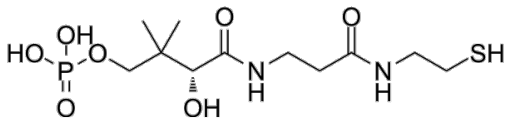
Product Data Sheet

Product Name: 4’-Phosphopantetheine
Cat. No.: GC81603

Chemical Properties

Cas. No.	2226-71-3		
Formula	$C_{11}H_{23}N_2O_7PS$	M.Wt	358.35
Solubility		Storage	Store at -20°C, sealed storage, away from moisture and light
General tips	For obtaining a higher solubility , please warm the tube at 37 °C and shake it in the ultrasonic bath for a while.Stock solution can be stored below -20°C for several months.		
Shipping Condition	Evaluation sample solution : ship with blue ice All other available size: ship with RT , or blue ice upon request.		
Structure			



Background

4’-Phosphopantetheine is an orally active coenzyme A (CoA) precursor. 4’-Phosphopantetheine is membrane-permeable and acts as a CoA precursor, a prosthetic group, and a reactive oxygen species (ROS) inhibitor. 4’-Phosphopantetheine binds covalently to rat liver fatty acid synthase, modifies the conserved serine residue in the PKS / NRPS carrier protein domain, and serves as a substrate for CoA synthase and PPAT. 4’-Phosphopantetheine undergoes non-catalytic exchange on rat liver fatty acid synthase, with a faster turnover rate than that of the enzyme complex, and restores intracellular CoA levels in cells with impaired de novo biosynthesis. 4’-Phosphopantetheine rescues

phenotypes induced by CoA deficiency, normalizes PKAN -related biomarkers, restores mitochondrial enzyme activity, and alleviates vascular endothelial damage. 4'-Phosphopantetheine shows biological stability in serum, acts as a prosthetic group and degradation product of ACP, and inhibits the formation of atherosclerotic plaques. 4'-Phosphopantetheine can be used in the research of brain iron accumulation neurodegenerative diseases, pantothenate kinase-associated neurodegeneration, CoASY protein-associated neurodegenerative diseases, coronary heart disease, and atherosclerosis [1] [2] [3] [4] [5] [6] [7] [8].

In Vivo, 4'-Phosphopantetheine (1.1 mCi calcium-3H-pantothenate; intraperitoneal injection; single administration) serves as the prosthetic group of rat liver FAS. Its exchange rate with free pantothenate compounds is over one order of magnitude faster than the half-life (71-108 hours) of this enzyme complex, and it reaches maximal labeling within 14 hours[1]. 4'-Phosphopantetheine (0.82-20 μg/g; p.o.; once daily; 14 days) normalizes CoA, iron, dopamine-related biomarkers, and mitochondrial enzyme activity in Pank2 knockout mice with PKAN, but its effects reverse within 7 days after discontinuation[3]. 4'-Phosphopantetheine (10 μg; intravenous injection; once weekly; for 15 consecutive weeks) reduces vascular endothelial injury by inhibiting ROS production and ox-LDL accumulation, thereby attenuating atherosclerotic plaque formation in ApoE–/– mice fed a high-fat diet and significantly reducing the plaque area ratio to approximately 3%[8].

In Vitro, 4'-Phosphopantetheine is the prosthetic group of purified rat liver fatty acid synthetase, which accounts for over 90% of the bound label in the preparation[1]. 4′-Phosphopantetheine (100 μM; 48 h) increases intracellular 4′-phosphopantetheine levels in HoPan-treated Drosophila S2 cells, reversing the reduction caused by PANK inhibition[2]. 4′-Phosphopantetheine (25-800 μM; 48 h) rescues the reduced cell count phenotype in HoPan-treated Drosophila S2 cells in vitro in a concentration-dependent manner, with maximal rescue at 100-400 μM[2]. 4′-Phosphopantetheine (100 μM; 3 d) rescues the reduced cell count phenotype and histone acetylation in dPANK/fbl RNAi-treated Drosophila S2 cells[2]. 4′-Phosphopantetheine (25 μM; 4 d) rescues the reduced histone acetylation phenotype in HoPan-treated Drosophila S2 cells[2]. 4′-Phosphopantetheine (25 μM; 4 d) rescues the reduced cell count phenotype and intracellular CoA levels in HoPan-treated HEK293 cells[2]. 4′-Phosphopantetheine (100 μM; unspecified time) enters Drosophila S2 cells and is intracellularly converted to CoA, even under conditions of impaired de novo CoA biosynthesis caused

by HoPan treatment[2]. 4′-Phosphopantetheine (100 μM; 10-30 min) enters Drosophila S2 cells via passive diffusion, as shown by temperature-independent uptake kinetics over 30 min of incubation with 100 μM labeled 4′-phosphopantetheine[2]. 4′-Phosphopantetheine (10-1000 μM; unspecified time) uptake by Drosophila S2 cells is concentration-dependent and temperature-independent, consistent with passive diffusion[2]. 4’-Phosphopantetheine (25-400 μM; 24 h) normalizes COASY gene expression in primary human PKAN fibroblasts in a dose-dependent manner[3]. 4'-Phosphopantetheine (0.23 μmoles; 30 min) isolated from hydrolyzed Escherichia coli ACP is enzymatically converted to CoA with 61% efficiency, confirming its identity as the prosthetic group of ACP[4]. 4'-Phosphopantetheine components in peptides isolated from peptic hydrolysates of 14C-malonyl-labeled Escherichia coli ACP are present in unimolar amounts, confirming 4'-Phosphopantetheine is the substrate-binding prosthetic group of ACP[4]. 4’-Phosphopantetheine (2.3-150 μM; 0, 10, 20, 30, 40 min) acts as a substrate for Staphylococcus aureus PPAT and exhibits significant substrate inhibition of the enzyme, while the cycloalkyl pyrimidine inhibitor competes with 4’-Phosphopantetheine for binding to the enzyme[7]. 4’-Phosphopantetheine (50-800 μM; 0, 10, 20, 30, 40 min) acts as a substrate for Streptococcus pneumoniae PPAT with a Michaelis constant of 223 μM, and the cycloalkyl pyrimidine inhibitor competes with 4’-Phosphopantetheine for binding to the enzyme and enzyme-ATP complex[7]. 4’-Phosphopantetheine (50 μM; 3 days, daily replenishment) normalizes complex I activity and reverses the glycolytic shift in primary human PKAN fibroblasts[3]. 4'-Phosphopantetheine (4 μM β-[3H]alanine; grown to late-logarithmic phase) accumulates as a major intracellular and extracellular metabolite in Escherichia coli strain SJ16[5]. 4'-Phosphopantetheine (4 μM β-[3H]alanine; up to 25 h of culture) is excreted into the growth medium of Escherichia coli strain SJ16 starting at 6 h of growth, accumulates continuously to 2.6 nmol/mL, and is not reutilized by the cells[5]. 4'-Phosphopantetheine (4 μM β-[3H]alanine, 4 μM β-[14C]alanine; overnight growth, grown to late-logarithmic phase) produced by Escherichia coli strain SJ16 originates from the degradation of intracellular ACP, rather than de novo biosynthesis from β-alanine[5]. 4'-Phosphopantetheine (0.8 μM, 0.6 μM; outgrowth assay, 1 h incubation at 37°C) cannot be assimilated by β-alanine-starved Escherichia coli strain SJ16 into CoA or ACP, nor used to support growth[5]. 4’-Phosphopantetheine (1 μg/mL; 24 h) inhibits ROS generation and ox-LDL accumulation in human umbilical vein vascular endothelial cells at a concentration of 1 μg/mL after 24 h of incubation[8].

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References:

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[3]. Jeong SY, et al. 4'-Phosphopantetheine corrects CoA, iron, and dopamine metabolic defects in mammalian models of PKAN. EMBO molecular medicine. 2019 Dec;11(12):e10489.
[4]. MAJERUS PW, et al. ACYL CARRIER PROTEIN. IV. THE IDENTIFICATION OF 4'-PHOSPHOPANTETHEINE AS THE PROSTHETIC GROUP OF THE ACYL CARRIER PROTEIN. Proc Natl Acad Sci U S A. 1965 Feb;53(2):410-7.
[5]. Jackowski S, et al. Metabolism of 4'-phosphopantetheine in Escherichia coli. Journal of bacteriology. 1984 Apr;158(1):115-20.
[6]. Meier JL, et al. Practical 4'-phosphopantetheine active site discovery from proteomic samples. Journal of proteome research. 2011 Jan 07;10(1):320-9.
[7]. de Jonge BL, et al. Discovery of inhibitors of 4'-phosphopantetheine adenylyltransferase (PPAT) to validate PPAT as a target for antibacterial therapy. Antimicrobial agents and chemotherapy. 2013 Dec;57(12):6005-15.
[8]. Zhai T, et al. 4'-phosphopantetheine acts as a potential antioxidant to limit atherosclerotic plaque formation by inhibiting ROS generation. Frontiers in physiology. 2022;13:989105.

Caution: Product has not been fully validated for medical applications. For research use only.
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