Cyanobacteria Remodel Thylakoid Membrane Architecture

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Scientific Achievement

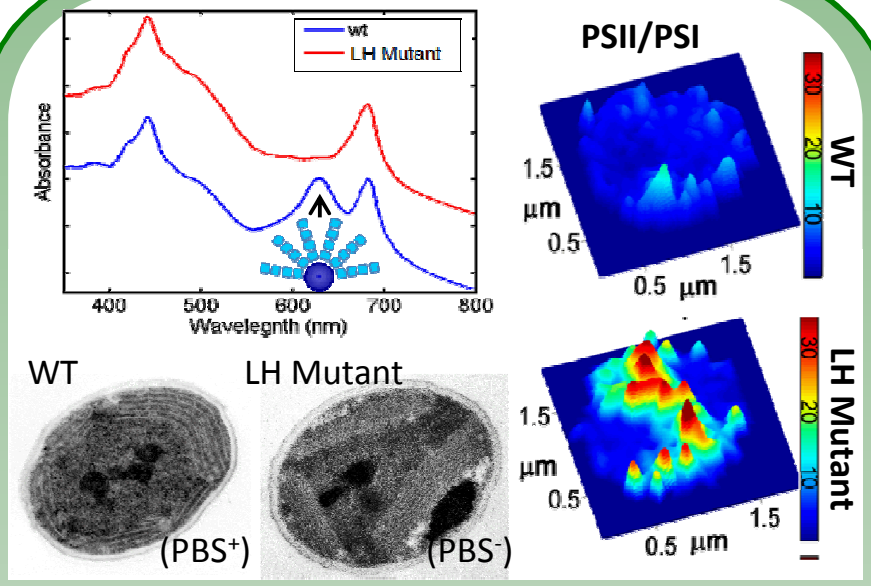
Determined the distribution and flexibility of light-harvesting pigments in living cells of wild-type cyanobacteria and mutants with diminished antennas.

Significance and Impact

Previously undiscovered modulation of membrane structure and pigment abundance with attenuated light-harvesting suggests an adaptive strategy to balance light excitation between the two photosystems.

Research Details

- The global distribution of photosynthetic complexes in the thylakoid membrane was previously unknown.
- Combined spectroscopic/microscopic approach
  - High spatial resolution TEM → thylakoid membrane structure
  - High spectral resolution spectral imaging → photosystem component localization
- Diminished light-harvesting leads to photosystem segregation and reduced thylakoid curvature and interthylakoid spacing.



Upper Left: Most cyanobacteria have a unique light-harvesting antenna termed phycobilisomes that absorb yellow-orange colored light.

Lower Left: TEM images revealing altered thylakoid structure

Right: Fluorescence emission ratios of photosystem II to photosystem I at the subcellular level. A diminished antenna leads to increased segregation of the two photosystems.

**The mutant strains used in this work were a gift of Ghada Ajlani.*

AM Collins, M Liberton, HDT Jones, OF Garcia, HB Pakrasi, JA Timlin. Plant Physiology, 2012, 158:4, 1600-1609.

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