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Polyclonal Antibody to RSK1/2 p90 pSer380/386 - Aff - Purified

Alternate names: 90 kDa ribosomal protein S6 kinase 1, EC=2.7.11.1, MAP kinase-activated protein kinase 1a, MAPKAPK1A, RPS6KA1, RSK-1, RSK1, Ribosomal S6 kinase 1, Ribosomal protein S6 kinase alpha-1, S6K-alpha 1, p90-RSK 1, p90S6K, pp90RSK1

Catalog No.: BP7207

Quantity: 0.1 ml

Background: RSK1 (also called MAPK Activated Protein Kinase-1a; MAPKAP-K1a) is a member of the broadly expressed p90 Ribosomal S6 Kinase (RSK) family of serine/threonine kinases that also includes RSK2 (MAPKAP-K1b), RSK3 (MAPKAP-K1c), and RSK4. RSK proteins are substrates for and downstream transducers of MAPK signaling proteins, primarily ERK1&2. RSK proteins possess two separate kinase domains, the C-terminal kinase domain and the N-terminal kinase domain, separated by a linker region containing a hydrophobic motif. Activation of RSK is a multi-step process involving phosphorylation of multiple residues within the three domains, changes in RSK protein localization, and modulation of complex formation with ERK1&2 and/or 14-3-3β proteins. RSK proteins are activated by many stimuli including growth factors, phorbol esters, cAMP, heat shock, and irradiation. ERK1&2 phosphorylate threonine 573 (threonine 577 in RSK2) of the C-terminal kinase domain, thereby stimulating this kinase activity and leading to phosphorylation of serine 380 (serine 386 in RSK2) within the linker region. This is part of a docking site for PDK1, a constitutively active cytoplasmic kinase that phosphorylates serine 221 (serine 227 in RSK2) and thereby activates the N-terminal kinase domain to phosphorylate various substrates that include transporters, transcription factors, and transcription co-activators.

Host: Rabbit

Immunogen: Chemically synthesized phosphopeptide derived from a region of human RSK1 that contains serine 380.
Remarks: The sequence is conserved in mouse and rat.

Format: **State:** Liquid Ig fraction
Purification: Epitope-specific affinity chromatography. The antibody has been negatively preadsorbed using a non-phosphopeptide corresponding to the site of phosphorylation to remove antibody that is reactive with non-phosphorylated RSK1. The final product is generated by affinity chromatography using a RSK1-derived peptide that is phosphorylated at serine 380.
Buffer System: Dulbecco's phosphate buffered saline (without Mg2+ and Ca2+), pH 7.3 (+/- 0.1), 50% glycerol with 1.0 mg/mL BSA (IgG, protease free) as a carrier, containing 0.05 % sodium azide as preservative

Applications: Western blot (1:1000 starting dilution / 0.1-1.0 mg/ml).
Positive Controls Used: A431 or NIH3T3 cells treated with 100 ng/mL PMA for 30 minutes at

37°C, or HEK293E cells transfected with human RSK1, chicken RSK1, mouse RSK2 or human RSK3.
Other applications not tested. Optimal dilutions are dependent on conditions and should be determined by the user.

Specificity:

This antibody detects RSK1.
Species: Human, Mouse, Rat, Chicken.
Other species not tested.

Add. Information:

Human RSK3 (77 % homologous) cross-reacts to a limited degree.
Mouse RSK2 (85 % homologous)
Human RSK2 (85 % homologous)
Human RSK4 (85 % homologous)
are expected to react.

Storage:

Store at 2 - 8 °C up to one week or (in aliquots) at -20 °C for longer. Avoid repeated freezing and thawing.
Centrifuge vial before opening.
Shelf life: one year from despatch.

General Readings:

Cavet, M.E., et al. (2003) 14-3-3β is a p90 Ribosomal S6 Kinase (RSK) isoform 1-binding protein that negatively regulates RSK kinase activity. J. Biol. Chem. 278(20):18376-18383.
Roux, P.P., et al. (2003) Phosphorylation of p90 Ribosomal S6 Kinase (RSK) regulates Extracellular Signal-Regulated Kinase docking site and RSK activity. Mol. Cell. Biol. 23(14):4796-4804.
Kim, K.-W., et al. (2001) Extracellular Signal-Regulated Kinase/90-kDa Ribosomal S6 Kinase/ Nuclear Factor-κB pathway mediates phorbol-12-myristate 13-acetate-induced megakaryocytic differentiation in K562 cells. J. Biol. Chem. 276(16):13186-13191.
Richards, S.A., et al. (2001) Characterization of regulatory events associated with membrane targeting of p90 Ribosomal S6 Kinase 1. Mol. Cell. Biol. 21(21):7470-7480.
Zhang, Y., et al. (2001) UVA induces Ser381 phosphorylation of p90RSK/MAPKAP-K1 via ERK and JNK pathways. J. Biol. Chem. 276(18):14572-14580.
Jensen, C.J., et al. (1999) 90-kDa Ribosomal S6 Kinase is phosphorylated and activated by 3-Phosphoinositide-Dependent Protein Kinase-1. J. Biol. Chem. 274(38):27168-27176.
Smith, J.A., et al. (1999) Identification of an Extracellular Signal-Regulated Kinase (ERK) docking site in Ribosomal S6 Kinase, as sequence critical for activation by ERK in vivo. J. Biol. Chem. 274(5):2893-2898.

Protocols:

Western Blotting Procedure

1. Lyse approximately 10e7 cells in 0.5 mL of ice cold Cell Lysis Buffer (formulation provided below). This buffer, a modified RIPA buffer, is suitable for recovery of most proteins, including membrane receptors, cytoskeletal-associated proteins, and soluble proteins. Other cell lysis buffer formulations, such as Laemmli sample buffer and Triton-X 100 buffer, are also compatible with this procedure. Additional optimization of the cell stimulation protocol and cell lysis procedure may be required for each specific application.
2. Remove the cellular debris by centrifuging the lysates at 14,000 x g for 10 minutes. Alternatively, lysates may be ultracentrifugedat 100,000 x g for 30 minutes for greater clarification.
3. Carefully decant the clarified cell lysates into clean tubes and determine the protein concentration using a suitable method, such as the Bradford assay. Polypropylene tubes are recommended for storing cell lysates.
4. React an aliquot of the lysate with an equal volume of 2x Laemmli Sample Buffer (125 mM Tris, pH 6.8, 10% glycerol, 10% SDS, 0.006% bromophenol blue, and 130 mM dithiothreitol [DTT]) and boil the mixture for 90 seconds at 100°C.
5. Load 10-30 µg of the cell lysate into the wells of an appropriate single percentage or

gradient minigel and resolve the proteins by SDS-PAGE.
6. In preparation for the Western transfer, cut a piece of PVDF membrane slightly larger than the gel. Soak the membrane in methanol for 1 minute, then rinse with ddH2O for 5 minutes. Alternatively, nitrocellulose may be used.
7. Soak the membrane, 2 pieces of Whatman paper, and Western apparatus sponges in transfer buffer (formulation provided below) for 2 minutes.
8. Assemble the gel and membrane into the sandwich apparatus.
9. Transfer the proteins at 140 mA for 60-90 minutes at room temperature.
10. Following the transfer, rinse the membrane with Tris buffered saline for 2 minutes.
11. Block the membrane with blocking buffer (formulation provided below) for one hour at room temperature or overnight at 4°C.
12. Incubate the blocked blot with primary antibody at a 1:1000 starting dilution in Tris buffered saline supplemented with 3% Ig-free BSA and 0.1% Tween 20 overnight at 4°C or for two hours at room temperature.
13. Wash the blot with several changes of Tris buffered saline supplemented with 0.1% Tween 20.
14. Detect the antibody band using an appropriate secondary antibody, such as goat F(ab)2 anti-rabbit IgG alkaline phosphatase conjugate or goat F(ab)2 anti-rabbit IgG horseradish peroxidase conjugate in conjunction with your chemiluminescence reagents and instrumentation.

Cell Lysis Buffer Formulation:
10 mM Tris, pH 7.4
100 mM NaCl
1 mM EDTA
1 mM EGTA
1 mM NaF
20 mM Na4P2O7
2 mM Na3VO4
0.1% SDS
0.5% sodium deoxycholate
1% Triton-X 100
10% glycerol
1 mM PMSF (made from a 0.3 M stock in DMSO)
or 1 mM AEBSF (water soluble version of PMSF)
60 µg/mL aprotinin
10 µg/mL leupeptin
1 µg/mL pepstatin
(alternatively, protease inhibitor cocktail such as Sigma Cat. # P2714 may be used)

Transfer Buffer Formulation:
2.4 gm Tris base
14.2 gm glycine
200 mL methanol
Q.S. to 1 liter, then add 1 mL 10% SDS.
Cool to 4°C prior to use.

Tris Buffered Saline Formulation:
20 mM Tris-HCl, pH 7.4
0.9% NaCl

Blocking Buffer Formulation:
100 mL Tris buffered saline
5 gm BSA
0.1 mL Tween 20

Peptide Competition Experiment
The specificity of a Phosphorylation Site Specific Antibody (PSSA) in each experimental system can be confirmed through peptide competition. In this technique, aliquots of antibody are pre-incubated with peptide containing the sequence of the phosphopeptide immunogen used to raise the PSSA and the corresponding non-phosphopeptide. Following preincubation with the peptide, each antibody preparation is then used as a probe in antibody-based detection methods, such as Western blotting, immunocytochemistry, flow cytometry, or ELISA. With a PSSA specific for the phosphorylated target protein, pre-incubation with an excess of peptide containing the sequence of the phosphopeptide immunogen will block all antigen binding sites, while pre-incubation with the corresponding non-phosphopeptide will not affect the antibody.
In performing the Peptide Competition Experiment, it is important to note that the optimal dilutions of both antibody and peptide should be determined empirically for each specific application. The optimal dilution of antibody in these procedures is below saturating, as determined by previous experiments in your system.
The optimal dilution of peptide used in these procedures will depend on the overall affinity or avidity of the antibody, as well as the quantity of the target antigen. A 50-150 fold molar excess of peptide to antibody is found to be effective for most peptide competition experiments.
In the example presented below, the PSSA is used as a dilution of 1:1000 and the peptides are used at a concentration of 333 nM. The total volume of the phosphopeptide and nonphosphopeptide pre-incubated antibody preparations is 2 mL, sufficient for probing Western blot strips, as well as for use in other antibody-based detection methods. Under these conditions, the molar excess of peptide to antibody is › / = 50.

Procedure:
1. Prepare three identical test samples, such as identical PVDF or nitrocellulose strips to which the protein of interest has been transferred. The test samples should be blocked using a blocking buffer, such as Tris buffered saline supplemented with 0.1% Tween 20, and either 5% BSA or 5% non-fat dried milk.
2. Prepare 6.5 mL of working antibody stock solution (1:1000 in this example) by adding 6.5 µL of antibody stock solution to 6.5 ml of buffer containing blocking protein, such as TBS supplemented with 0.1% Tween 20, and either 3% BSA or 3% non-fat dried milk.
3. Apportion the unused PSSA into working aliquots and store at -20°C for future use (the stock PSSA contains 50% glycerol and will not freeze at this temperature).
4. Allow the lyophilized control peptides to reach room temperature, ideally under desiccation. 5. Reconstitute each of the control peptides to a concentration of 66.7 µM with nanopure water. (i.e. for a peptide with a molecular mass of 1500, reconstitution with 1 mL water yields a solution with a concentration of 66.7 µM).
6. Apportion the unused reconstituted peptide solutions into working aliquots and store at -20°C for future use.
7. Label 3 test tubes as follows:
- tube 1: water only no peptide control
- tube 2: phosphopeptide
- tube 3: non-phosphopeptide
8. Into each tube, pipette the following components
- tube 1: 2 mL diluted PSSA solution plus 10 µL nanopure water

- tube 2: 2 mL diluted PSSA solution plus 10 µL phosphopeptide
- tube 3: 2 mL diluted PSSA solution plus 10 µL non-phosphopeptide

9. Incubate the three tubes for 30 minutes at room temperature with gentle rocking. During this incubation, the peptides have the chance to bind to the combining site of the antibody.
10. At the end of the incubation step, transfer the contents of each of the three tubes to clean reaction vessels containing one of the three identical test samples.

For Western blotting strips:
Incubate the strips with the pre-incubated antibody preparations for 1 hour at room temperature or overnight at 4°C.
Wash each strip four times, five minutes each, to remove unbound antibody. Transfer each strip to a new solution containing a labeled secondary antibody [e.g., goat F(ab)2 anti-rabbit IgG alkaline phosphatase conjugate or goat F(ab)2 anti-rabbit IgG horseradish peroxidase conjugate.
Remove unbound secondary antibody by thorough washing, and develop the signal using your chemiluminescent reagents and instrumentation.
The signal obtained with antibody incubated with the "Water Only, No Peptide Control" (Tube 1), represents the maximum signal in the assay. This signal should be eliminated by preincubation with the "Phosphopeptide" (Tube 2), while pre-incubation with the "Non-Phosphopeptide" (Tube 3) should not impact the signal. If the "Phosphopeptide" only partially eliminates the signal, repeat the procedure using twice the volume of water or peptide solutions listed in Step 8. If partial competition is seen following pre-incubation with the "Non-Phosphopeptide", repeat the procedure using half the volumes of water or peptide solutions listed in Step 8.

Pictures:

Upregulation and Antibody-Peptide Competition Extracts of A431 cells unstimulated (1) or stimulated with 100 ng/mL PMA (a phorbol ester activator of protein kinase C) for 30 minutes at 37°C (2-5) were resolved by SDS-PAGE on a 10% Tris-glycine gel and transferred to PVDF. The membrane was blocked with a 5% BSA-TBST buffer for one hour at room temperature and incubated with the RSK1 [pS380] / RSK2 [pS386] antibody for two hours at room temperature in a 3% BSA-TBST buffer, following prior incubation with: no peptide (1, 2), the non-phosphopeptide corresponding to the phosphopeptide immunogen (3), a generic phosphoserine-containing peptide (4), or the phosphopeptide immunogen (5). After washing, the membrane was incubated with goat F(ab')2 anti-rabbit IgG HRP conjugate and signals were detected using the Pierce SuperSignalTM method. The data show that only the phosphopeptide corresponding to RSK1 [pS380] / RSK2 [pS386] blocks the antibody signal, demonstrating the specificity of the antibody. The data also show the upregulation of the RSK1 [pS380] / RSK2 [pS386] phosphorylation by stimulation with PMA in this cell system.