MULTIGENE PHYLOGENETIC ANALYSES TO STUDY DISPERSAL MECHANISMS AND POPULATION STRUCTURE OF CYANIDIOPHYCEAE FROM ICELAND

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The Cyanidiophyceae is a unique and remarkable group of unicellular eukaryotes. These bright blue-green colored algae thrive in extremely acidic (pH 0.5 – 3.0) hot springs (50 – 55°C) around volcanoes. Although these unicellular taxa show little morphological variation due to their highly reduced, specialized state, our previous work using environmental PCR has shown that substantial 'hidden' biodiversity exists in the Cyanidiophyceae (Ciniglia *et al*., 2004). The dispersal of endolithic, thermophilic, and acidophilic algae is an enigma because these photosynthetic cells are not expected to survive outside of their extreme environments, yet, they have successfully dispersed throughout the world. Our preliminary studies show that most species are endemic, but a small number have cosmopolitan distributions. To study the dispersal and population biology of Cyanidiophyceae, we have chosen the volcanic island sites of Iceland. We have isolated DNA from isolated samples and sequence coding (rbcL, psaA, psbA genes) and non-coding (calmodulin introns) sequences from plastidial and nuclear loci (already established in our lab for calmodulin genes) to answer questions such as: How are local populations in acid pool and crypto-endolithic sites established; i.e., from local or globally distributed populations? Is there a fit of the population data to a stepping-stone dispersal model?

Seventy-five strains were isolated from eight acidothermal stations dispersed on the entire Icelandic territory.

Multigene approach have revealed neither *C. caldarium* nor *C. merolae* sequences among Icelandic isolates; only one genus has been found among isolates by phylogenetic analyses, mainly ascribable to *Galdieria maxima* and *daedala*.

Phylogenetic analyses have shown discrepancies among genes with a different time scale of chloroplast evolutionary changes; some organisms more closely clustered with *G. daedala* from rbcL and psaA, were more closely related *to G. sulphuraria* or to *G. maxima* by psbA. These results suggest a hypothetical lateral gene transfer among Icelandic thermoacidophilic strains.

Toplin J.A., Norris T.B., Lehr C.R., McDermott T.R., Castenholz R.W., 2008. Biogeographic and Phylogenetic Diversity of Thermoacidophilic *Cyanidiales* in Yellowstone National Park, Japan, and New Zealand. Applied and Environmental Microbiology 74: 2822-2833.

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