The effect of Mg/Ca ratios upon the Mg, Sr, and other elements within coral skeletons

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The chemical composition of minor and trace elements within calcareous organisms is generally considered to be related to the ratio of an element to Ca in seawater. However, with some exceptions, these relationships have not been constrained. In the experiments described here we have grown the scleractinian coral, *Pocillopora damicornis*, for a period of nine weeks. In these experiments, the concentrations of Ca^{2+} and Mg^{2+} were increased separately (Ca = +2.5 and +5 mmol and Mg = + 4 and +8 mmol above normal) and in combination. In one experiment the concentration of Sr was increased by 90 μmol. While the corals showed robust growth in all treatments, the highest rates were observed in the experiments in which Mg^{2+} had been added. Interestingly there were no differences in growth rates between the control and the elevated Ca^{2+} experiments. The Sr concentration of the skeletons behaved as expected with respect to Ca and identical results were found compared to previous work [1]. Raising the Mg/Ca ratio of the seawater appeared to affect the Sr distribution coefficient, as suggested previously. Elements such as S, P, and B increase were inversely correlated to the elemental ratio relative to Ca, so that the concentration of these elements increased as the Ca concentration increased. This behaviour may be related to the fact that these elements are present in seawater as anion complexes and may be partitioned relative to carbonate rather than calcium. Additional experiments are currently being conducted to decrease Mg^{2+} concentrations and to increase Ca^{2+} concentrations to match the seawater composition of ancient oceans.

[1] Swart, P.K. (1981) *Palaegeography, Palaeoclimatology, Palaeoecology*, **34**, 115-136.