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Product Manual

# Pan-Ras Activation Assay Kit

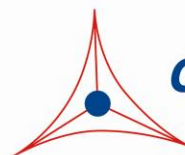
Catalog Number

STA-400

20 assays

**FOR RESEARCH USE ONLY**  
**Not for use in diagnostic procedures**

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**CELL BIOLABS, INC.**  
*Creating Solutions for Life Science Research*

## **Introduction**

Small GTP-binding proteins (or GTPases) are a family of proteins that serve as molecular regulators in signaling transduction pathways. Ras, a 21 kDa protein, regulates a variety of biological response pathways that include cell growth, cell transformation and tumor invasion. Like other small GTPases, Ras regulates molecular events by cycling between an inactive GDP-bound form and an active GTP-bound form. In its active (GTP-bound) state, Ras binds specifically to the Ras-binding domain (RBD) of Raf1 to control downstream signaling cascades. The most notable members of the Ras subfamily are H-Ras, N-Ras and K-Ras, mainly for being implicated in many types of cancer.

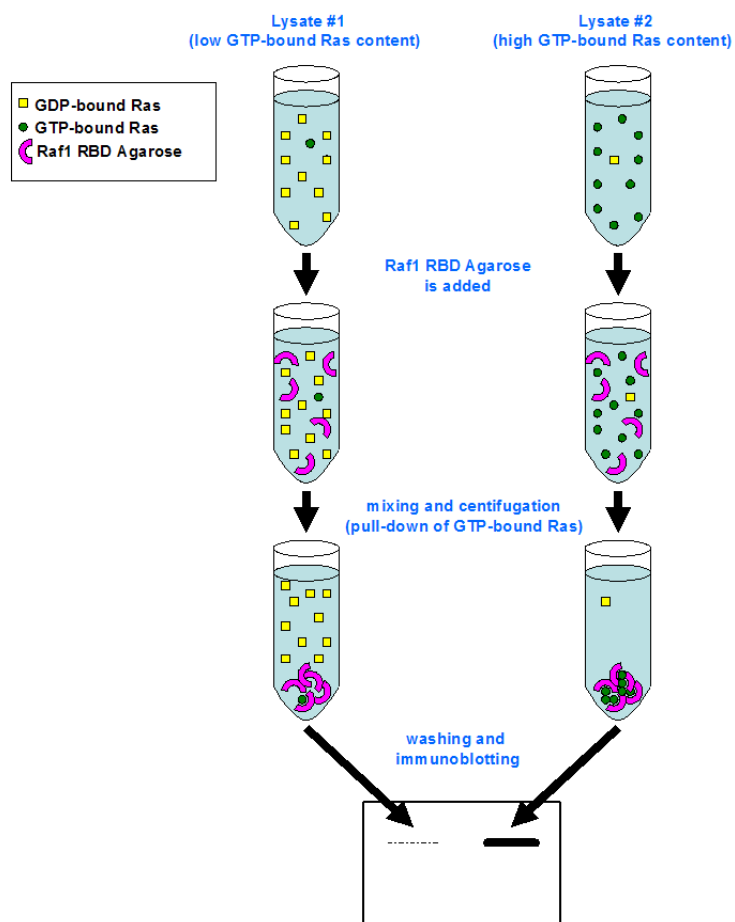
Cell Biolabs' Pan-Ras Activation Assay Kit utilizes Raf1 RBD Agarose beads to selectively isolate and pull-down the active forms of Ras (H-Ras, K-Ras, and N-Ras) from purified samples or endogenous lysates. Subsequently, the precipitated GTP-Ras is detected by western blot analysis using an Anti-pan-Ras Antibody.

Cell Biolabs' Pan-Ras Activation Assay Kit provides a simple and fast tool to monitor the activation of Ras. The kit includes easily identifiable Raf1 RBD Agarose beads (Figure 1), pink in color, and a GTPase Immunoblot Positive Control for quick Ras identification. Each kit provides sufficient quantities to perform 20 assays.



**Figure 1:** Raf1 RBD Agarose beads, in color, are easy to visualize, minimizing potential loss during washes and aspirations.

## Assay Principle



## Related Products

1. STA-401-1: Rac1 Activation Assay Kit
2. STA-402: Cdc42 Activation Assay Kit
3. STA-403-A: RhoA Activation Assay Kit
4. STA-410: Raf1 RBD Agarose Beads

## **Kit Components**

1. Raf1 RBD Agarose (Part No. STA-410): One vial – 800  $\mu$ L of 50% slurry, 400  $\mu$ g Raf1 RBD in PBS containing 50% glycerol.  
*Note: Agarose bead appears pink in color for easy identification, washing, and aspiration.*
2. 100X GTP $\gamma$ S (Part No. 240103): One vial – 50  $\mu$ L of 10 mM GTP $\gamma$ S dissolved in sterile water.
3. 100X GDP (Part No. 240104): One vial – 50  $\mu$ L of 100 mM GDP dissolved in sterile water.
4. 5X Assay/Lysis Buffer (Part No. 240102): One bottle – 30 mL of 125 mM HEPES, pH 7.5, 750 mM NaCl, 5% Igepal CA-630, 50 mM MgCl<sub>2</sub>, 5 mM EDTA, 10% Glycerol.
5. Anti-pan-Ras, Mouse Monoclonal (Part No. 240002): One vial – 40  $\mu$ L in PBS, pH 7.4, 0.05% NaN<sub>3</sub>, 0.1% BSA.
6. GTPase Immunoblot Positive Control (Part No. 240105): One vial – 100  $\mu$ L of 293 cell lysate at 0.5 mg/mL (provided ready-to-use in 1X reducing SDS-PAGE Sample Buffer, pre-boiled)

## **Materials Not Supplied**

1. Stimulated and non-stimulated cell lysates
2. Ras activators
3. Protease inhibitors
4. 0.5 M EDTA in water
5. 1 M MgCl<sub>2</sub>
6. 30°C incubator or water bath
7. 4°C tube rocker or shaker
8. 2X reducing SDS-PAGE sample buffer
9. Electrophoresis and immunoblotting systems
10. Immunoblotting wash buffer such as TBST (10 mM Tris-HCl, pH 7.4, 0.15 M NaCl, 0.05% Tween-20)
11. Immunoblotting blocking buffer (TBST containing 5% Non-fat Dry Milk)
12. PVDF or nitrocellulose membrane
13. Secondary Antibody
14. ECL Detection Reagents

## **Storage**

Store all kit components at -20°C. The 5X Assay/Lysis Buffer may be stored at either -20°C or 4°C. Avoid multiple freeze/thaw cycles.

## **Preparation of Reagents**

- 1X Assay/Lysis Buffer: Mix the 5X Stock briefly and dilute to 1X in deionized water. Just prior to usage, add protease inhibitors such as 1 mM PMSF, 10  $\mu$ g/mL leupeptin, and 10  $\mu$ g/mL aprotinin.

## **Preparation of Samples**

*Note: It is advisable to use fresh cell lysates because GTP-Ras is quickly hydrolyzed to GDP-Ras; frozen lysates stored at -70°C may be used. Performing steps at 4°C or on ice may reduce hydrolysis. Avoid multiple freeze/thaw cycles of lysates.*

### **I. Adherent Cells**

1. Culture cells to approximately 80-90% confluence. Stimulate cells with Ras activator(s) as desired.
2. Aspirate the culture media and wash twice with ice-cold PBS.
3. Completely remove the final PBS wash and add ice-cold 1X Assay/Lysis Buffer to the cells (0.5 - 1 mL per 100 mm tissue culture plate).
4. Place the culture plates on ice for 10-20 minutes.
5. Detach the cells from the plates by scraping with a cell scraper.
6. Transfer the lysates to appropriate size tubes and place on ice.
7. If nuclear lysis occurs, the cell lysates may become very viscous and difficult to pipette. If this occurs, lysates can be passed through a 27½-gauge syringe needle 3-4 times to shear the genomic DNA.
8. Clear the lysates by centrifugation for 10 minutes (14,000 x g at 4°C).
9. Collect the supernatant and store samples on ice for immediate use, or snap freeze and store at -70°C for future use.
10. Proceed to GTPγS/GDP Loading for positive and negative controls, or Pull-Down Assay.

### **II. Suspension Cells**

1. Culture cells and stimulate with Ras activator(s) as desired.
2. Perform a cell count, and then pellet the cells by centrifugation.
3. Aspirate the culture media and wash twice with ice-cold PBS.
4. Completely remove the final PBS wash and add ice-cold 1X Assay/Lysis Buffer to the cell pellet (0.5 – 1 mL per  $1 \times 10^7$  cells).
5. Lyse the cells by repeated pipetting.
6. Transfer the lysates to appropriate size tubes and place on ice.
7. If nuclear lysis occurs, the cell lysates may become very viscous and difficult to pipette. If this occurs, lysates can be passed through a 27½-gauge syringe needle 3-4 times to shear the genomic DNA.
8. Clear the lysates by centrifugation for 10 minutes (14,000 x g at 4°C).
9. Collect the supernatant and store samples on ice for immediate use, or snap freeze and store at -70°C for future use.
10. Proceed to GTPγS/GDP Loading for positive and negative controls, or Pull-Down Assay.

## **Assay Protocol**

*Important Note: Before running any Small GTPase pull-down assay, it is always a good practice to run a Western Blot directly on the cell lysate using the antibody provided in this kit. For example: load 5  $\mu$ g, 10  $\mu$ g and 20  $\mu$ g of lysate onto an SDS-PAGE gel, transfer and blot. When proceeding with the pull-down assay, use 100-times the amount of lysate that gave you a clear band of your desired small GTPase in the direct Western blot. For example: if the 5  $\mu$ g band was faint but the 10  $\mu$ g band was clear and strong, use  $100 \times 10 \mu\text{g} = 1 \text{ mg}$  of lysate in the assay. Using sufficient lysate in the pull-down assay is critical to success.*

### **I. GTP $\gamma$ S/GDP Loading (Positive and Negative Controls)**

*Note: Samples that will not be GTP $\gamma$ S/GDP loaded may be kept on ice during the loading of controls.*

1. Aliquot 0.5 – 1 mL of each cell lysate to two microcentrifuge tubes.  
*Note: Typical protein content/sample is > 0.5 mg.*
2. Adjust the volume of each sample to 1 mL with 1X Assay Lysis Buffer.
3. Add 20  $\mu$ L of 0.5 M EDTA to each sample.
4. Add 10  $\mu$ L of 100X GTP $\gamma$ S to one tube (positive control) and 10  $\mu$ L of 100X GDP to the other tube (negative control). Mix and label each tube appropriately.
5. Incubate the tubes for 30 minutes at 30°C with agitation.
6. Stop the loading by adding 65  $\mu$ L of 1 M MgCl<sub>2</sub> to each tube. Mix and place tubes on ice.
7. Continue with Pull-Down assay.

### **II. Ras Pull-Down Assay**

1. Aliquot 0.5 – 1 mL of cell lysate (treated with Ras activators or untreated) to a microcentrifuge tube.
2. Adjust the volume of each sample to 1 mL with 1X Assay Lysis Buffer.
3. Thoroughly resuspend the Raf1 RBD Agarose bead slurry by vortexing or titrating.
4. Quickly add 40  $\mu$ L of resuspended bead slurry to each tube (including GTP $\gamma$ S/GDP controls).
5. Incubate the tubes at 4°C for 1 hour with gentle agitation.
6. Pellet the beads by centrifugation for 10 seconds at 14,000 x g.
7. Aspirate and discard the supernatant, making sure not to disturb/remove the bead pellet.
8. Wash the bead 3 times with 0.5 mL of 1X Assay Buffer, centrifuging and aspirating each time.
9. After the last wash, pellet the beads and carefully remove all the supernatant.
10. Resuspend the bead pellet in 40  $\mu$ L of 2X reducing SDS-PAGE sample buffer.
11. Boil each sample for 5 minutes.
12. Centrifuge each sample for 10 seconds at 14,000 x g.

### III. Electrophoresis and Transfer

1. Load 20  $\mu\text{L}$ /well of pull-down supernatant to a polyacrylamide gel. Also, it's recommended to include a pre-stained MW standard (as an indicator of a successful transfer in step 3).

*Note: If desired, 10  $\mu\text{L}$ /well of GTPase Immunoblot Control (provided ready-to-use, pre-boiled) can be added as an immunoblot positive control.*

2. Perform SDS-PAGE as per the manufacturer's instructions.
3. Transfer the gel proteins to a PVDF or nitrocellulose membrane as per the manufacturer's instructions.

### IV. Immunoblotting and Detection (all steps are at room temperature, with agitation)

1. Following the electroblotting step, immerse the PVDF membrane in 100% Methanol for 15 seconds, and then allow it to dry at room temperature for 5 minutes.

*Note: If Nitrocellulose is used instead of PVDF, this step should be skipped.*

2. Block the membrane with 5% non-fat dry milk in TBST for 1 hr at room temperature with constant agitation.

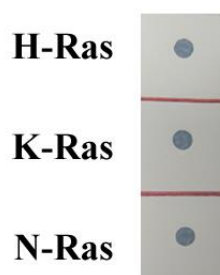
Incubate the membrane with Anti-pan-Ras Antibody, freshly diluted 1:1000 in 5% non-fat dry milk/TBST, for 1-2 hr at room temperature with constant agitation.

*Note: To conserve antibody, incubations should be performed in a plastic bag.*

3. Wash the blotted membrane three times with TBST, 5 minutes each time.
4. Incubate the membrane with a secondary antibody (e.g. Goat Anti-Mouse IgG, HRP-conjugate), freshly diluted in 5% non-fat dry milk/TBST, for 1 hr at room temperature with constant agitation.
5. Wash the blotted membrane three times with TBST, 5 minutes each time.
6. Use the detection method of your choice. We recommend enhanced chemiluminescence reagents from Pierce.

### Example of Results

The following figure demonstrates typical results seen with Cell Biolabs Pan-Ras Activation Assay Kit. One should use the data below for reference only.



**Figure 2: Pan-Ras Activation Assay.** Demonstrates Anti-pan-Ras monoclonal antibody specificity by dot blot.

## References

1. Bar-Sagi D., and Hall A. (2000) *Cell* **103**: 227-38.
2. de Rooij J., and Bos J. L. (1997) *Oncogene* **14**: 623-5.

## Recent Product Citations

1. Motta, M. et al. (2021). SPRED2 loss-of-function causes a recessive Noonan syndrome-like phenotype. *Am J Hum Genet.* **108**(11):2112-2129. doi: 10.1016/j.ajhg.2021.09.007.
2. Kanda, M. et al. (2020). Therapeutic monoclonal antibody targeting of neuronal pentraxin receptor to control metastasis in gastric cancer. *Mol Cancer.* **19**(1):131. doi: 10.1186/s12943-020-01251-0.
3. Bersuker, K. et al. (2019). The CoQ oxidoreductase FSP1 acts parallel to GPX4 to inhibit ferroptosis. *Nature.* doi: 10.1038/s41586-019-1705-2.
4. Dobenecker, M.W. et al. (2018). Signaling function of PRC2 is essential for TCR-driven T cell responses. *J Exp Med.* **215**(4):1101-1113. doi: 10.1084/jem.20170084.
5. Sangrador, I. et al. (2018). Zeb1 in Stromal Myofibroblasts Promotes Kras-Driven Development of Pancreatic Cancer. *Cancer Res.* **78**(10):2624-2637. doi: 10.1158/0008-5472.CAN-17-1882.
6. Ullrich, M. et al. (2017). OCD-like behavior is caused by dysfunction of thalamo-amygdala circuits and upregulated TrkB/ERK-MAPK signaling as a result of SPRED2 deficiency. *Mol Psychiatry.* doi: 10.1038/mp.2016.232.
7. Nakaoka, H. J. et al. (2016). NECAB3 promotes activation of hypoxia-inducible factor-1 during normoxia and enhances tumourigenicity of cancer cells. *Sci Rep.* **6**:22784.
8. Gall, J. M. et al. (2014). Conditional knockout of proximal tubule mitofusin 2 accelerates recovery and improves survival after renal ischemia. *J Am Soc Nephrol.* 10.1681/ASN.2014010126.
9. Nikolos, F. et al. (2014). ER $\beta$  regulates NSCLC phenotypes by controlling oncogenic RAS signaling. *Mol Cancer Res.* **12**:843-854.
10. Ohashi, K. et al. (2012). Lung cancers with acquired resistance to EGFR inhibitors occasionally harbor BRAF gene mutations but lack mutations in KRAS, NRAS, or MEK1. *PNAS.* **109**:E2127-E2133.
11. Harmon, B. et al. (2008). Induction of the G $\alpha$ q signaling cascade by the human immunodeficiency virus envelope is required for virus entry. *J. Virol.* **82**:9191-9205.
12. Camalier, C.E. et al. (2010). Elevated phosphate activates N-ras and promotes cell transformation and skin tumorigenesis. *Cancer Prev. Res.* **3**:359-370.
13. Geryk-Hall, M. et al. (2010). Driven to death: inhibition of farnesylation increases Ras activity in osteosarcoma and promotes growth arrest and cell death. *Mol. Cancer Ther.* **9**:1111-1119.



## **Warranty**

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