



Pioneering GTPase and Oncogene Product Development since 2010

Configuration-specific Monoclonal Antibody Based

Rap1 Activation Assay Kit

(30 Assays)

Cat. # 81401

FOR RESEARCH USE ONLY. NOT FOR DIAGNOSTIC APPLICATIONS

NewEast Biosciences
1150 First Avenue, Suite 501
King of Prussia, PA 19406

Support: 610-945-2007
info@neweastbio.com
Web: www.neweastbio.com

Rap1 Activation Assay Kit Protocol

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Introduction

A. Background

Small GTPases are a super-family of cellular signaling regulators. Rap1 belongs to the Rho sub-family of GTPases that regulate cell motility, cell division, and gene transcription. GTP binding increases the activity of Rap1, and the hydrolysis of GTP to GDP renders it inactive.

Currently the activation of Rap1 proteins is assayed with the binding of GTP-bound Rap1 to the p21-binding domain (PBD) of p21-activated protein kinase (PAK). This method is based on the observation that the active, GTP-bound Rap1 could bind to the PBD of PAK. However, the reproducibility of this method is poor. This is partially due to the relatively quick hydrolysis of GTP to GDP during the assay procedure, and the low binding affinity of PBD to Rap1-GTP.

B. Assay Principle

NewEast Biosciences Rap1 Activation Assay Kit uses configuration-specific anti-Rap1-GTP Mouse monoclonal antibody to measure Rap1-GTP levels either from cell extracts or from in vitro GTPγS loading Rap1 activation assays. Anti-Rap1-GTP mouse monoclonal antibody is first incubated with cell lysates containing Rap1-GTP. Next, the GTP-bound Rap1 is pulled down by protein A/G agarose. Finally, the precipitated Rap1-GTP is detected through immunoblot analysis using Anti-Rap1 Rabbit Polyclonal Antibody.

C. Kit Contents

This kit contains enough reagents for approximately 30-35 pull-down assays.

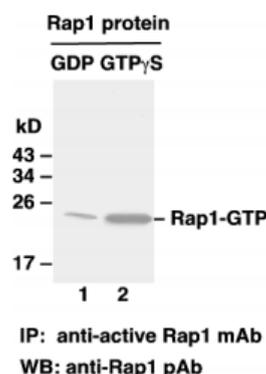
Reagent	Cat. #	Quantity	Storage
Anti-Rap1-GTP Mouse Monoclonal Antibody	26912	30 μL	-20°C
Protein A/G Agarose	30301	600 μL	4°C
5X Assay/Lysis Buffer	30302	30 mL	4°C
Anti-Rap1 Rabbit Polyclonal Antibody	21156	50 μL	-20°C
100X GTPγS	30303	50 μL	-20°C
100X GDP	30304	50 μL	-20°C
HRP-Goat Anti-Rabbit IgG	29002	50 μL	-20°C

D. Materials Needed but Not Supplied

1. Stimulated and non-stimulated cell lysates
2. Protease inhibitors
3. 4°C tube rocker or shaker
4. 0.5 M EDTA at pH 8.0
5. 1.0 M MgCl₂
6. 2X reducing SDS-PAGE sample buffer
7. Electrophoresis and immunoblotting systems
8. Immunoblotting wash buffer such as TBST (10 mM Tris-HCl, pH 7.4, 0.15 M NaCl, 0.05% Tween-20)
9. Immunoblotting blocking buffer (TBST containing 5% Non-fat Dry Milk or 3% BSA)
10. ECL Detection Reagents

E. Example Results

The following figure demonstrates example results seen with the Rap1 Activation Assay Kit. For reference only.



Rap1 Activation Assay. Purified Rap1 proteins were immunoprecipitated after treated with GDP (lane 1) or GTPγS (lane 2). Immunoprecipitation was done with the anti-Rap1-GTP monoclonal antibody (Cat. No. 26912). Immunoblot was with an anti-Rap1 polyclonal antibody (Cat. # 21104).

Assay Procedure

A. Reagent Preparation

1X Assay/Lysis Buffer: Shake the 5X Stock Buffer (Cat. # 30302) briefly and dilute with 4 times deionized water to make 1X buffer. Just prior to usage, add protease inhibitors such as 1 mM PMSF, 10 μg/mL leupeptin, and 10 μg/mL aprotinin.

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B. Sample Preparation

μL of 1 M MgCl_2 (final concentration of 60 mM).

Adherent Cells

1. Culture cells (one 10-cm plate) to approximately 80-90% confluence ($\sim 10^7$ cells). Stimulate the cells with activator or inhibitor as desired.
2. Aspirate the culture media and wash twice with ice-cold PBS buffer.
3. Completely remove the final PBS wash and add ice-cold 1X Assay/Lysis Buffer (See Reagent Preparation) to cells (0.5-1 mL per 10 cm 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 them on ice.
7. If nuclear lysis occurs, the cell lysates may become viscous and difficult to pipette. If this occurs, lysates can be passed through a 27 $\frac{1}{2}$ -gauge syringe needle 3-4 times to shear the genomic DNA.
8. Clear the lysates by centrifuging at 12,000 x g and 4°C for 10 minutes.
9. Collect the supernatant into a tube and store the sample (~ 1 -2 mg of total protein) on ice for immediate use, or snap freeze and store it at -70°C for the future use.

Suspension Cells

1. Culture cells and stimulate with activator or inhibitor as desired.
2. Perform a cell count and then pellet the cells through 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 (See Reagent Preparation) to the cell pellet (0.5-1 mL per 10^7 cells).
5. Lyse the cells by repeated pipetting.
6. Transfer the lysates to appropriate size tubes and place them on ice.
7. If nuclear lysis occurs, the cell lysates may become viscous and difficult to pipette. If this occurs, lysates can be passed through a 27 $\frac{1}{2}$ -gauge syringe needle 3-4 times to shear the genomic DNA.
8. Clear the lysates by centrifuging at 12,000 x g and 4°C for 10 minutes.
Collect the supernatant into a tube and store the sample (~ 1 -2 mg of total protein) on ice for immediate use, or snap freeze and store it at -70°C for future use.

C. In vitro GTP γ S/GDP Protein for Positive and Negative Controls

Note: In vivo stimulation of cells will activate approximately 10% of the available Rap1, whereas in vitro GTP γ S protein loading will activate nearly 90% of Rap1.

1. Aliquot 0.5 mL of cell extract (or 1 μg of purified Rap1 protein) into two microcentrifuge tubes.
2. To each tube, add 20 μL of 0.5 M EDTA (final concentration of 20 mM).
3. Add 5 μL of 100 X GTP γ S (Cat. # 30303) to the first tube as a positive control.
4. Add 5 μL of 100 X GDP (Cat. # 30304) to the second tube as a negative control.
5. Incubate both tubes at 30°C for 30 minutes with agitation.
6. Stop loading by placing the tubes on ice and adding 32.5

D. Affinity Precipitation of Activated G Protein

1. Aliquot 0.5-1 mL of cell lysates (about 1 mg of total cellular protein) to a microcentrifuge tube.
2. Adjust the volume to 1 mL with 1X Assay/Lysis Buffer (See Reagent Preparation).
3. Add 1 μL anti-Rap1-GTP antibody (Cat. # 26912).
4. Prepare the protein A/G Agarose bead slurry (Cat. # 30301) by resuspending through vortexing or titrating.
5. Quickly add 20 μL of resuspended bead slurry to above tube.
6. Incubate the tube at 4°C for 1 hour with gentle agitation.
7. Pellet the beads through centrifugation at 5,000 x g for 1 min.
8. Aspirate and discard the supernatant (making sure not to disturb or remove the bead pellet).
9. Wash the beads 3 times with 0.5 mL of 1X Assay/Lysis Buffer, centrifuging and aspirating each time.
10. After the third wash, pellet the beads through centrifugation and carefully remove all the supernatant.
11. Resuspend the bead pellet in 20 μL of 2X reducing SDS-PAGE sample buffer.
12. Boil the sample for 5 minutes.
13. Centrifuge it at 5,000 x g for 10 seconds.

E. Western Blot Analysis

1. Load 15 μL /well of pull-down supernatant to a polyacrylamide gel (17%). It is recommended to include Prestained Protein Markers (as an indicator of a successful transfer in step 3 below).
2. Perform SDS-PAGE following the manufacturer's instructions.
3. Transfer the gel proteins to a PVDF or nitrocellulose membrane following the manufacturer's instructions.
Note: Steps 4-11 are at room temperature with agitation
4. Following electroblotting, 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, step 4 should be skipped.
5. Block the membrane with 5% non-fat dry milk or 3% BSA in TBST for 1 hr at room temperature with constant agitation.
6. Wash the blotted membrane three times with TBST, 5 minutes each time.
7. Incubate the membrane with Anti-Rap1 Rabbit Polyclonal Antibody (Cat. # 21156), which is freshly diluted 1:50~500 (depending on the amount of Rap1 proteins in your sample) in 5% non-fat dry milk or 3% BSA in TBST, for 1-2 hr at room temperature with constant agitation or at 4°C overnight.
8. Wash the blotted membrane three times with TBST, 5 minutes each time.
9. Incubate the membrane with a secondary antibody (Cat. # 29002), which is freshly diluted 1:1000 in 5% non-fat dry milk or 3% BSA in TBST, for 1 hr at room temperature with constant agitation.
10. Wash the blotted membrane three times with TBST, 5 minutes each time.
11. Use the detection method of your choice such as ECL.