

Biom mineralization

Proteins

Sequence
Proteins

Metal Binders

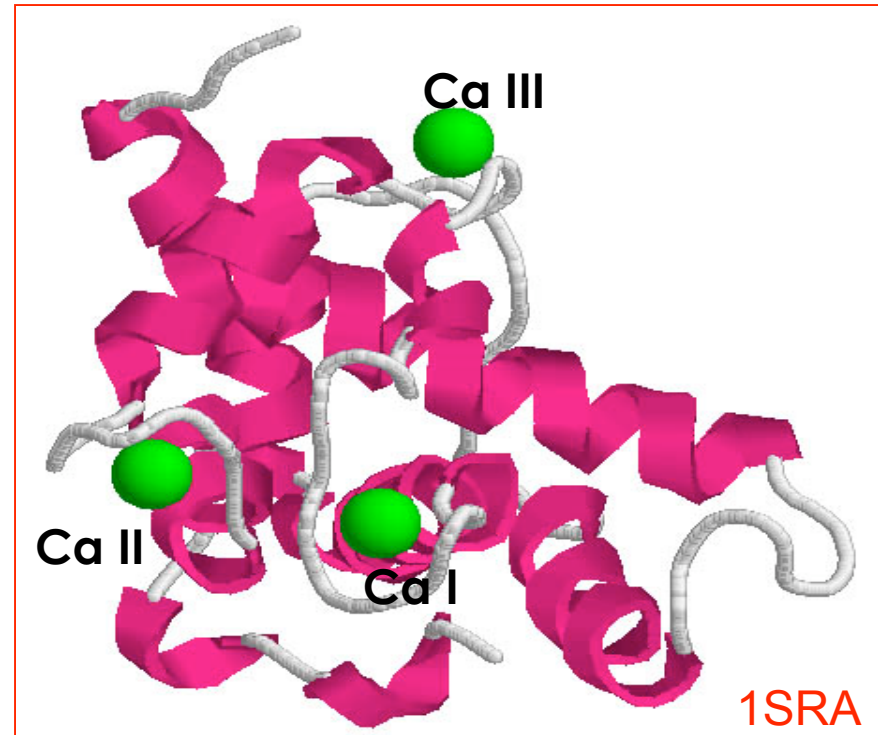
Proteins

Sequence

Structure

Calcium-binding: 5

Zinc-binding: 5



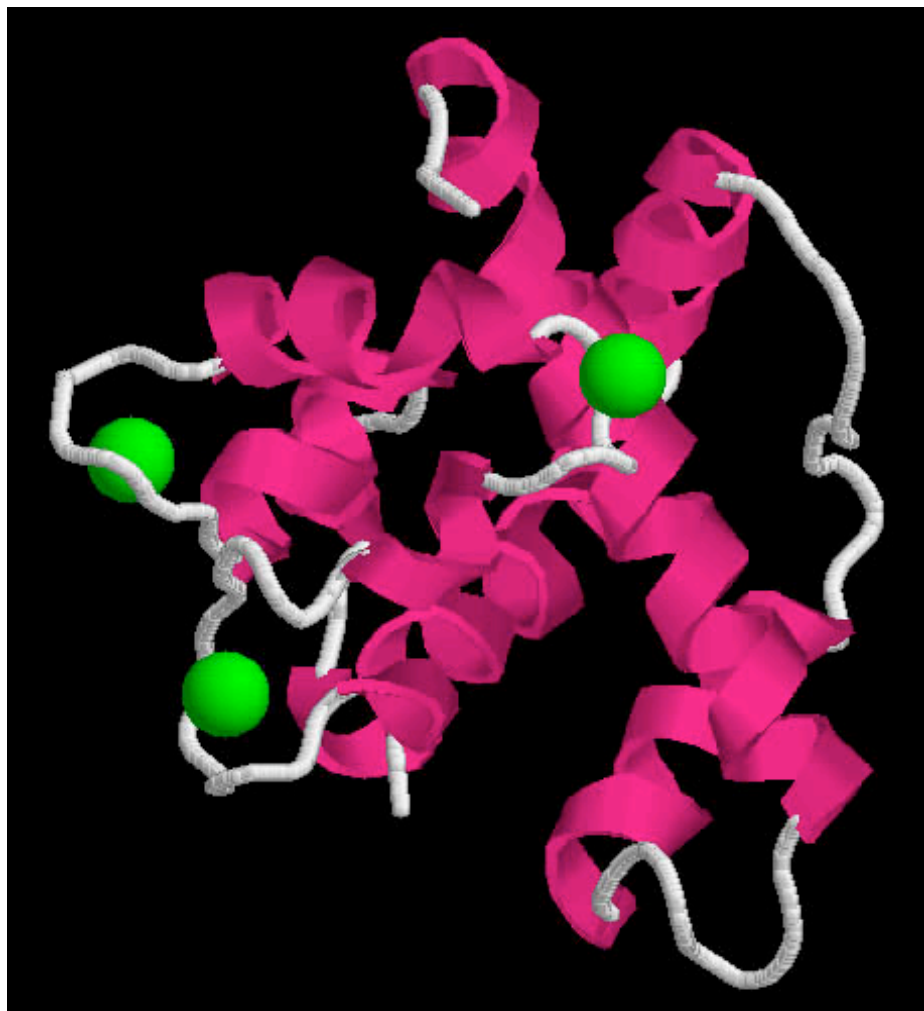
Small molecules

Carbohydrates

Lipids

Neucleotides

Biom mineralization



<http://chemistry.gsu.edu/faculty/Yang/Yang.html>

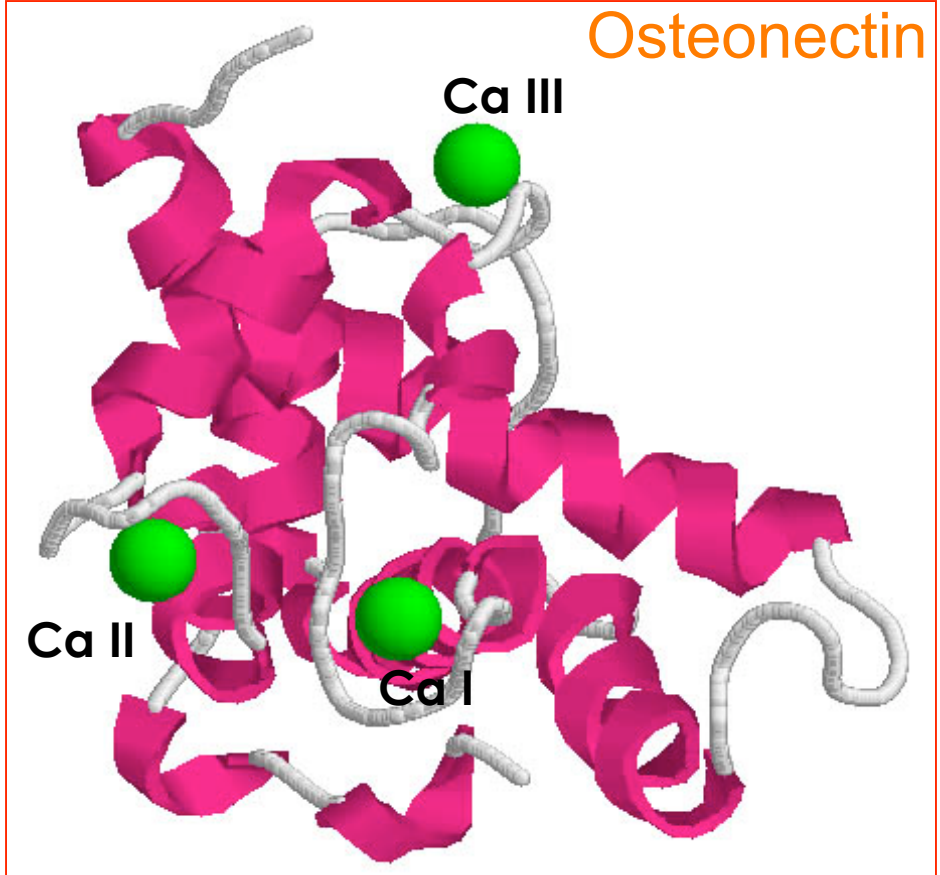
Protein Name	Synonym	PDB ID	
Osteonectin	BM-40	1SRA	
Function/System			
<p>Appears to regulate cell growth through interactions with the extracellular matrix and cytokines. Binds Ca, Cu, several types of collagen, albumin, thrombospondin, PDGF, and cell membranes.</p>			
Ligand Residues			
<p>EF2: Asp 257, Asp 259, Asp 261, Tyr 263, Glu 268</p> <p>EF1: Asp 222, Pro 225, Asp 227, Tyr 229, Glu 234</p> <p>MET: Ala 240, Leu 242, Met 245</p>			
Structure Classification	Types of Metals	# of Metals	EF-hand?
All alpha proteins	Calcium	3	2

Protein Name	Synonym	PDB ID	# Res
Osteonectin	Bm-40	1SRA	151aa

Function/System
Appears to regulate cell growth through interactions with the extracellular matrix and cytokines. Binds Ca, Cu, several types of collagen, albumin, thrombospondin, PDGF, and cell membranes.

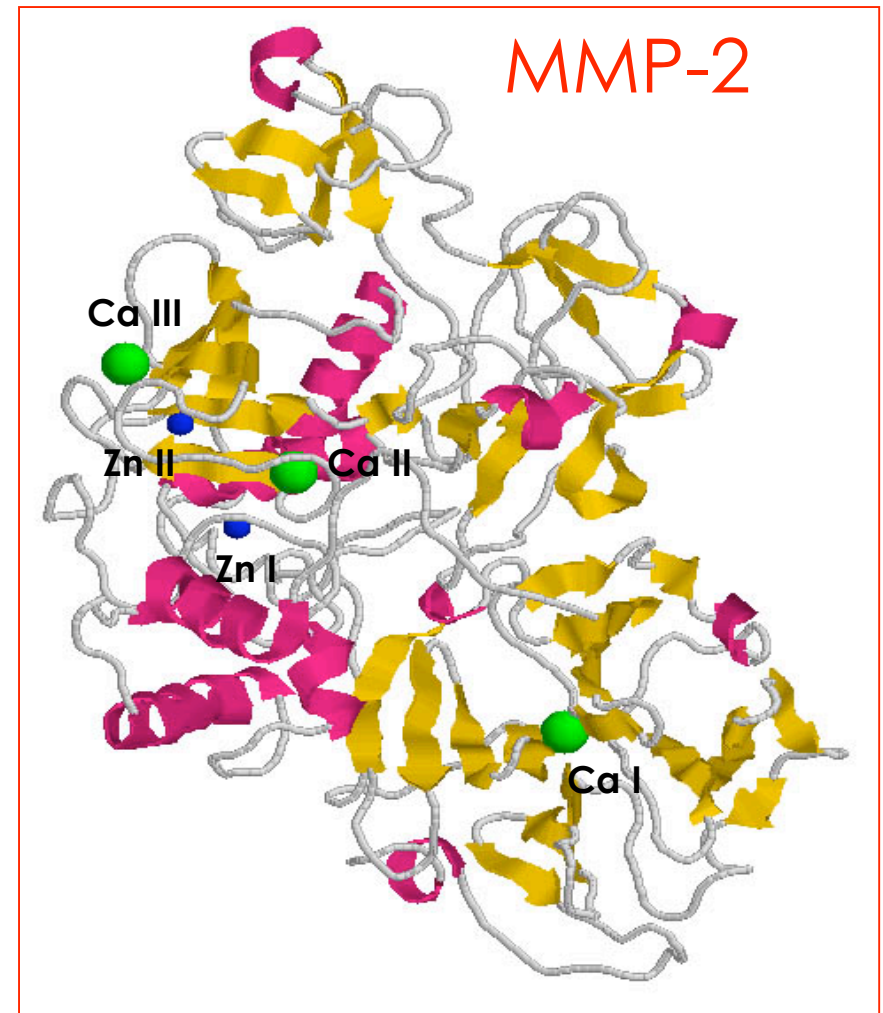
Ligand Residues	
Ca II	EF2: Asp 257, Asp 259, Asp 261, Tyr 263, Glu 268
Ca I	EF1: Asp 222, Pro 225, Asp 227, Tyr 229, Glu 234
Ca III	MET: Ala 240, Leu 242, Met 245

Structure Classification	Types of Metals	# of Metals	EF-hand?
All α proteins	Calcium	3 Ca	2



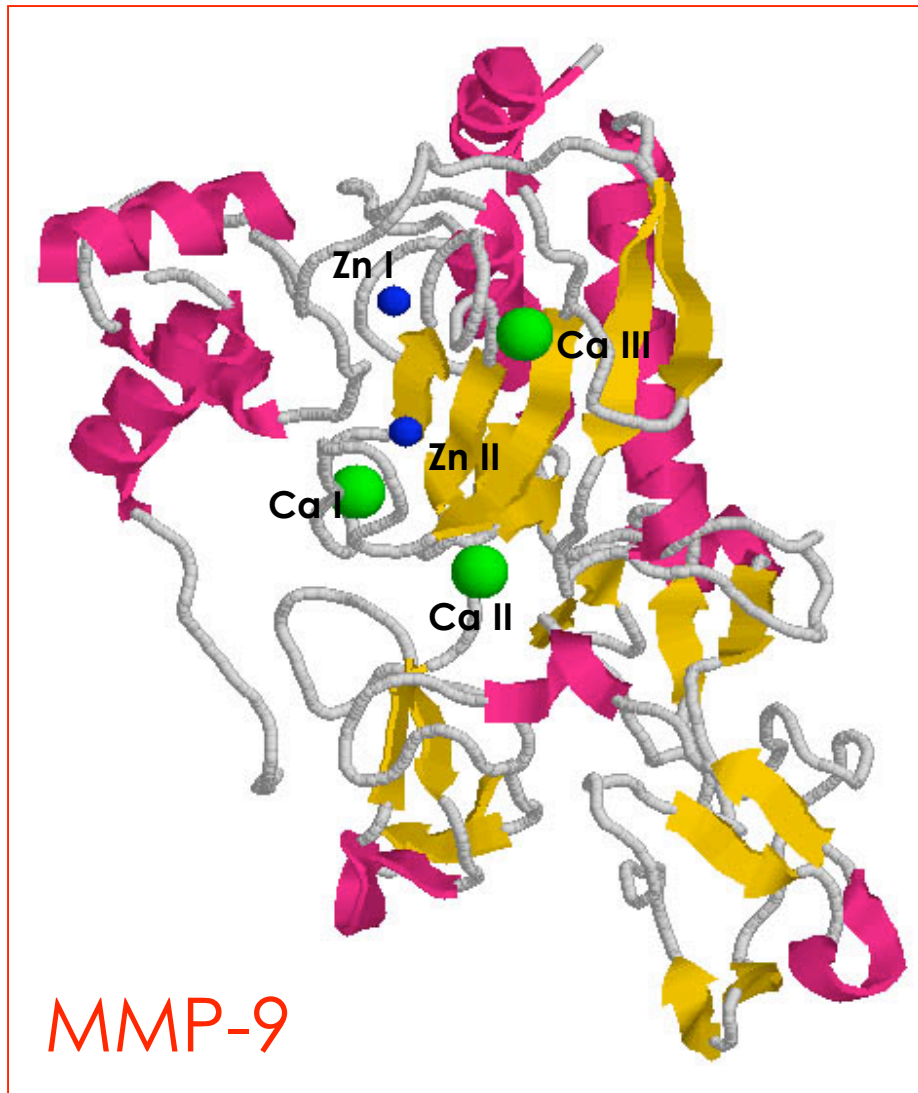
Structure Classification	Types of	# of Metals	EF-hand?
All α proteins	Metals		
	Calcium	3 Ca	no
	Zinc	2 Zn	

Ligand Residues			
Ca I	Asp 476A, Asp 521A, Asp 569A, Asp 618A	Zn I	Cys 102A, His 403A, His 407A, His 413A
Ca II	Asp 185A, Gly 186A, Asp 188A, Leu 190A, Asp 208A, Glu 211A	Zn II	Asp 180A, His 178A, His 193A, His 206A
Ca III	Glu 168A, Ala 167A, Asp 168A, Gly 200A, Gly 202A, Asp 204A	# Residues: 631 aa	



Synonym	PDB ID	Function/System
Gelatinase A; 72 Kd Type IV Collagenase	1CK7	Produced by normal skin fibroblasts: Cleavage of gelatin type I and types IV, V, VII, X. Cleaves the collagen-like sequence Pro-Gln-Gly- -Ile-Ala-Gly-Gln

Protein Name	Synonym	PDB ID	Function/System
Matrix Metalloprotein-Mmp9	Gelatinase B	1L6J	Bone: Could play a role in bone osteoclastic resorption



		Ligand Residues	
Ca I	Asp 182(A) Gly 183(A) Asp 205(A) Glu 208(A) Leu 187(A)	Zn I	Cys99(A) His401(A) His405(A) His411(A)
Ca II	Asp 131(A) Glu 208(A) Asp 206(A) Asp 206(A)	Zn II	His175(A) His190(A) His203(A) Asp177(A)
Ca III	Asp 165(A) Asp 201(A) Gly 197(A) Gln 199(A)	# Residues: 425 aa	
Structure Classification	Types of Metals	# of Metals	EF-hand?
All α proteins	Calcium Zinc	3 Ca 2 Zn	no

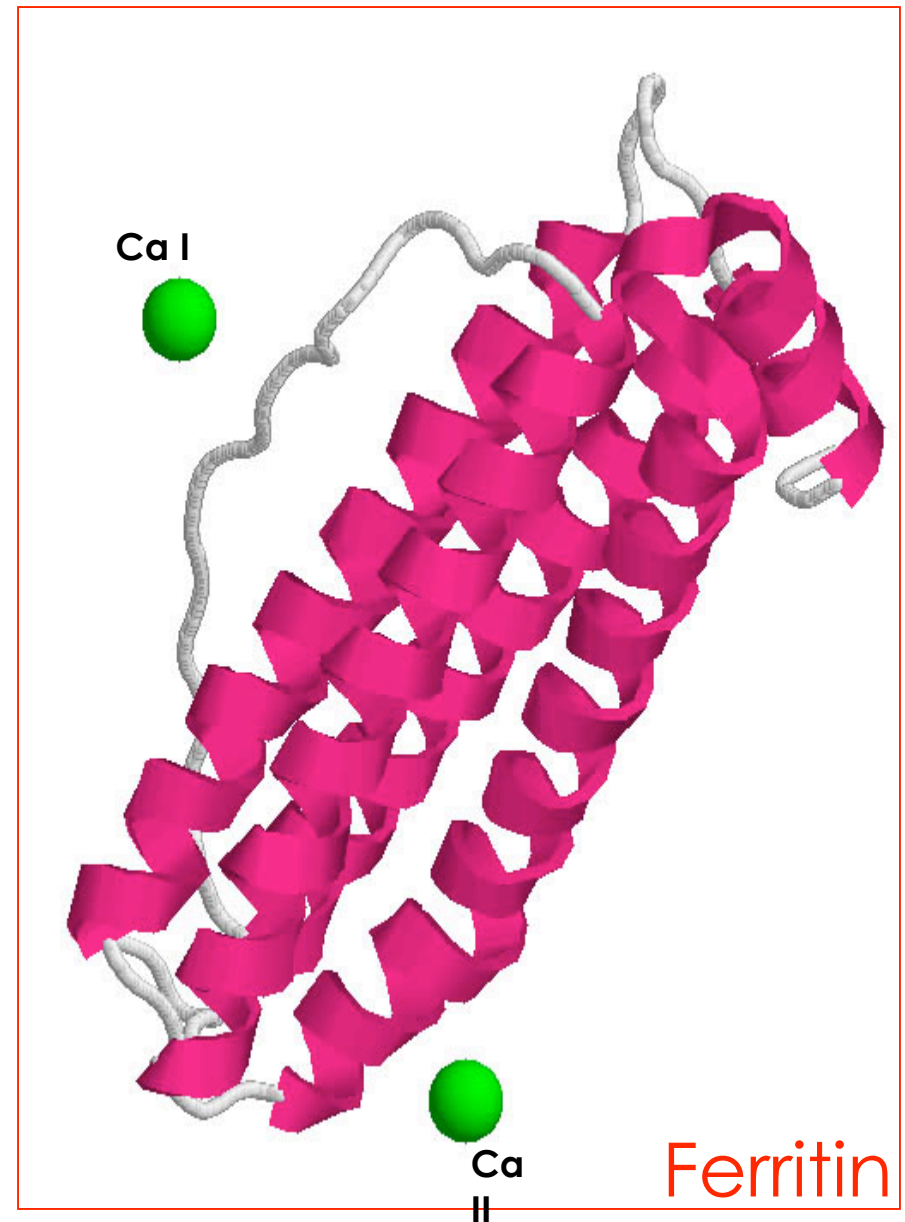
Protein Name	Synonym	PDB ID
Ferritin		2FHA

Structure Classification	Types of Metals	# of Metals	EF-hand?
All α proteins	Calcium	2	no

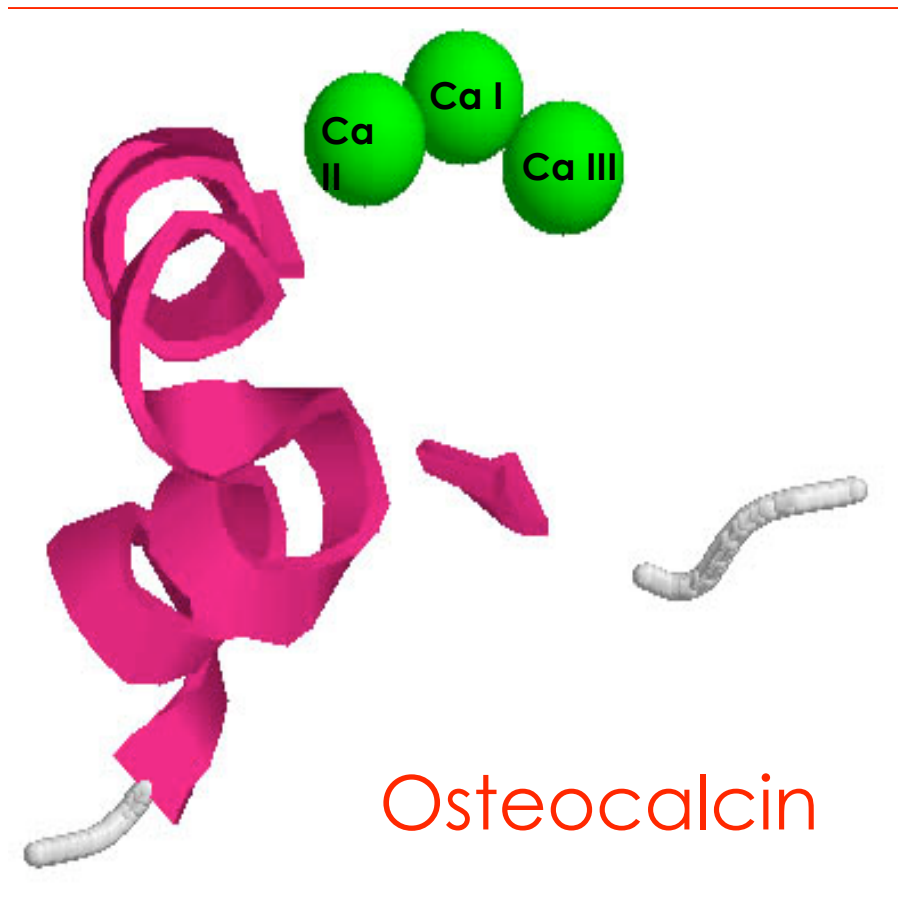
Ligand Residues		
Ca I	Gln86	# Residues: 183 aa
Ca II	Asp131 Glu134	

Function/System

Ferritin is one of the major non-heme iron storage proteins in animals, plants, and microorganisms. It consists of a mineral core of hydrated ferric oxide, and a multi-subunit protein shell which encloses the former and assures its solubility in an aqueous environment. In animals the protein is mainly cytoplasmic and there are generally two or more genes that encode closely related subunits (in mammals there are two subunits which are known as H(eavy) and L(ight)). In plants ferritin is found in the chloroplast.



Protein Name	Synonym	PDB ID	# Residues	Function/System
Osteocalcin	Bone gamma-carboxy-glutamic	1Q8H	49 aa	Bone: Constitutes 1-2% of the total bone protein. It binds strongly to apatite and calcium



Ligand Residues	
Ca I	Cgu* 24(A) Asp 30(A)
Ca II	Cgu 24(A) Cgu 24(A)
Ca III	Cgu 21(A) Cgu 24(A)

Structure Classification	Types of Metals	# of Metals	EF-hand?
All α proteins	Calcium	3	no

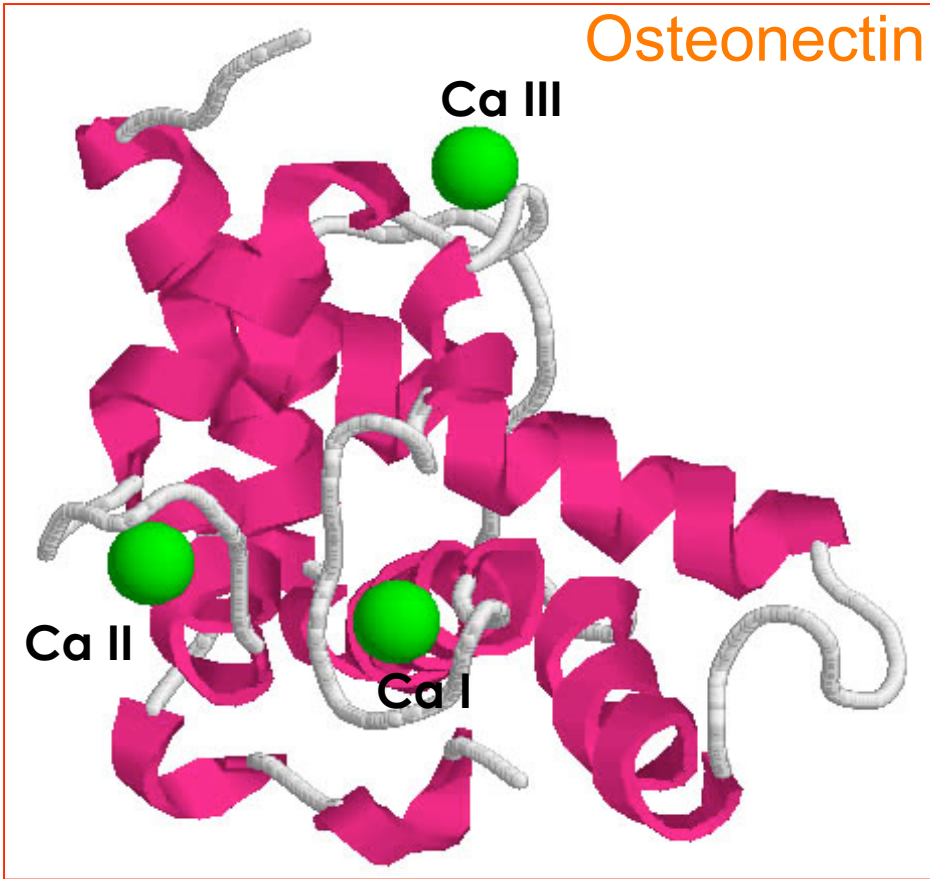
* Cgu: Gamma-carboxy-glutamic acid

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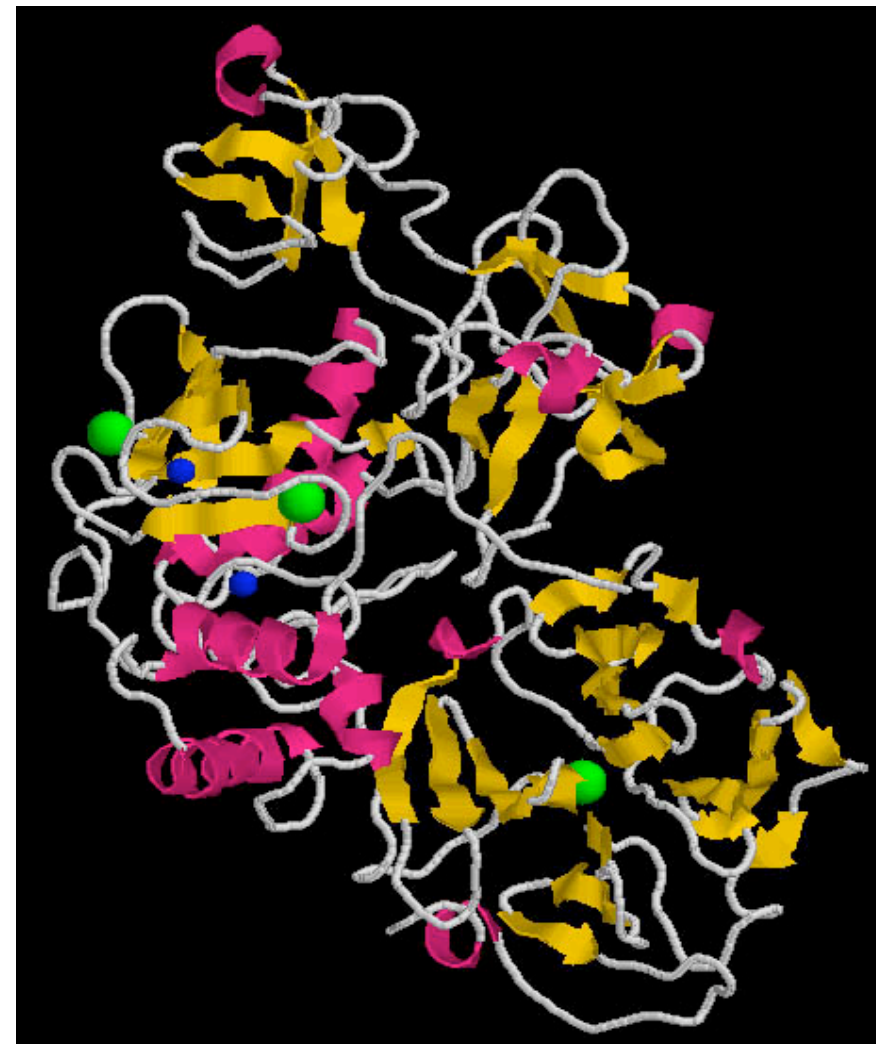
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CAB: Glu 166A, Ala 167A, Asp 168A, Gly 200A, Gly 202A, Asp 204A	



Protein Name	Synonym	PDB ID	Function/System
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