DUAL PHOTOTROPHY

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Dual phototrophy is a recently discovered strategy that allows microorganisms to use light energy through two different systems: bacteriochlorophyll-based photosystems and proton-pumping rhodopsins. Using two light-harvesting systems may help microorganisms adapt to these challenging conditions and use energy more efficiently. This study focuses on the alpine lake bacterium *Sphingomonas glacialis* AAP5, which is able to use both systems.

Cell growth and XR production were increased by optimization of the growth medium. In addition, extraction methods for XR and bacteriochlorophyll were improved for HPLC analysis, resulting in better detection and higher pigment recovery. Experiments with different light intensities showed that XR production increases with increasing light intensity, and that at least 100 µmol photons m^{-2} s^{-1} is required for effective XR production. Furthermore, an improved extraction and purification method for photosystems led to a higher yield of purified XR. Preliminary structural information of purified XR was obtained using cryo-electron microscopy. Together, these results provide a stronger basis for physiological and structural studies of dual phototrophy.

These findings improve the understanding of microbial light utilization and suggest that dual phototrophy is an important, but still not widely recognized, adaptation in natural ecosystems.