Symbiotic algae and cyanobacteria isolated from Antarctic lichens

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Lichens are very slowly growing symbiotic organisms, often inhabiting locations of extreme environmental conditions. They consist of fungus (mycobiont) and green alga or cyanobacteria as a photobiont. Due to relatively fast growth, fungal partner provides structure which helps to retain water and provides protection to the photobiont. In the symbiotic association, photobiont provides energy from photosynthesis - sugars. Whereas mycobionts are not able to grow without the other symbiont, photobionts are capable to survive and thrive all alone.

In our study, we isolated photobiont cultures from two Antarctic lichens – *Dermatocarpon polyphyllizum* and *Solorina spongiosa.* Samples were collected on James Ross Island during the expeditions held during austral summer in 2018 and 2019. After collection. the lichen thalli were washed in demineralised water, then lichen upper cortex was removed and photobiont cells were inoculated on sterile BBM agar (1%, pH 6.5). Later, these cultures were transported to the laboratories (the Masaryk University, Czech Republic), cultivated at the temperature of +10°C and 20 μmol (photons) m^{-2} s^{-1} of photosynthetically active radiation. During several months of cultivation, photobiont cultures were repeatedly reinoculated until almost axenic photobiont was obtained. Afterwards, the cultures were studied under the light microscope in order to determine their purity and for analysis of separate colonies shape (digital light microscope).

Dermatocarpon polyphyllizum is a foliose chlorolichen quite common in Antarctica as well as in Arctic regions. Its probable photobiont is green alga *Diplosphaera chodatii*, identified in several closely related species. We managed to isolate almost pure culture od green algal cells similar to the samples of *D. chodatii* (strain CCALA 336). Colonies were granular with adherent algal cells.

Solorina spongiosa is a crustose cephalolichen, whose distribution is almost entirely limited to the Northern Hemisphere, with only few exceptions in New Zealand and Antarctica (specifically James Ross Island). The cyanobacterial photobiont was isolated from cephalodium and cultivated on agar. Colonies were round with cells loosely packed, not adhering together. These samples still need more cultivation and purification before molecular analysis-based identification.

In the follow up studies, we would like to compare physiological responses of previously lichenized photobiont cells and not lichenized samples of the same species. We hypothesize that there might be some differences due to lichenization. especially in the response to UV irradiation or extreme temperature changes.

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