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The diversity of Scottish oceanic cloud bacteria

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From 1,500 to 20,000 bacteria are known to be present in each millilitre of cloud water. This project aims to characterise their diversity (using 16S rDNA), determine which are active (using 16S rRNA) and screen for ice nucleating genes and their expression. We collected cloud and rain water samples from two coastal mountains in the Outer Hebrides (islands off NW Scotland). Community composition was determined using a combination of amplified 16S rDNA restriction analysis and sequencing. The 256 clones yielded 100 OTUs, of which 69 occurred only once. The rain samples were more diverse than the cloud samples, which could be attributed to atmospheric scrubbing as the rain falls. Around half of the OTUs were related to bacteria from terrestrial psychrophilic, polar environments (e.g. ice cores or Antarctic microbial mats). Cloud samples were dominated by a mixture of fluorescent Pseudomonads, some of which are known ice nucleators. Possession of cloud condensing and ice nucleating abilities may protect bacteria from desiccation or irradiation and assist in nutrient scavenging, aiding their survival and growth. We are currently determining whether these Pseudomonads are active and expressing these ice nucleation proteins in cloud water.