The Ultraviolet (UV) Protecting Pigment in Cyanobacteria, Scytonemin: The Affects of the External Protectant, Iron, and its Implications for Life on Mars

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Cyanobacteria are among the oldest life forms, aiding in the creation of the oxygenic atmosphere. Thus, knowing how cyanobacteria survived early Earth is critical to understanding the interconnection between biotic evolution and the physical environment. Focusing on adaptation to conditions such as extreme temperatures, desiccation, salinity and UV radiation regimes we can come to some conclusions of how life survived harsh environments with and without the use of external supplements. Using *Lyngbya aestuarii*, a filamentous cyanobacterium found in Baja California, Mexico, we will study adaptations to extreme UV regimes with and without the use of external protectants. Exposing *Lyngbya* to varying levels of UVC (190-280 nm), a spectral range found on the early Earth, and measuring the response of its UV protecting pigment, scytonemin, we can determine how the organism deals with extreme radiation. Scytonemin is known to absorb in the UV regions of the light spectrum, protecting cells from its devastating affects. Higher exposures create a need for scytonemin to react and absorb, protecting the organism from cellular and molecular damage. *Lyngbya* can withstand some exposure to UVC radiation but how does this change with protectants available in the environment? Possibilities of extreme exposure sheltered by iron-bearing minerals in Martian soil may decrease debilitating affects of UV damage. We will study UV shielding affects of Martian soil analog materials in media of laboratory samples to understand how iron-bearing minerals may have been utilized for protection against extreme UV fluxes encountered on the early Earth and other potentially habitable planets.