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Metagenomic dynamics of four glaciers of Pakistan

Muhammad Rafiq

Quaid-i-Azam University, Pakistan

Mountain ranges of Hindu Kush, Karakoram and Himalaya (HKKH) are among the largest mountains of the world. Due to heavy glacial ice mass they are termed as third pole of the world. There is no report to describe the microbial diversity of these psychrophilic important niches. Present study aims to unveil unculturable microbial diversity of the HKKH glaciers; Tirich Mir glacier (Hindu Kush), Batura and Passu (Karakoram) and Siachen (Himalayan Karakoram) to enhance understanding of microbial diversity of these regions. Ice, sediment and melt water samples were collected from these glaciers. Metagenomic approach was used via Illumina for sequencing of samples and analyzed through MG-RAST (Metagenomic Rapid Annotation Subsystem Technologies). These samples were rich in diversity and members of all three domains of life were detected. Most abundant group was bacteria constituting more than 90% in all samples (Some samples had about 97–98% of bacteria). Insight into domain bacteria revealed most abundant groups were Proteobacteria, Actinobacteria, Cyanobacteria, Firmicutes, Bacteroidetes, Chloroflexi in all samples. Combination of autotrophs and heterotrophs was observed. Radioresistant *Deinococcus* was also observed. Eukarya domain was dominated by heterotrophic fungi Ascomycota. Number of Ascomycota was much higher than relative eukaryote groups. Few important primary producers of Eukarya domain were present. Major group was Algae having a basic role in cycling of important compounds. Members of domain Archaea were also found in large number. These psychrophilic archaea belong to Crenarchaeota, Euryarchaeota, Korarchaeota and Nanoarchaeota. Besides, a large number of sequences belonging to psychrophilic viruses were also detected and few sequences were unspecified. Results indicated these glaciers inhabit diverse microbial life never explored earlier. Data of diversity in that part of world can be used to compare microbial life in other polar and non-polar glaciers of the world and further their role and functions can also be analyzed.

mr14311@bristol.ac.uk