

Effect of shell formation on tissue amino acid carbon composition in the marine snail *Strombus* sp: implications for interpreting biochemical and environmental conditions from organic matter bound in carbonate shells

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Compound-specific isotopic analysis of organic molecules from biologic samples has the ability to elucidate pathways of biochemical activity which are crucial to interpreting diet and trophic fractionation patterns of organisms. However, in the case of carbonate secreting shelled organisms, isotopic relationships between diet and organism biomass are complicated by the requirements of synthesis of shell matrix proteins. Determining the effects of shell formation on the distribution of carbon isotopes in a modern carbonate secreting organism provides an important test for the use of shell-bound organic matter for interpreting ancient food webs and energy flow in ecosystems. This study examines the relationship between diet, tissue and shell organic matter in laboratory-cultured *Strombus* sp., an herbivorous marine gastropod, by analysis of the carbon isotopic composition of individual amino acids. Tissue amino acids were consistently enriched relative to the diet. Phenylalanine (+1.8‰) and alanine (+3.8‰) showed the least fractionation between diet and tissue, while aspartic acid (+10.7‰) and glutamic acid (+14.6‰) showed the greatest enrichment. On average, nonessential amino acids fractionated to a greater extent than did essential amino acids (+ 7.7‰ vs +3.9‰). The large fractionations associated with aspartic and glutamic acids are unexpected when compared to previously published records of amino acid carbon isotopes and may reflect the role they play in carbonate-shell secreting organisms. Biogenic carbonates are typically constructed via the secretion of a glycoprotein matrix which guides crystal nucleation. It is predominately composed of aspartic and glutamic acids. In rapidly growing individuals such as those cultured in this study, a high demand for these molecules for shell formation appears to be leaving the pool available for incorporation into soft tissue isotopically enriched. Ongoing research aims to analyze the isotopic composition of organics in the shell matrix itself. Shell matrix proteins are a widely recognized geochemical repository of ancient biological materials, and can provide a window into food webs and energy flow in marine ecosystems over geologic timescales. A clear understanding of the biochemical relationships between shell matrix and the parent organism will further the understanding of this archive and its potential for application to paleoecologic and paleoenvironmental studies.