Epiphytic bacteria are indispensable in production of algae-derived RDOM (refractory dissolved organic matter)

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Microbial carbon pump (MCP) provides a mechanistic illustration on formation of refractory dissolved organic matter (RDOM) in the ocean. Here we demonstrated the key roles of algae-associated microorganisms (mainly heterotrophic bacteria) in the production of RDOM through laboratory cultures of *Skeletonema dohrnii.* Without the participation of the associated bacteria, RDOM could not be detected in antibiotics-treated algal culture with high-resolution technique Fourier Transform Ion Cyclotron Resonance Mass Spectrometry (FT-ICR MS). Similarly, RDOM were not detected either in bacterial cultures only. Our experimental results show that in addition to affecting growth and physiology of *S. dohrnii*, algae-associated bacteria are indispensable in the process of converting algal DOM into RDOM. Facilitated by these bacteria consortia, quantity and chemodiversity of algae-originated RDOM increased during the growth and decomposition of algal cells. The detailed characterization of RDOM changes in marine microalgae culture confirmed that the direct involvement of algae-associated bacteria in the RDOM production, emphasizing their vital roles in marine carbon sequestration.