

Isolation and sequence of the vitamin K-dependent matrix Gla protein from the calcified cartilage of the soupfin shark.

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High levels of the vitamin K-dependent matrix Gla protein (MGP) have been found in the calcified costal cartilage of the cow and the calcified vertebral cartilage of the soupfin shark (*Galeorhinus galeus*). In both species, MGP accounts for 35-40% of the total protein in the acid demineralization extract of calcified cartilage, and the mineral content of calcified cartilage is comparable to that of bovine cortical bone. Shark and bovine MGP are both nearly insoluble in neutral buffers, a conserved property that indicates that self-aggregation could be important to the as yet unknown function of MGP. The complete amino acid sequence of shark MGP was determined to compare the structure of the elasmobranch protein to the several currently known mammalian MGP sequences. Shark MGP contains 4 residues of the vitamin K-dependent amino acid gamma-carboxyglutamic acid in its 102 residue sequence and has a calculated molecular weight = 12,770 daltons. The first 76 residues of shark MGP are homologous in sequence to mammalian MGPs, with 37% sequence identity, but the C-terminal 23 residues of the shark protein have no counterpart in the mammalian MGPs. This C-terminal segment of shark MGP contains 8 basic residues and no acidic residues. Among the features conserved in shark MGP, in all mammalian MGPs, and in all other currently known vitamin K-dependent mammalian proteins are a 15-residue region of sequence homology that has been shown to function as the gamma-carboxylase recognition sequence and an invariant sequence of unknown function, Gla-Xaa-Xaa-Xaa-Gla-Xaa-Cys.