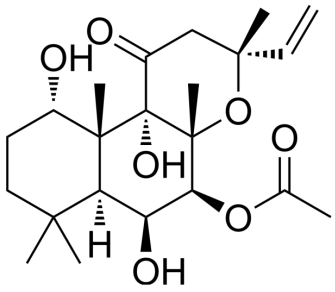
Forskolin

Cat. No.:	HY-15371
CAS No.:	66575-29-9
Molecular Formula:	$C_{22}H_{34}O_7$
Molecular Weight:	410.5
Target:	Adenylate Cyclase; Autophagy; FXR
Pathway:	GPCR/G Protein; Autophagy; Metabolic Enzyme/Protease
Storage:	4°C, protect from light * In solvent : -80°C, 6 months; -20°C, 1 month (protect from light)



SOLVENT & SOLUBILITY

In Vitro

DMSO : 100 mg/mL (243.61 mM; Need ultrasonic)

Preparing Stock Solutions	Solvent / Mass / Concentration	1 mg	5 mg	10 mg
	1 mM	2.4361 mL	12.1803 mL	24.3605 mL
	5 mM	0.4872 mL	2.4361 mL	4.8721 mL
	10 mM	0.2436 mL	1.2180 mL	2.4361 mL

Please refer to the solubility information to select the appropriate solvent.

In Vivo

1. Add each solvent one by one: 10% DMSO >> 40% PEG300 >> 5% Tween-80 >> 45% saline
   Solubility: ≥ 2.5 mg/mL (6.09 mM); Clear solution
2. Add each solvent one by one: 10% DMSO >> 90% corn oil
   Solubility: ≥ 2.5 mg/mL (6.09 mM); Clear solution

BIOLOGICAL ACTIVITY

Description

Forskolin (Coleonol) is a potent adenylate cyclase activator with an IC_{50} of 41 nM and an EC_{50} of 0.5 μM for type I adenylyl cyclase[1]. Forskolin is also an inducer of intracellular cAMP formation[2]. Forskolin induces differentiation of various cell types and activates pregnane X receptor (PXR) and FXR[3]. Forskolin exerts a inotropic effect on the heart, and has platelet antiaggregatory and antihypertensive actions. Forskolin also induces autophagy[4][5].

IC_{50} & Target

IC50: 41 nM (Adenylyl cyclase)[1]
EC50: 0.5 μM (Adenylyl cyclase)[1]

In Vitro

Forskolin (Coleonol) is also a potent exosome biogenesis and/or secretion activator in prostate cancer (PC) cells[8].
?Forskolin (Fsk) is a naturally occurring diterpene isolated from Coleus forskholii, directly activates adenylyl cyclase (AC) through its catalytic subunit to increase intracellular levels of cyclic adenosine monophosphate (cAMP)[1].

	?Forskolin (Fsk) affects the proliferation of the human T-cell lines such as Kit 225 and MT-2. Forskolin treatment inhibits the proliferation of both Kit 225 and MT-2 cells in a dose-dependent manner with an IC_{50} equal to ~5 μM Fsk. Forskolin treatment (10-100 μM) increases cAMPi levels ~5- to 20-fold above basal levels, which reache maximum levels between 50-100 μM Forskolin[6]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.
In Vivo	The Forskolin (Coleonol)-treated $Mrp4^{-/-}$ mice shows an increased number of Ki67-positive and cleaved caspase 3-positive ECs, a significant decrease in the amount of pericyte coverage, and a reduced number of empty sleeves. In pups exposed to hyperoxia (75% oxygen) from P7 to P12, the $Mrp4^{-/-}$ mice shows a significant increase in the unvascularized retinal area[2]. ?The average blood glucose in the healthy rat group is 102.12±1.94 mg/dL, 101.25±3.56 for control group and 103±2.08 in forskolin group. The data shows that glucose levels at the end of the study are lower in forskolin group, with a significant difference according to the statistical tests applied (p=0.03)[7]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

PROTOCOL

Cell Assay [2]	Quiescent Kit 225 or MT-2 cells are seeded into 96-well plates at 5×10^4 cells per well. Cells are then pretreated for 1 h with 1% DMSO (vehicle) or Forskolin at 1, 5, 10, 25, 50, and 100 μMconcentrations. The cells are stimulated with IL-2 and cultured for an additional 20 h at 37°C. Control cells are treated with 1% DMSO for 20 h. During the final 4 h of incubation, the cells are pulsed with [^{3}H]thymidine at a concentration of 0.5 μCi/200 μL. Cells are harvested onto fiberglass filters and analyzed using liquid scintillation counting[2]. MCE has not independently confirmed the accuracy of these methods. They are for reference only.
Animal Administration [3][4]	Mice[3] C57BL/6J mice are used. Mrp4-knockout mice, which are established and repeatedly backcrossed to the C57BL/6J mice. Forskolin is injected intraperitoneally into neonatal mice at postnatal days 4 (P4) and 5 (P5). Mice injected with DMSO serve as the controls. The treated mice are euthanized at P6, and their retinas are isolated for whole-mount immunohistochemistry (IHC). The effect of different concentrations of Forskolin on the survival rate and retinal vasculature is first tested, and the optimal concentration is determined, 1.0 μg/50 μL (0.3 mg/kg) at P4 and 1.5 μg/50 μL (0.5 mg/kg) at P5, used to compare the retinal vascular phenotypes between WT mice and Mrp4-deficient mice. Rats[4] Male Wistar rats, aged 10-14 weeks old, with a mean weight of 300 g±50 g, are divided into four groups; 19 are experimentally induced to develop diabetes, and 8 are maintained in a healthy condition. Both diabetic and healthy rats receive no Forskolin (control), or 6 mg/kg per day of Forskolin, administered orally for 8 weeks. Blood glucose levels are determined in each group before and after Forskolin treatment. The diabetic rats are tested two weeks after confirming the presence of diabetes (three weeks after the induction) and after eight weeks of the designated treatment. MCE has not independently confirmed the accuracy of these methods. They are for reference only.

CUSTOMER VALIDATION

- Cancer Cell. 2023 Jun 12;41(6):1103-1117.e12.
- Signal Transduct Target Ther. 2021 Feb 28;6(1):91.
- Nat Cell Biol. 2023 Jun 5.
- Nat Metab. 2022 Jan 6.
- Bioact Mater. 2023 Sep, 377-393.

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REFERENCES

[1]. Robbins JD, et al. Forskolin carbamates: binding and activation studies with type I adenylyl cyclase. J Med Chem. 1996 Jul 5;39(14):2745-52.

[2]. Matsumiya W, et al. Forskolin modifies retinal vascular development in Mrp4-knockout mice. Invest Ophthalmol Vis Sci. 2012 Dec 7;53(13):8029-35.

[3]. Mayati A, et al. Functional polarization of human hepatoma HepaRG cells in response to forskolin. Sci Rep. 2018 Oct 31;8(1):16115.

[4]. Awad JA, et al. Interactions of forskolin and adenylate cyclase. Effects on substrate kinetics and protection against inactivation by heat and N-ethylmaleimide. J Biol Chem. 1983 Mar 10;258(5):2960-5.

[5]. Seamon KB, et al. Structure-activity relationships for activation of adenylate cyclase by the diterpene forskolin and its derivatives. J Med Chem. 1983 Mar;26(3):436-9.

[6]. Ríos-Silva M, et al. Effect of chronic administration of forskolin on glycemia and oxidative stress in rats with and without experimental diabetes. Int J Med Sci. 2014 Mar 11;11(5):448-52.

[7]. Rodriguez G, et al. Forskolin-inducible cAMP pathway negatively regulates T-cell proliferation by uncoupling the interleukin-2 receptor complex. J Biol Chem. 2013 Mar 8;288(10):7137-46.

[8]. Amrita Datta, et al. High-throughput screening identified selective inhibitors of exosome biogenesis and secretion: A drug repurposing strategy for advanced cancer. Sci Rep. 2018 May 25;8(1):8161.

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