Unique microbial ecosystems of Antarctica

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Antarctic freshwater ecosystems are generally considered to be simplified food webs dominated by microorganisms, among which cyanobacteria often form mat consortia on lake bottoms. In association with microbial mats, the aquatic moss Leptobryum wilsonii forms unique tower-like structures called "moss pillars" reported so far only in East Antarctica. Previous analyses on rDNA genotyping showed that bacterial communities differed among the exterior, upper-interior, and lowerinterior sections of the pillars and that more than 60% of the observed 16S rDNA phylotypes were novel taxa at the species, genus, or class levels (Nakai et al., 2012). In addition, uncultivated ultra-small bacterial groups known as candidate divisions OP11 and OD1 representing new phylum-level lineages, were obtained from the lowest section of the exterior (Nakai et al., 2012). Ultra-small microorganisms, or ultramicrobacteria, that pass through 0.2-μm-pore-size filters used for removing microorganisms have recently been observed in various Antarctic environments (e.g., Nakai et al., 2013; Kuhn et al., 2014). Although the reduction of cell size has been described as a strategy to maintain cell integrity in extremely cold environments (Ponder et al., 2008), the species diversity and ecological function of ultramicrobacteria was unknown. There is a cultured species in the newly described bacterial class Oligoflexia that during their life cycle change in morphology from filamentous to ultrasmall cocci (Nakai et al., 2014). The novel phylotypes belonging to Oligoflexia were also found in glacial ice (Nakai and Naganuma, 2015). Ultramicrobacterial populations thus contain some phylogenetically unique species. We have now attempted to cultivate ultramicrobacteria from various samples obtained during the 56th Japanese Antarctic Research Expedition (JARE-56) and will expound on the progress of our research in this presentation.

References

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