

## ALK-1 Protein, Rat (HEK293, His-Fc)

Cat. No.:	HY-P72820
Synonyms:	Serine/threonine-protein kinase receptor R3; SKR3; ALK-1; TSR-I; ACVRL1
Species:	Rat
Source:	HEK293
Accession:	P80203 (D23-A118)
Gene ID:	25237
Molecular Weight:	50-55 kDa

### PROPERTIES

AA Sequence	<p>D L V K P S R G Q L      V N C T C E N P H C      K R P I C Q G A W C      T V V L V R E Q G R</p> <p>H P Q V Y R G C G S      L N Q E L C L G R P      T E F V N H H C C Y      R S F C N H N V S L</p> <p>M L E A T Q T P S E      E P E V D A</p>
Biological Activity	The enzyme activity of this recombinant protein is testing in progress, we cannot offer a guarantee yet.
Appearance	Lyophilized powder.
Formulation	Lyophilized from a 0.2 $\mu$ m filtered solution of PBS, pH 7.4. Normally 5% - 8% trehalose, mannitol and 0.01% Tween 80 are added as protectants before lyophilization.
Endotoxin Level	<1 EU/ $\mu$ g, determined by LAL method.
Reconstitution	It is not recommended to reconstitute to a concentration less than 100 $\mu$ g/mL in ddH <sub>2</sub> O.
Storage & Stability	Stored at -20°C for 2 years. After reconstitution, it is stable at 4°C for 1 week or -20°C for longer (with carrier protein). It is recommended to freeze aliquots at -20°C or -80°C for extended storage.
Shipping	Room temperature in continental US; may vary elsewhere.

### DESCRIPTION

Background	<p>ALK-1, also known as ACVRL1, is a type I receptor for TGF-<math>\beta</math> superfamily with 2 ligands, BMP9 and BMP10. ALK-1 is predominantly expressed in endothelial cells and plays a critical role in regulating angiogenesis<sup>[1][2]</sup>.</p> <p>Mature human ALK-1 shares 89% amino acid sequence identity with mouse and rat ALK-1. While, mouse ALK-1 shares 96% aa sequence identity with rat ALK-1 protein.</p> <p>ALK-1 is able to bind to TGF-<math>\beta</math>1 or activins in the presence of either T<math>\beta</math>R-II or activin type II receptors, respectively. However, ALK-1 does not elicit a specific transcriptional response. Thus, ALK-1 has been considered an “orphan” receptor. ALK-1 is a type I receptor that mediates signaling of BMP9 (bone morphogenetic protein) and BMP10, proteins in the TGF-<math>\beta</math></p>
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superfamily. Signaling through ALK-1 results in phosphorylation of the intracellular Smad 1/5/8 cascade which activates proangiogenic transcription factors such as ID1 and ID3. ALK-1 binds to TGF- $\beta$ 1 and phosphorylates Smad1 and Smad5. Overexpression of ALK-1 in HepG2 cells inhibits the ALK5-mediated TGF- $\beta$ 1 response. The balance between ALK-1 and ALK5 may be crucial for controlling the properties of endothelium during angiogenesis<sup>[1]</sup>. BMP9/BMP10/ALK-1 signaling controlled the specific gene expression program and survival of Kupffer cells (KCs) through a Smad4-dependent pathway. Functionally, the loss of ALK-1 resulted in impaired capture of L. monocytogenes and overwhelming disseminated infections [2].

ALK-1 is expressed in blood vessels during embryogenesis and adult stages. In addition, mutations of the ALK-1 gene have been linked to the type II hereditary hemorrhagic telangiectasia<sup>[1]</sup>. ALK-1 inhibits BMP9-mediated Id-1 expression in human umbilical vein endothelial cells. In a chick chorioallantoic membrane assay, ALK-1 reduces VEGF-, FGF-, and BMP10-mediated vessel formation. In addition, ALK1 reduces tumor burden in mice receiving orthotopic grafts of MCF7 mammary adenocarcinoma cells<sup>[3]</sup>.

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## REFERENCES

- [1]. S P Oh, et al. Activin receptor-like kinase 1 modulates transforming growth factor-beta 1 signaling in the regulation of angiogenesis. Proc Natl Acad Sci U S A. 2000 Mar 14;97(6):2626-31.
- [2]. Dianyan Zhao, et al. ALK1 signaling is required for the homeostasis of Kupffer cells and prevention of bacterial infection. J Clin Invest. 2022 Feb 1;132(3):e150489.
- [3]. Dianne Mitchell, et al. ALK1-Fc inhibits multiple mediators of angiogenesis and suppresses tumor growth. Mol Cancer Ther. 2010 Feb;9(2):379-88.
- [4]. Dongxing Zhu, et al. BMP-9 regulates the osteoblastic differentiation and calcification of vascular smooth muscle cells through an ALK1 mediated pathway. J Cell Mol Med. 2015 Jan;19(1):165-74.
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Tel: 609-228-6898

Fax: 609-228-5909

E-mail: tech@MedChemExpress.com

Address: 1 Deer Park Dr, Suite Q, Monmouth Junction, NJ 08852, USA