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The bivalve calciumcarbonate factory – a microsensor approach to extrapallial fluid dynamics

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Ocean acidification (OA) is expected to affect biogenic $CaCO_3$ formation negatively to the competitive disadvantage of organisms that depend on carbonate structures. Of these, bivalves are one of the most diverse and ecologically significant benthic groups.

In bivalves, calcification happens in the narrow Extrapallial Space (EPS) between the outer mantle epithelium and the inner shell surface, where the shell grows. The EPS is filled with the Extrapallial Fluid (EPF) which is considered to create the microenvironment for $CaCO_3$ precipitation and dissolution. The EPF contains a mixture of anorganic and organic compounds including amino acids, proteins, acid mucopolysaccharides, carbohydrates and probably lipids. Knowledge of the chemical processes and dynamics in the EPF under normal conditions is a prerequisite for a mechanistic understanding of OA effects on shell calcification.

Here, we introduce a new protocol for in vivo microsensor (MS) measurement of pH and Ca2+ dynamics within the EPF of the bivalve Arctica islandica combined with DIC determination by means of EPF sampling during live MS measurements.