Microbiological research on the Nornahraun lava field

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Newly formed lava fields are unique environments as they are the only naturally sterile (life-free) places on Earth. This makes fresh lava fields ideal research environments for studying microbial succession – colonization of the rock and development of viable microbial communities – that eventually leads to soil formation and development of higher life. Although the latest models suggest that life might have emerged on volcanic rocks in a formamide environment, nothing is known about the ability of modern microbes to thrive in previously uninhabited rocky environments.

The aim of this study is to reveal the microorganisms responsible for the transformation of the barren rock to a life-supporting ecosystem with soil and vegetation. Our research site is the Nornahraun lava field of the Bárðarbunga volcanic system in Iceland that formed during fissure eruptions between August 2014 and February 2015. The lava field covers ~85 km^2 and contains several microenvironments with different starting conditions (humidity, radiation, temperature, lava morphology, mineralogy) for microbes. Sampling included collection of rocks from different microenvironments and testing the eolian input of microbes with growth media plates deployed on the lava field. Plate experiments revealed the introduction of fungi and bacteria onto the lava field, with rain being probably a more important source than wind. Rock samples will be analysed for the presence of microbes and their specific metabolic properties. Only a limited number of species with special molecular properties are expected to survive on hostile lava fields with few available nutrients. Samples are also subjected to geochemical analysis to study the effects of different mineralogy on microbial colonization.. Sampling of the lava field is planned to continue annually for the purpose of long-term monitoring of the colonization. The results will unravel the primary microbial succession in rocky environment and also build on our understanding of geochemical recycling as the first colonizers and the environments they create facilitate rock weathering and soil formation.