Geophysical Research Abstracts, Vol. 7, 00073, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00073
© European Geosciences Union 2005

Barium uptake into the shells of the common mussel (*Mytilus edulis*): results from a field and laboratory experiment

D.P. Gillikin (1), F. Dehairs (1), D. Steenmans (1), A. Lorrain (2), L. André (2), J. Navez (1,2),W. Baeyens (1), and the CALMARs group (3)

(1) Vrije Universiteit Brussel, Dept. of Analytical and Environmental Chemistry, Brussels, Belgium, (2) Royal Museum for Central Africa, Dept. of Geology, Tervuren, Belgium, (3) http://www.vub.ac.be/calmar (david.gillikin@vub.ac.be)

Ba/Ca ratios in corals and foraminifera have been used as a proxy of dissolved seawater Ba, providing information on salinity, nutrient and alkalinity distributions in past oceans [1, 2]. There has been less research conducted on Ba/Ca in bivalve shells and the few reports suggest that Ba/Ca peaks recorded in the shells reflect spring phytoplankton production [3, 4]. There has been one study on bivalve shell Ba/Ca as a tracer of dissolved seawater Ba [5], however they did not determine the Ba/Ca partition coefficient (D_{Ba}).

We conducted both field and laboratory experiments on *Mytilus edulis* to determine the effect of seawater Ba/Ca on shell Ba/Ca. The field experiments confirm the general occurrence of sharp Ba peaks in spring after the winter growth stop, when shell growth resumes. The process inducing these Ba peaks is not understood yet, but laboratory results suggest that the dominant pathway of barium incorporation into the shell is from the dissolved phase via the hemolymph, and not from food. After removing spring Ba/Ca peaks from the shell data (i.e., only considering the baseline Ba/Ca data), there was a strong linear relationship between solution Ba/Ca and shell calcite Ba/Ca for both mussels in the laboratory (R^2 = 0.84, $p < 0.0001$, n = 28) and field (R^2 = 0.96, $p < 0.0001$, n = 236 (data of 6 shells from 4 sites)), however, slopes were not the same (t-test, p = ns). The D_{Ba} in laboratory mussels was 0.10 ± 0.02 and in the field was 0.071 ± 0.002 ($\pm$ 95% CI), considerably lower than calcitic foraminifera [1], but higher than abiogenic calcite [6].

Although there is most likely a biological control on shell Ba/Ca ratios, our results indicate that the baseline Ba/Ca ratios recorded in *M. edulis* shells is a robust proxy of dissolved Ba/Ca in the estuarine environment. Despite the fact that estuaries can have different Ba/salinity relationships [7], shell Ba/Ca data can be used to give an indication of salinity, similar to δ^{13}C data, and can aid in δ^{18}O paleotemperature interpretation. Furthermore, past dissolved estuarine Ba concentrations determined from archeological or fossil shells would be highly valuable information *per se*.

[1] Lea & Boyle 1991 GCA 55:3321-31; [2] McCulloch et al 2003 Nature 421:727-30; [3] Stecher et al 1996 GCA 60:3445-56; [4] Vander Putten et al 2000 GCA 64:997-1011; [5] Torres et al 2001 L&O 46:1701-8; [6] Tesoriero & Pankow 1996 GCA 60:1053-63; [7] Coffey et al 1997 EC&SS 45:113-121.