EBERHARD KARLS
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GRK 1708

Molecular principles of bacterial survival strategies

Dormancy and germination in filamentous cyanobacteria

Wednesday, 09. July 2014

8:30 (s.t.)

Prof. Assaf Sukenik

Kinneret Limnological Laboratory, Israel Oceanographic & Limnological Research

Guests are cordially invited.

Location: Auf der Morgenstelle 28, 3rd floor, Room 3N12

Dormancy and germination in filamentous cyanobacteria

Prof. Assaf Sukenik

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Abstract

Cells of filamentous cyanobacteria from the orders Nostocales and Stigonematales can differentiate into dormant forms called akinetes. These spore-like cells play a key role in the life cycle, survival and distribution of the species, contributing the inoculum for the cyanobacteria perennial blooms. Akinetes survive under changing environmental conditions like cold and starvation. Various environmental factors were reported to trigger the differentiation of akinetes including light intensity and quality, temperature and nutrient deficiency. Development of akinetes from vegetative cells is a process that involves morphological and biochemical modifications to reach filament-free matured akinetes. In the cyanobacterium Aphanizomenon ovalisporum, potassium deficiency induced akinete formation. In response to this external trigger, some vegetative cells along the trichome, differentiate into akinetes in an unsynchronized manner. We applied various physiological, biochemical and molecular techniques to study cellular changes during akinetes differentiation. Photosynthetic activity of differentiating akinetes was maintained until their maturation, concomitant with substantial lose in their light harvesting capability. Using a single cell genomic approach and fluorescence techniques, we recorded an extreme increase in the nucleic acid content of akinetes and shoed that genome copy numbers of single akinetes were ~20-fold those found in vegetative cells. The phosphorus requirement for the increased nucleic acid pool in akinetes was apparently provided from ample polyphosphate bodies found in vegetative cells. The formation of akinetes in response to potassium deficiency was associated with a burst of reactive oxygen species (ROS). During akinetes formation, transcript and protein levels of the antioxidative pathway, positively correlated with the cellular ROS pool, but this pool could not be assigned as an internal signal that leads to or control akinetes' differentiation. It is postulated that akinete forming cells keep the anti-oxidative machinery as an arsenal for protection until germination is possible.