

Endolithic microbial communities linked with elements of Svalbard rocks

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Introduction and methods

The high Arctic has long been considered a suitable terrestrial analogue to Mars in many geological and astrobiological aspects [1]. We used a combination of pyrosequencing of bacterial 16S rRNA gene and statistical methods to conduct a survey of the composition of microbial communities in rocks from Svalbard. This study investigates the correlation between major elements of rocks and endolithic colonization in the harsh Arctic environment.

Bacterial Phyla	Mantel test based on Spearman's rank correlation									
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	Na ₂ O	MgO	P ₂ O ₅	K ₂ O	CaO	TiO ₂	MnO
Full community	0.36	0.39	0.41	0.29	0.57	0.47	0.39	0.42	0.41	0.10
Acidobacteria	0.05	0.23	0.05	0.02	0.32	0.04	0.23	0.05	0.13	0.06
Actinobacteria	0.31	0.39	0.37	0.16	0.44	0.37	0.37	0.40	0.36	0.05
Bacteroidetes	0.36	0.39	0.41	0.29	0.57	0.47	0.39	0.42	0.41	0.10
Chloroflexi	0.35	0.10	0.30	0.23	0.32	0.45	0.09	0.33	0.24	0.13
Cyanobacteria	0.27	0.52	0.65	0.34	0.62	0.63	0.53	0.26	0.68	0.37
Proteobacteria	0.36	0.47	0.55	0.49	0.76	0.62	0.48	0.35	0.59	0.30

Table 1: Correlation between bacterial community structure and major elements of rocks. Significant correlations shown in bold($p < 0.01$).

Results and Discussion

The results of the Mantel test showed that the bacterial community structure was significantly linked to some of the rock element factors (Table 1). When data for each phylum were analyzed separately, the *Actinobacteria*, *Bacteroidetes*, and *Proteobacteria* exhibited a significant positive relationship with Al and K(except for *Proteobacteria*), Fe, Mg, P, and Ti, while, *Chloroflexi* was significant positively linked with only P. Therefore, the endolithic bacterial community at the phylum level might be affected by different rock element factors. All kinds of microbes play a remarkably diverse set of geoactive roles in the biosphere [2]. This study demonstrates the interaction of rock-microbes with metals and minerals, as well as their importance in geological and environmental processes.

[1] Susana (2011) *Anal Bioanal Chem* **401**, 2927-2933. [2] Gadd (2010) *Microbiology* **156**, 609-643.