Aspartic acid-rich proteins: the organic matrix of calcitic sclerites from the alcyonarian, Sinularia polydactyla

PE-29 Aspartic acid-rich proteins: the organic matrix of calcitic sclerites from the alcyonarian, *Sinularia polydactyla*

M. Azizur Rahman, Tamotsu Oomori and Tsuyoshi Uehara

Faculty of Science, University of the Ryukyus, Okinawa 903-0213

Acidic proteins play a major role in the bio-calcification process. These proteins are generally thought to control mineral formation and growth. Thus, the characterization of acidic proteins in alcyonarian coral is important as a first step toward linking function to individual proteins, which is our ultimate goal. The analysis of proteinaceous components in the soluble and insoluble fractions have shown a particularly high content of aspartic acid, comprising about 61% of insoluble and 31% of soluble fractions. Using an in vitro assay, we show that matrix proteins, which have an abundance of aspartic acids, induce the formation of amorphous calcium carbonate prior to its transformation into the calcitic crystalline form. The crystalline form of calcium carbonate was also identified by X-ray diffraction, revealing the calcite (104) reflection. Electrophoretic analyses of proteins extracted from the soluble and insoluble organic matrix of the sclerites showed five protein bands; two of which are probably glycosylated. The soluble matrix showed two additional faint bands. Calcium-binding analysis of components in fractions showed a significant protein fraction at 109 kDa, indicating that both fractions, which are enriched in aspartic acid, have the ability to bind Ca^{2+}, playing an important role in sclerite formation. A newly derived protein sequence was subjected to bioinformatics analysis involving identification of similarities to other acidic proteins. These results strongly suggest that the aspartic acid-rich proteins within the matrix of alcyonarian play a major role in the process of biomineralization.

Keywords: alcyonarian coral, aspartic acid-rich protein, bio-calcification, calcite