B102-P010 **Room: Poster Session Hall** **Time: May 27**

Calcification and intracellular pH in hyaline vs miliolid foraminifera

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Reconstructions of past changes in ocean circulation and climate provide crucial information for understanding the functioning of the Earth's climate. Conditions of past marine environments can be reconstructed using so-called proxy relationships and fossil foraminiferal tests are the most widely used proxy signal carriers for these reconstructions. Chemical and isotopic composition of their calcium carbonate tests is known to reflect chemical and physical properties of ambient seawater. Among these, the calcitic Mg concentration (commonly expressed as the Mg/Ca ratio) correlates with seawater temperature and therefore plays an important role in determining oceanic behaviour on long timescales.

Laboratory studies have shown that the partition coefficient of Mg in calcite of many species, however, differs greatly from those obtained from inorganic co-precipitation experiments. This indicates that before and during foraminiferal calcite precipitation, there is a strong control of the individual on the incorporation of magnesium (and other trace elements), commonly abbreviated as the 'vital effect'. To apply Mg/Ca ratios correctly and with higher precision than is currently possible, a better understanding of the physiological control on the vital effect is necessary.

$CaCO_3$ precipitation in foraminifera starts with the vacuolization of seawater (the mother solution). In the mother solution, high concentrations of Mg^{2+} in the precipitation vesicles prevents calcite precipitation and therefore, foraminifera either have to remove Mg^{2+} or remove H+ to promote precipitation. To analyze the extent to which foraminifera adopt these physiological strategies, two different groups of benthic foraminifera are cultured under sea water with different Mg/Ca ratios and different pH's. The added fluorescent probe HPTS makes it possible to visualize and estimate the pH in the calcifying vesicles and at which pH calcite is precipitated.

First results with this probe show that hyaline foraminifera, with generally low calcitic Mg/Ca ratios, are capable of increasing the pH of the mother solution by at least 1 unit after uptake of sea water. The resulting high-pH vesicles participate in chamber formation and result in the formation of a zone of high pH (over 9.0) in which $CaCO_3$ precipitates. Miliolid species, with on average a very high calcitic Mg/Ca ratio, precipitate their calcite intracellular and agglutinate these precipitates into a wall during chamber formation. In this group, pH during calcification is also elevated by at least 1 unit. These results will lead to a new, more detailed model for calcite precipitation in benthic foraminifera and serve to re-evaluate Mg/Ca ratios as popular tool to reconstruct paleoenvironments.