

D-CALCIUM PANTOTHENATE

Definition

Calcium salt of dextrorotatory isomer of pantothenic acid, belonging to the group of water-soluble vitamins, member of B-complex-vitamins

Synonymous names

Dextrorotatory-calcium-pantothenate,
D-Calcium-Pantothenate,
Calcium-d-Pantothenate,
D-Pantothenic Acid Calcium salt,
coenzyme A factor

Old (obsolete) names from literature

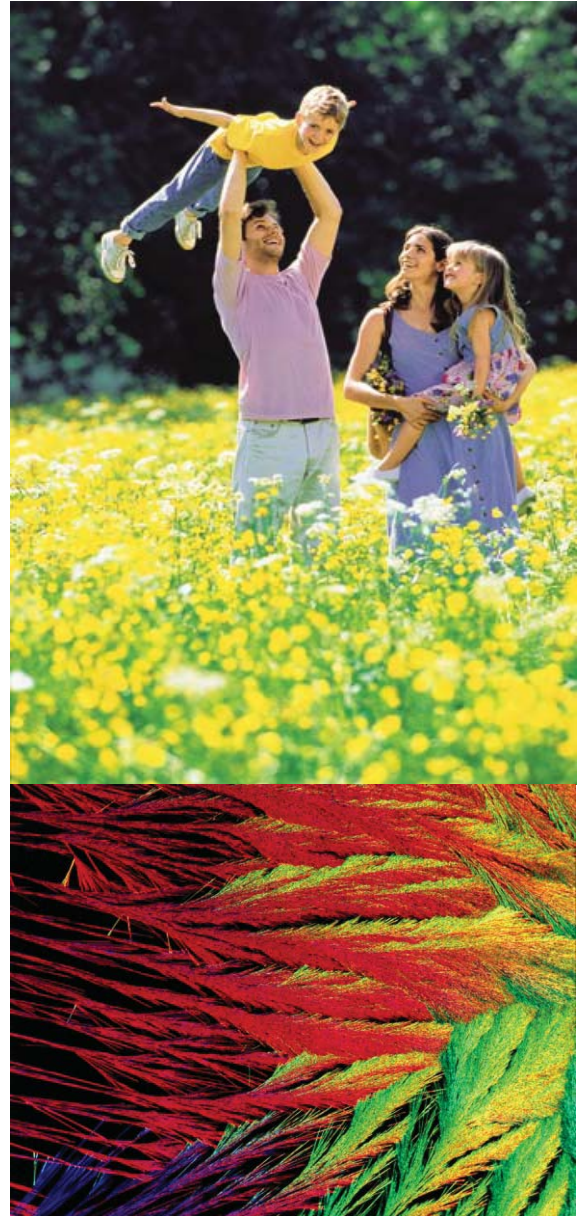
Vitamin B3
Vitamin B5
Growth Factor
Filtrate Factor
Antidermatitis Factor
Chick Antidermatitis Factor

Chemical names

Calcium bis-[(R)-3-(2,4-dihydroxy-3,3-dimethylbutyramido)propionate];
beta-alanine N-(2,4-dihydroxy-3,3-dimethyl-1-oxobutyl)-, calcium salt, (R);
Calcium bis-[(R)-N-(2,4-dihydroxy-3,3-dimethylbutyryl)-beta-alaninate];
Calcium D(+)-N-(2,4-dihydroxy-3,3-dimethylbutyryl)-beta-alaninate

Official adopted names and nomenclatures

CAS No.: 137-8-6
EINECS No.: 205-278-9
IUPAC/IUP: Pantothenic Acid
(CAS No. 79-83-4)
INN name (WHO): Calcium Pantothenate
INCI name: Calcium Pantothenate
CTFA name: Calcium Pantothenate
CN code: 2936 24 00
D- or DL-Pantothenic Acid
(Vitamin B3 or Vitamin B5)
and its derivatives

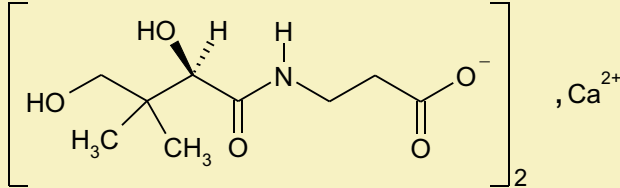


Producer: DAIICHI FINE CHEMICAL CO., Ltd. Japan



Kyowa Hakko Europe GmbH
Daiichi Fine Chemical Division

SPECIFICATION*

Chemical name:	Calcium bis-[(R)-3-(2,4-dihydroxy-3,3-dimethylbutyramido)propionate]	
Chemical structure:		
Empirical formula:	$C_{18}H_{32}CaN_2O_{10}$	Molecular weight: 476.5
Appearance:	White powder, odorless, sweetish taste with slightly bitter aftertaste	
Identification:	A: Specific optical rotation B: TLC test C: Copper sulphate test D: Calcium test	
Appearance of solution:	Clear and colorless	
ph of 5% solution:	6.8 ~ 8.0	
Specific optical rotation:	$[\alpha]_D^{20} : +25.5^\circ \sim +27.5^\circ$	
3-Aminopropionic acid:	Not more than 0.5%	
Chloride content:	Not more than 200 ppm	
Heavy metals:	Not more than 20 ppm	
Loss on drying:	Not more than 3.0% (100 ~ 105°C)	
Assay:	Not less than 98.0% and not more than 101.0%	

*meets the quality requirements of the current Ph. Eur. Monograph of Calcium Pantothenate

Other Physio-Chemical Properties

Nitrogen:	5.7% - 6.0%
Calcium:	8.2% - 8.6%
Melting point:	At about 195°C with decomposition
Status:	Product complies with relevant chapters, annexes, and quality-specifications of European food and cosmetic regulations

Storage and Packing

Storage:	Protect against moisture and heat, store in tight containers at room temperature
Standard packing:	Cartons with inside alu-lined bag containing 25 kg net
Expiry date:	In unopened original packing and under adequate storage conditions minimum 3 years after production date

Formulating

Standardization: 1 mg of D-Calcium Pantothenate in dry matter is equivalent to 0.92 mg of pantothenic acid
1 mg of D-Calcium Pantothenate as it is equivalent to min. 0.89 mg of pantothenic acid as it is

Stability: Relatively stable to oxygen and light, typically sensitive to moisture by hygroscopicity and heat, spraydried particles of DAIICHI D-CALCIUM PANTOTHENATE showed comparingly improved stability in a test under severe conditions (50°C/75% RH), stable in neutral, less stable in acidic and alkaline aqueous solutions by hydrolytic cleavage (for which dexpanthenol is the better choice as alternative derivative of pantothenic acid), exposure to heat exceeding 70°-75°C may cause racemization

Thanks to the spraydrying technique DAIICHI D-CALCIUM PANTOTHENATE gets essentially non-hygroscopic, non-dusty and non-electrostatic properties expressed by free material flow in process, storing and transportation systems. An optimal distribution in premixes and food is safeguarded, as well as recovery rate in multivitamin premixes and mineral premixes near 100%, preparing mixing (f.i. after weighing) D-CALCIUM PANTOTHENATE should not have direct contact to acids (nicotinic- ascorbic acid)

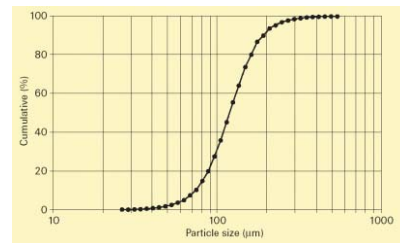
Solubility: Freely soluble in water (about 4 g in 10.0 ml), soluble in glycerol, slightly soluble in alcohol and acetone, practically insoluble in chloroform and ether

Microorganisms: Bacteria count not more than 100/g
Fungii not more than 10/g
Pathol. causative organisms like pseudomonas aeruginosa, staphylococcus aureus, candida albicans, escherichia coli are not traceable

Typical Particle Size Pattern

REGULAR MESH:

Percentage	Particle size
about 10%	> 190µm
about 10%	> 160µm
about 25%	> 125µm
about 20%	> 105µm
about 15%	> 88µm
about 20%	< 88µm



Bulk density: 0.50 - 0.70 g/ml after tapping: 0.65 - 0.80 g/ml

Properties: Fine particle size, excellent flowability, not compacted, less dusty, uniform in particle size, easily mixable with optimal distribution

No. of particles/g: More than 1.0 million

FINE MESH: On special request only

Applications

Pharmaceuticals: Multivitamin tablets, B-complex preparations, vitamin injections softgelatine capsules

Dietetic food: Powder-type preparations, vitamin fortification of beverages, breakfast cereals, chocolate drinks, nut/chocolate creams

Cosmetics: In skin, nail and hair care

Technical use: In fermentation processes

Nutritional Functions / Therapeutical Utilization

D-Calcium Pantothenate is the most important derivative of pantothenic acid. The vitamin itself appears as a yellow, very hygroscopic oil, which is very unstable. D-Calcium Pantothenate, the calcium salt of pantothenic acid, is the main commercial form in the market. The name was derived from the Greek word "pantos" meaning "found everywhere" in nature. In modern nutrition designed for high performances pantothenic acid is an essential ingredient for vitamin fortification.

Biolog. activity: Pantothenic acid is optically active and only the dextrorotatory form has vitamin activity. It is a constituent of two important coenzymes, coenzyme A and acyl carrier protein (ACP). It links carbohydrate, fat and amino acid metabolism and forms the common pathway for these nutrients to enter the citric acid cycle.

General functions: The most important function of the coenzyme A is to act as a carrier mechanism for carboxylic acids. Such acids when bound to the coenzyme A have a high potential for transfer to other groups. The most important of these reactions is the combination of coenzyme A with acetate to form "active acetate" with a high energy bond that renders acetate capable of further chemical interactions. Despite the central role in metabolism, pantothenic acid is indispensable for the normal functions of the skin and the mucosae, for pigmentation of the hair and for resistance to infections.

Fat metabolism: The coenzyme A has an essential function in lipid metabolism. Fatty acids are activated by formation of the coenzyme derivative, and degradation by removal of acetate fragments in beta-oxidation also uses another molecule of coenzyme A.

Deficiency symptoms: From observations on pantothenic-acid-deficient animals and studies in human volunteers, deficiency of the vitamin is shown in the following signs and symptoms:

- reduced growth and decreased feed conversion efficiency
- lesions of skin and appendages
- disorders of the nervous system
- gastrointestinal disturbances
- inhibition of antibody formation and thus decreased resistance to infections
- impairment of adrenal function

Requirements: For humans (4,0 -7,0 mg/day) according to national and international recommendations.

Therapeutical use: Though deficiency symptoms in humans are rarely found in practice, at certain indications, treatment with pantothenic acid is recommended, partly in association with other vitamins of the B-complex:

- in case of malnutrition
- in case of complete parenteral nutrition
- in case of dialysis
- in case of liver dysfunctions
- for reduction of cholesterol level ("PANTOSIN" Daiichi)
- to increase gastrointestinal peristalsis

Safety: Pantothenic Acid and its derivatives are reported to be atoxic. The LD50 are as follows: mice: 6.25 g/kg rabbits: 3.00 g/kg. High dosages of 10 g/day to humans over long periods caused no serious symptoms.

Literature: K.-H. Bässler, I. Golly, D. Loew, K. Pietrzik: Vitamin-Lexikon für Ärzte, Apotheker und Ernährungswissenschaftler (1997). P. Berry Ottaway: The Technology of Vitamins in Food (1993). Lee Russell McDowell: Vitamins in Animal Nutrition (1989). Karl-Heinz Bässler: Vitamine (1989). AWT: Vitamins in Animal Nutrition (3rd Edition 1992). DGE: Empfehlungen für die Nährstoffzufuhr (1991). Bundesanzeiger Nr. 179 dd. 93/09/23: Monographie Pantothenic Acid, systemic use; Nr. 24 dd. 93/02/05: Monographie Pantothenic Acid, systemic use; Nr. 24 dd. 93/02/05: Monographie Pantothenic Acid, topical use.

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