Microbial colonization of rock surfaces; random or mineral specific selection?

E. HUTCHENS[1], N. CLIPSON[1] AND F.P. MCDERMOTT[2]

[1] School of Biological and Environmental Sciences, University College Dublin, Belfield, Dublin 4, Ireland; (elena.hutchens@ucd.ie), (nichloas.clipson@ucd.ie)

[2] School of Geological Sciences, University College Dublin, Belfield, Dublin 4, Ireland. (frank.mcdermott@ucd.ie)

All microbes require sources of energy, carbon and nitrogen for growth and survival, as well as a supply of essential elements, including S, P, K, Mg, Ca and Fe. Adequate levels of Cu, Mn, Zn, etc are essential to life, often functioning as cofactors in enzymatic processes. To acquire essential nutrients from dissolving minerals at the Earth's surface it has been hypothesized that microbes preferentially colonize the surfaces of minerals which contain such nutrients [1]. Gleeson et al [2, 3] found a significant correlation between certain species of bacteria and fungi and particular chemical elements found in a pegmatitic granite.

In this study we exploit the contrasting major element chemistry of three different minerals: muscovite, feldspar and quarz from several sampling points of a pegmatitic granite outcrop to investigate influences on microbial and fungal diversity on mineral surfaces. Adjacent soils from above the rock profile were also analysed to understand the possible link between the microbial communities that develop in the soils and on the rocks underneath. A DNA-based community fingerprinting approach (automated ribosomal intergenic spacer analysis - BARISA, FARISA) was used to assess the nature and extent of bacterial diversity. This molecular method discriminates to species or even strain level, and offers the potential to geomicrobiologists of matching uncultivated microorganisms to biogeochemical reactions.

The molecular biology approach was combined with chemical analysis and multivariate statistics: multi dimensional scaling (MDS), canonical correspondence analysis (CCA), and analysis of variance (ANOVA) to identify the main geochemical factors influencing microbial community structure *in situ*.

The possibility of a strong substrate control, with many bacterial and fungal populations being limited to a single mineral type, will be discussed.

References

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