Particulate versus dissolved organic matter uptake by deep-sea benthic foraminifera revealed by in situ 13C-labeling experiments

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Benthic foraminifera have a variety of feeding ecologies and utilize different food sources on the seafloor. In deep-sea settings, particulate organic matter such as phytodetritus, surface sediments, and bacteria often constitute the major food sources for benthic foraminifera. Foraminifera gather this particulate organic matter with their reticulopodia and incorporate it to food vacuoles. In addition, direct incorporation of dissolved organic carbon by carrier-mediated transport system via cell membrane has been reported for some agglutinated foraminifera. These different ways of feeding metabolism could serve us an important insight to the evolution of foraminiferal nutritional ecologies.

In this study, the importance of dissolved and particulate organic carbon to deep-sea benthic foraminifera was evaluated by conducting *in situ* ^{13}C-labeling experiments in the central part of Sagami Bay, Japan (water depth 1453 m). Both ^{13}C-labeled glucose and Chlorella (Chlorophyta) were injected into a series of *in situ*-culture cores and incubated for 1, 2, 9 days, and 1 year. Glucose was chosen as a representative of dissolved organic carbon in the interstitial water, and Chlorella as a representative of phytodetritus. Chlorella was incorporated by foraminiferal species that are known to ingest phytodetritus with various extents ranging from 0.0 to 40% of their cell between species. On the other hand, glucose was incorporated into every examined species with similar extents ranging from 0.1 to 0.3% of their cell. Many foraminiferal species incorporated glucose faster than Chlorella. Results indicate that dissolved organic carbon in the sediments may provide an accessible and abundant food source for many benthic foraminifera while rate and extent of phytodetritus utilizations substantially differ between species.