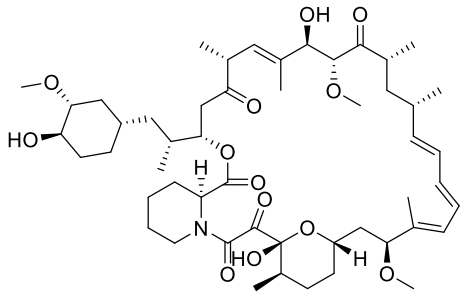
Product data sheet

MedKoo Cat#: 100766 Name: Sirolimus (Rapamycin) CAS#: 53123-88-9 Chemical Formula: $C_{51}H_{79}NO_{13}$ Exact Mass: 913.55514 Molecular Weight: 914.17	
Product supplied as:	Powder
Purity (by HPLC):	≥ 98%
Shipping conditions	Ambient temperature
Storage conditions:	Powder: -20°C 3 years; 4°C 2 years.
	In solvent: -80°C 3 months; -20°C 2 weeks.

1. Product description:

Sirolimus, also known as rapamycin, is a natural macrocyclic lactone produced by the bacterium Streptomyces hygroscopicus, with immunosuppressant properties. In cells, sirolimus binds to the immunophilin FK Binding Protein-12 (FKBP-12) to generate an immunosuppressive complex that binds to and inhibits the activation of the mammalian Target Of Rapamycin (mTOR), a key regulatory kinase. This results in inhibition of T lymphocyte activation and proliferation that occurs in response to antigenic and cytokine (IL-2, IL-4, and IL-15) stimulation and inhibition of antibody production.

2. CoA, QC data, SDS, and handling instruction

SDS and handling instruction, CoA with copies of QC data (NMR, HPLC and MS analytical spectra) can be downloaded from the product web page under "QC And Documents" section. Note: copies of analytical spectra may not be available if the product is being supplied by MedKoo partners. Whether the product was made by MedKoo or provided by its partners, the quality is 100% guaranteed.

3. Solubility data

Solvent	Max Conc. mg/mL	Max Conc. mM
DMSO	63.32	69.27
DMF	10.0	10.94
Ethanol	80.0	87.51

4. Stock solution preparation table:

Concentration / Solvent Volume / Mass	1 mg	5 mg	10 mg
1 mM	1.09 mL	5.47 mL	10.94 mL
5 mM	0.22 mL	1.09 mL	2.19 mL
10 mM	0.11 mL	0.55 mL	1.09 mL
50 mM	0.02 mL	0.11 mL	0.22 mL

5. Molarity Calculator, Reconstitution Calculator, Dilution Calculator

Please refer the product web page under section of "Calculator"

6. Recommended literature which reported protocols for in vitro and in vivo study

In vitro study

1. Nie D, Zhang J, Zhou Y, Sun J, Wang W, Wang JH. Rapamycin Treatment of Tendon Stem/Progenitor Cells Reduces Cellular Senescence by Upregulating Autophagy. Stem Cells Int. 2021 Feb 1;2021:6638249. doi: 10.1155/2021/6638249. PMID: 33603790; PMCID: PMC7870298.
2. Sahni A, Narra HP, Sahni SK. Activation of Mechanistic Target of Rapamycin (mTOR) in Human Endothelial Cells Infected with Pathogenic Spotted Fever Group Rickettsiae. Int J Mol Sci. 2020 Sep 29;21(19):7179. doi: 10.3390/ijms21197179. PMID: 33003310; PMCID: PMC7582468.

In vivo study

1. Lin F, Liu Y, Tang L, Xu X, Zhang X, Song Y, Chen B, Ren Y, Yang X. Rapamycin protects against aristolochic acid nephropathy in mice by potentiating mammalian target of rapamycin-mediated autophagy. Mol Med Rep. 2021 Jul;24(1):495. doi: 10.3892/mmr.2021.12134. Epub 2021 May 6. PMID: 33955513; PMCID: PMC8127069.

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2. Wu J, Zhong W, Zhang H, Yin Y. Mammalian Target of Rapamycin Signaling Enhances Ovalbumin-Induced Neutrophilic Airway Inflammation by Promoting Th17 Cell Polarization in Murine Noneosinophilic Asthma Model. Pediatr Allergy Immunol Pulmonol. 2020 Mar;33(1):25-32. doi: 10.1089/ped.2019.1088. PMID: 33406024; PMCID: PMC7875112.

7. Bioactivity

Biological target:

Rapamycin (Sirolimus; AY 22989) is a potent and specific mTOR inhibitor with an IC50 of 0.1 nM in HEK293 cells.

In vitro activity

To further investigate the role of autophagy in the regulation of PTSC senescence and the potential mechanisms involved, this study examined the protein expression levels of autophagy markers and SASP markers with bleomycin and rapamycin treatments. First, the expression of p62, which was inversely correlated with autophagy, was increased in the bleomycin-treated PTSCs (Figure 3(a)). The addition of rapamycin reversed the p62 expression to the basal level as in the control group (Figures 3(a) and 3(b)). Meanwhile, as an indicator of autophagy activation, the LC3 II/LC3 I expression ratio was significantly reduced by bleomycin treatment in the PTSCs, but rapamycin antagonized this decrease (Figures 3(a) and 3(c)). Moreover, rapamycin at the dose of 25 nM completely inhibited the downstream responder S6 phosphorylation, indicating an inhibition of the mTOR signaling pathway (Figure 3(a)).

Reference: Stem Cells Int. 2021; 2021: 6638249. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7870298/

In vivo activity

As expected, rapamycin treatment effectively prevented the AA-induced increase in mTOR and S6K1 phosphorylation, which led to marked elevations in AA-induced renal expression of the autophagy markers (Fig. 2). This suggested that inhibiting mTOR activity by rapamycin further activated renal autophagy. Autophagy and apoptosis are two connected pathological processes involved in the development of AAN. To determine the effects of rapamycin on renal apoptosis in AAN mice, the protein expression of Bcl-2 and Bax, common markers of apoptosis, was assessed in kidney tissues using western blotting. The results indicated that the kidney tissue of AA-treated mice presented with decreased expression of Bcl-2 and increased expression of Bax, which were reversed by rapamycin treatment (Fig. 2A, G and H), suggesting that rapamycin inhibited apoptosis in the kidneys of AA-treated renal injury mice. Taken together, these observations indicate that rapamycin supplementation inhibits the renal activity of mTOR, which promotes renal autophagy, thereby probably suppressing the apoptosis of kidney tissues in mice with AA-induced renal injury.

Reference: Mol Med Rep. 2021 Jul; 24(1): 495. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8127069/