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Inorganic carbon uptake mechanisms in the coccolithophore Emiliania huxleyi: The physiological basis.

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The coccolithophore *Emiliania huxleyi* was cultured in a variety of carbonate chemistry conditions to study the dependency of growth, calcification and stable carbon isotope fractionation on the concentrations of CO_2, HCO_3^-, CO_3^{2-} and pH. First results indicate that the growth rate exclusively depends on the concentration of CO_2 if pH (pH on free scale) is higher than 7.7. Below this threshold growth rates are negatively influenced by unfavorable pH conditions. Calcification rates show no clear dependence on CO_2 but correlate better to the combined concentration of HCO_3^- and CO_2. Similar to growth rates, calcification rates are also negatively influenced by low pH. However this negative influence might be overcome to some extent by relatively high concentrations of dissolved inorganic carbon (DIC). While the results for particulate organic carbon production are less clear, stable carbon isotope fractionation in the organic carbon increased with increasing CO_2 and showed a strong correlation to this molecule regardless if pH was high or low. According to calculations with a cell model, gross leakage of CO_2 out of the cells is the key mechanism driving the observed changes in stable carbon isotope fractionation, although the ratio of HCO_3^- to DIC-uptake might play a role at very low CO_2. The physiological response data given here together with the molecular data from the same experiments provided by Mackinder et al. (see: Inorganic carbon uptake mechanisms in the coccolithophore *Emiliania huxleyi*: The molecular basis) might help to understand the carbon metabolism of the cell and how predicted changes in the marine carbonate chemistry will affect *E. huxleyi* in the future.