correction is not available, subtract readings at 540 nm or 570 nm from the readings at 450 nm. This subtraction will correct for optical imperfections in the plate. Readings made directly at 450 nm without correction may be higher and less accurate.

\*IC Diluent #1 with 2% heat-inactivated normal rabbit serum. Prepare 1 - 2 hours prior to use.

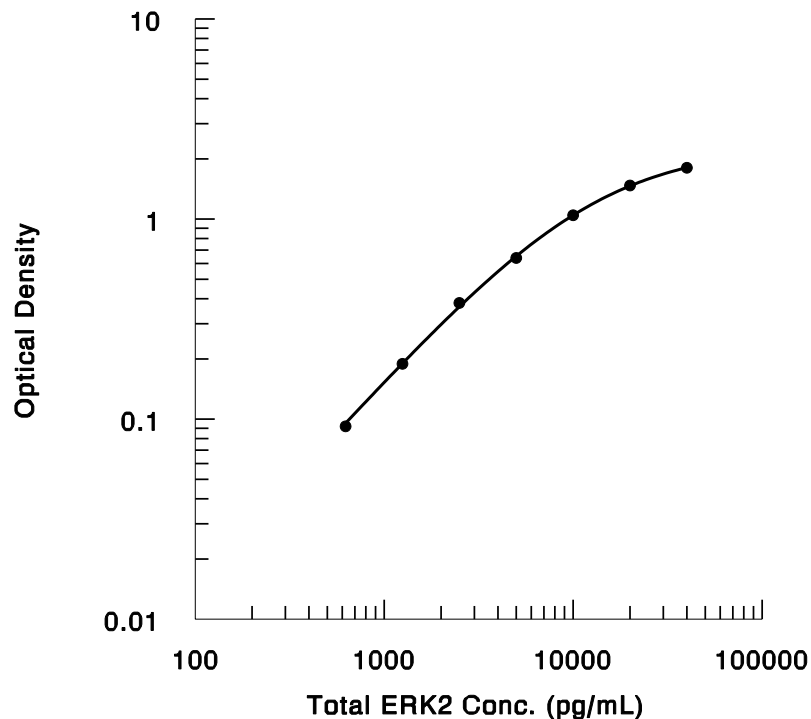
## CALCULATION OF RESULTS

Average the duplicate readings for each standard and sample, then subtract the average zero standard optical density. Results may be normalized to total protein or cell number.

Create a standard curve by reducing the data using computer software capable of generating a four parameter logistic (4-PL) curve-fit. As an alternative, construct a standard curve by plotting the mean absorbance for each standard on the y-axis against the concentration on the x-axis and draw a best fit curve through the points on the graph. The data may be linearized by plotting the log of the ERK2 concentrations versus the log of the O.D. and the best fit line can be determined by regression analysis. This procedure will produce an adequate but less precise fit of the data.

## TYPICAL DATA

A standard curve should be generated for each set of samples assayed. The graph below represents typical data generated when using the Human/Mouse/Rat Total ERK2 DuoSet IC ELISA. The standard curve was calculated using a computer generated 4-PL curve-fit. This standard curve is for demonstration purposes only.



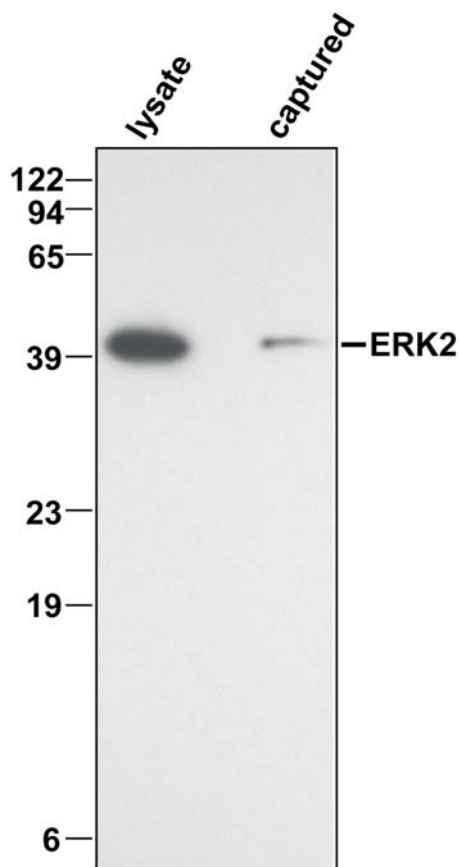


## CALIBRATION

This DuoSet IC ELISA is calibrated against a highly purified *E. coli*-expressed recombinant human ERK2 produced at R&D Systems.

## SPECIFICITY

The Human/Mouse/Rat Total ERK2 DuoSet IC ELISA specifically recognizes ERK2. Specificity was demonstrated by Western blot analysis of the protein bound by the capture antibody supplied in the kit.



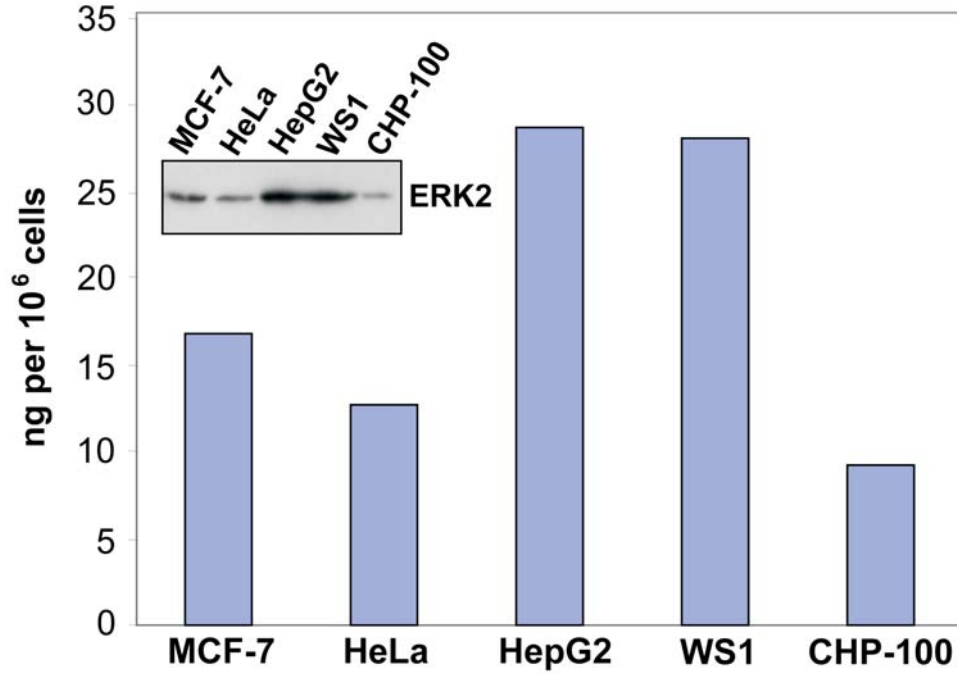
**Figure 1:** Lysates prepared from human HepG2 cells were incubated in wells coated with ERK2 DuoSet IC Capture Antibody. Unbound material was removed by washing and bound material was solubilized in SDS gel sample buffer. The same lysate and captured proteins were electrophoresed, transferred to an Immobilon-P (Millipore) membrane and immunoblotted with Total ERK2 Detection Antibody. Only a single band corresponding to ERK2 was detected.

To further determine specificity, unphosphorylated recombinant human ERK1 was assayed at 100 ng/mL and did not cross-react or interfere. Other MAP kinases, unphosphorylated recombinant human p38 $\alpha$  and JNK1, were assayed at 100 ng/mL and did not cross-react or interfere.

## QUANTIFICATION

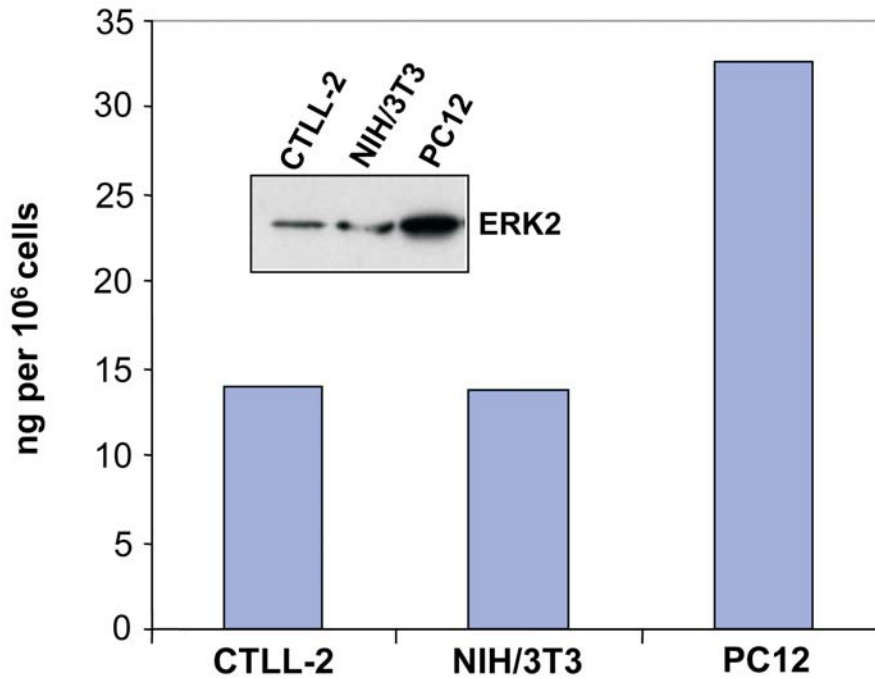
Amounts of ERK2, as quantified by the Human/Mouse/Rat Total ERK2 DuoSet IC ELISA, are consistent with the amounts of ERK2 determined by qualitative Western blot analysis.

### Quantification of ERK2 in various human cell lines



**Figure 2:** Lysates prepared from human MCF-7, HeLa, HepG2, WS1, and CHP-100 cells were quantified with this DuoSet IC ELISA. The same lysates were also immunoblotted (inset) with anti-ERK2 monoclonal antibody (R&D Systems, Catalog # MAB1230). The DuoSet IC ELISA results correlate well with the total amounts of ERK2 detected by Western blot.

### Quantification of ERK2 in mouse and rat cell lines



**Figure 3:** Lysates prepared from mouse CTLL-2 and NIH/3T3 cells and rat PC12 cells were quantified with this DuoSet IC ELISA. The same lysates were also immunoblotted (inset) with anti-ERK2 monoclonal antibody. The DuoSet IC ELISA results correlate well with the total amounts of ERK2 detected by Western blot.

# PLATE LAYOUT

Use this plate layout to record standards and samples assayed.

1								
2								
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4								
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9								
10								
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12								
	A	B	C	D	E	F	G	H