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A comparative study on effects of heterotrophic microbial activity on the stability of bivalve and coral carbonate during early diagenesis.

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Following deposition and shallow burial, marine biogenic carbonates are exposed to an environment that is geochemically affected by a manifold of bacterial metabolic redox processes. To allow for comparison of potential microbe-mediated alteration effects on carbonates, we used aragonitic bivalve shell samples and porous aragonitic coral fragments for incubation experiments in oxic- and anoxic seawater media. The media contained marine sediment slurries or bacterial cultures to mimic the natural processes *in vitro*. The results for anoxic experimental media containing bivalve shell samples or coral fragments displayed considerable changes in carbonate-system parameters (pH, A_T, CA, DIC) and divalent-cation ratios (Mg/Ca, Mg/Sr, Sr/Ca) over time. Furthermore, incubated bivalve shell samples were altered in morphology, elemental composition and isotopic signature. Coral-fragment bearing oxic incubations were run at two temperature regimes and divalent-cation ratios of the high-temperature bacterial medium displayed withdrawal of Ca^{2+} and Sr^{2+} from the medium, thus indicating microbe-induced secondary aragonite precipitation. Analyses of coral fragments include electron-microprobe mapping and X-ray microtomography to resolve elemental sample composition and pore-space alteration features, respectively. Up to this point our results indicate that heterotrophic bacterial activity has the potential to affect surficial or open pore space in carbonate archives by increasing rates of alteration relative to sterile environments.