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Dynamics and phototrophy of microbial communities in the ocean

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Possible role of phototrophy by heterotrohic bacterial populations on significant energy supply to oligotrophic ocean ecosystems has been recently suggested. Their ubiquitous distribution and unexpected abundance in surface seawater environments have been reportedly emphasized. Oxygenic photosynthetic bacteria, cyanobacteria, are one of the major primary producers in the ocean, whereas anoxygenic photosynthetic bacteria are rather minor in oxidized ocean environments because they are basically anaerobes and require reduced coumpounds as an electoron donners. Aerobic anoxygenic photosynthetic bacteria possessing an ability of photosynthetic light reactions under an aerobic condition were firstly isolated in 1979 by Shiba and colleagues. In 2000, Kolber and his colleagues reported that these photosynthetic bacteria widely distributed in oceanic surface seawaters and accounted for 11 % of total bacteria and 5-10 % of total chlorophyll a concentrations. Also, a wide distribution of some bacteria possessing light-dependent proton pump to generate ATP has been recently suggested. Some bacteria inhabiting marine surface waters possess rhodopsin-retinal complex to absorb light and carry proton ions across a cell membrane. This rhodopsin was just discovered ten years ago and named proteorhodopsin to distinguish from bacteriorhodopsin of archaeal homologous proteins. Both culture-dependent and -independent works indicated a ubiquitous distribution of proteorhodopsin-possessing bacteria in surface seawater environments. In this presentation, we would like to discuss spatiotemporal dynamics of these light-utilizing heterotrophic bacterial populations and possible effect of light and organic matter supply on their growth and survival in marine environments.

Keywords: marine bacteria, photosynthetic bacteria, rhodopsin, photoheterotrophy