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Product Information

Calmodulin from bovine testes

Catalog Number **P1431**
Storage Temperature –20 °C

CAS RN 77107-46-1
Synonyms: calcium dependent regulator protein (CDR), phosphodiesterase 3′:5′ cyclic nucleotide activator, CaM

Product Description

The protein calmodulin (CaM) is said to have roles in intracellular Ca^{2+} homeostatis, cell proliferation, smooth muscle contraction, microtubular function, exocytotic secretion of cellular products, and cell motility. Several review articles on CaM have been published.[1,2]

CaM contains many acidic amino acids and lacks cysteine, hydroxyproline, and tryptophan. The abundance of acidic carboxyl groups allows for reversible binding of Ca^{2+}. The absence of cysteine and hydroxyproline allows for a very flexible tertiary structure for interaction with various calmodulin-regulated proteins. CaM also has a high ratio of phenylalanine (8 residues) to tyrosine (2 residues), and has a distinctive UV spectrum with five peaks at 252 nm, 259 nm, 265 nm, 269 nm, and 277 nm, with a shoulder at 282 nm.[1]

X-ray crystallography of CaM, in the presence of Ca^{2+}, indicates a long dumbbell-shaped structure 65 Å long. Each globular end contains two Ca^{2+} binding domains. These domains are common among many Ca^{2+} binding proteins and are described as helix-loop-helix "EF-Hand" regions. The Ca^{2+} binding regions are connected by an extended 40 Å, 28-amino acid α-helical region.[3-5] Upon Ca^{2+} binding, CaM undergoes a conformational change in which the hydrophobic regions become exposed. These hydrophobic regions are said to be involved with enzyme binding.[6,7] Phosphorylation of CaM *in vivo* has been reported when cells are stimulated with insulin[8-10] and *in vitro* by various protein kinases.[11-16]

The four Ca^{2+} binding sites of CaM are designated I, II, III, and IV, starting from the site closest to the N-terminus. The order of Ca^{2+} binding to CaM is believed to be III, IV, I, and II. Sites III and IV have affinity for Ca^{2+} 10–20 times higher than sites I and II.[17,19]

CaM has been found to activate such enzymes as ATPase,[20-25] calmodulin kinases I, II, and III,[26-30] phosphorylase kinase,[31-34] cyclic nucleotide phosphodiesterase,[35-38] adenylate cyclase,[39] NADPH oxidase,[40] and myosin light chain kinase.[41]

Molecular Mass:
- 16.79 kDa (amino acid sequence)[42]
- 18.7 kDa (sedimentation equilibrium)[43]
- 19 kDa (SDS in presence of EGTA)
  Note: The migration rate in SDS is faster when Ca^{2+} is present and slower when EGTA removes the Ca^{2+}.[44]

Stokes Radius: 20.9 Å (calculated)[43]
$E_{276}^{1\%}$ = 1.8 (0.1 M Imidazole-HCl, pH 7.0 with 1 mM EDTA)[21]
Note: Addition of 0.5 mM $CaCl_2$ results in an 8% decrease in absorption.[45]
Isoelectric point (pI):[46,47] 3.9–4.3

Purity: ≥98% (SDS-PAGE)
This product is purified from bovine testes by a modification of a published procedure.[48] It is supplied as an essentially salt-free lyophilized powder. The calcium content of a representative lot was found to be <0.05%.

Precautions and Disclaimer

For R&D use only. Not for drug, household, or other uses. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Storage/Stability

Store the product at –20 °C. Stored properly, as supplied in the powder form, calmodulin should remain active for a minimum of two to three years.

Preparation Instructions

Aqueous solutions at ≥1 mg/mL in such solvents as saline or 0.1 M Tris-HCl, pH 7.5, remain active at 2–8 °C for 1-2 days, or frozen for ~1 week. If there are difficulties with solubility, small μL aliquots of concentrated base (e.g. 1 M NaOH) may be used to help to dissolve the material.

References

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