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# The Microbiome of Shallow Water Hydrothermal Vents: their Metabolic Diversity, Biogeochemistry and Coevolution

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Shallow-water hydrothermal vents are prevalent marine ecosystems with diverse microbial communities that play a significant role in the cycling of biogeochemical elements [1]. Unlike their deep-sea counterparts, these vents exhibit a combination of chemolithotrophic and phototrophic processes, creating highly energetic environments. They are widely distributed globally, often near continental margins and volcanic regions, and can be found at depths of up to 200 meters [1]. The emissions from shallow-water hydrothermal vents release nutrients and trace metals that contribute substantially to local and mesoscale primary productivity, providing essential resources to adjacent ecosystems where these nutrients may be limiting [2]. Additionally, the diverse communities associated with shallow vent emissions serve as hotspots of biodiversity, housing compounds with potential biotechnological applications. Despite their significance, our understanding of the microbial diversity in these ecosystems remains limited. Previous studies have shown that the microbial communities in investigated shallow water vents respond to distinct geochemical conditions [3]. However, these studies have focused on only a few specific shallow vents worldwide, and the underlying geological processes influencing these geochemical drivers have not been fully explored. Recent research has indicated that different

geological characteristics, such as tectonic settings and volcanic activities, directly influence microbial diversity and composition [3]. This influence is mediated by a range of interactions between water and rocks at significant depths, as well as the mixing of subsurface and surface processes. The goal of this project is to conduct an extensive investigation of numerous shallow-water hydrothermal vents, employing an integrated approach that combines geochemical and microbiological analyses across diverse geological contexts.

**References**

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