Rhodopsin phototrophy promotes bacterial survival

April 27 2010

Bacteria in the ocean can harvest light energy from sunlight to promote survival thanks to a unique photoprotein. This novel finding by a team of scientists in Sweden and Spain is to be published next week in the online, open access journal *PLoS Biology*.

"It was long thought that phytoplankton were the only organisms in the sea that could harvest the energy from sunlight for growth," says Dr. Jarone Pinhassi, scientist in marine microbiology at Linnaeus University, Sweden. These microscopic planktonic organisms carry out the same chlorophyll driven photosynthesis process as green plants on land.

In 2000, American scientists discovered that many marine bacteria contain a gene in their genome that encodes a new kind of light-harvesting pigment: proteorhodopsin. Proteorhodopsin is related to the pigment in the retina that enables human vision in less intense light. Now, a decade later, the first direct evidence for the functioning of proteorhodopsin in native marine bacteria is presented, based on mutational analysis in a marine bacterium. At the same time the present study shows that proteorhodopsin-mediated phototrophy (the process of acquiring energy from light) allows marine bacteria to better survive periods of starvation in an often nutrient-depleted ocean.

The importance of understanding novel mechanisms for marine bacteria to efficiently use solar energy is obvious if one considers that a liter of seawater on average contains around a billion bacteria, many of which contain proteorhodopsin. The activity of these bacteria play a crucial

role in the global carbon cycle by determining oceanic production of CO_2 through respiration and determining how the fluxes of energy that are fixed by photosynthesis are channeled through marine food chains.

"Bacteria in the surface ocean are swimming in a sea of light, and it may not be all that surprising that evolution has favored microorganisms that can use this abundant energy source," says Pinhassi.

More information: Gómez-Consarnau L, Akram N, Lindell K, Pedersen A, Neutze R, et al. (2010) Proteorhodopsin Phototrophy Promotes Survival of Marine Bacteria during Starvation. PLoS Biol 8(4): e1000358. doi:10.1371/journal.pbio.1000358

Provided by Public Library of Science