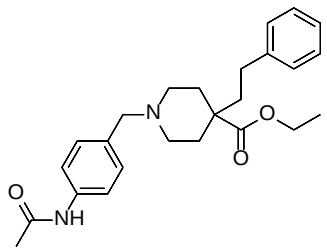
Product data sheet

MedKoo Cat#: 555940 Name: CYM51010 CAS: 1069498-96-9 Chemical Formula: $C_{25}H_{32}N_2O_3$ Exact Mass: 408.2413 Molecular Weight: 408.542	
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:
CYM51010, also known as CID23723457 and ML335, is a biased ligand of μ-opioid receptor – δ-opioid receptor heterodimers. CYM51010 exhibits anti-nociceptive activity similar to morphine, but with a decreased levels of tolerance development and withdrawal symptoms. ML335 showed an EC50 of 403 nM, and selectivities vs. OPRM1, OPRD1, and HTR5A of 37, 2.7, and >99, respectively.

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	5.0	12.24

4. Stock solution preparation table:

Concentration / Solvent Volume / Mass	1 mg	5 mg	10 mg
1 mM	2.45 mL	12.24 mL	24.48 mL
5 mM	0.49 mL	2.45 mL	4.90 mL
10 mM	0.25 mL	1.22 mL	2.45 mL
50 mM	0.05 mL	0.25 mL	0.49 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

Gomes I, Fujita W, Gupta A, Saldanha SA, Negri A, Pinello CE, Eberhart C, Roberts E, Filizola M, Hodder P, Devi LA. Identification of a μ-δ opioid receptor heteromer-biased agonist with antinociceptive activity. Proc Natl Acad Sci U S A. 2013 Jul 16;110(29):12072-7. doi: 10.1073/pnas.1222044110. Epub 2013 Jul 1. Erratum in: Proc Natl Acad Sci U S A. 2013 Oct 15;110(42):1760. Saldanha, Adrian S [corrected to Saldanha, S Adrian]; Eberhart, Christina [added]. PMID: 23818586; PMCID: PMC3718106.

In vivo study

Tiwari V, He SQ, Huang Q, Liang L, Yang F, Chen Z, Tiwari V, Fujita W, Devi LA, Dong X, Guan Y, Raja SN. Activation of μ-δ opioid receptor heteromers inhibits neuropathic pain behavior in rodents. Pain. 2020 Apr;161(4):842-855. doi: 10.1097/j.pain.0000000000001768. PMID: 31815916; PMCID: PMC7085422.

7. Bioactivity
Biological target:
CYM51010 is a biased ligand of μ-opioid receptor – δ-opioid receptor heterodimers with an EC_{50} of 403 nM.

Product data sheet

In vitro activity

This study reports the identification of compounds targeting μOR-δOR heteromers through high-throughput screening of a small-molecule library. Among them, CYM51010 was found to be a μOR-δOR-biased ligand, because its activity is blocked by the μOR-δOR heteromer antibody. Notably, systemic administration of CYM51010 induced antinociceptive activity similar to morphine, and chronic administration of CYM51010 resulted in lesser antinociceptive tolerance compared with morphine. Taken together, these results suggest that CYM51010, a μOR-δOR-biased ligand, could serve as a scaffold for the development of a unique type (heteromer-biased) of drug that is more potent and without the severe side effects associated with conventional clinical opioids.

Reference: Proc Natl Acad Sci U S A. 2013 Jul 16;110(29):12072-7. https://pubmed.ncbi.nlm.nih.gov/23818586/

In vivo activity

This study examined the effects of spinal nerve injury on μ-δ heteromer expression in dorsal root ganglion (DRG) neurons and the effects of a μ-δ heteromer-targeting agonist, CYM51010, on neuropathic pain behavior in rats and mice. Importantly, in SNL rats, subcutaneous injection of CYM51010 inhibited mechanical hypersensitivity in a dose-related manner (EC50: 1.09 mg/kg) and also reversed heat hyperalgesia and attenuated ongoing pain (2 mg/kg, subcutaneously). Electrophysiologic studies showed that CYM51010 inhibited the C-component and windup phenomenon in spinal wide dynamic range neurons of SNL rats. The pain inhibitory effects of CYM51010 persisted in morphine-tolerant rats but was markedly attenuated in μ-OR knockout mice.

Reference: Pain. 2020 Apr;161(4):842-855. https://pubmed.ncbi.nlm.nih.gov/31815916/