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The use of the fluorescent probe Calcein to study biomineralization processes in foraminifera.

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Calcein is readily incorporated into newly precipitated calcium carbonate in foraminifera shells and it has been widely used to indicate new chamber addition in this group. This in itself is a surprising observation because the molecular weight of Calcein is 622 g per mole and it is known to be membrane impermeable. Our previous studies showed that these observations can be explained by seawater vacuolization that supply Calcein (and other similar fluorescent dyes) directly into the site of biomineralization (Erez 2003, Bentov et al 2009). Every perforate species that was tested including Amphistegina lobifera, A. lessonii, Orbulina universa, Globigerinella siphonifera as well as the imperforate species Amphisourus hemprichii and a few other Milliolids were all labeled with Calcein. We show that Calcein incorporation into foraminiferal shells of A. lobifera is proportional to the actual calcification rate but in order to achieve reliable rates, the incubation time needs to be at least 24 hours. Pulse chase experiments demonstrate that the internal storage of seawater labeled with Calcein is quite large and may exceed the internal volume of the chambers. The effects of salinity changes on Calcein uptake by A. lobifera, suggests that osmotic regulation may play a role in the biomineralization process.

References:

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