Response of Surface-Derived Marine Microorganisms to High Hydrostatic Pressure: "Marine Snow" Experiments in Rotating Pressure Tanks

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Evidence is accumulating that sinking phytoplankton aggregates carry relatively fresh particulate organic matter to great water depths sustaining benthic communities in the deep sea. We hypothesized that organic matter degradation through microbial respiration is inhibited by the increase in hydrostatic pressure during the descent of phytoplankton aggregates. Real-time and end-point oxygen measurements in rotating pressure tanks were therefore used to measure dark respiration rates in sinking diatom-bacteria aggregates, in an axenic strain of the aggregate-forming diatom *Skeletonema marinoi*, and in diatom-free surface seawater.

At pressure levels of 200-500 bar (corresponding to water depths of 2000-5000 m), respiration rates were generally inhibited by 10-50%. At pressure levels of 500-1000 bar, however, respiration ceased rapidly in the diatom-free surface seawater, implying the complete inhibition of bacterial degradation of organic matter. By contrast, respiration continued for a few hours in diatom-bacteria aggregates and in *S. marinoi* exposed to 500-1000 bar, before it ceased too.

We conclude that hydrostatic pressure inhibits the respiratory activity of diverse surface-derived marine microorganisms that are not adapted to high-pressure conditions. The entailing reduction of microbial organic matter degradation likely contributes to the deposition of relatively fresh organic matter in the deep sea and in hadal trenches.