Molecular Characterization of Arctic Microbial Communities

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Scope of Work:
As the oil industry continues to explore drilling and production activities in the Arctic, it becomes imperative to understand how the marine microbial community will respond to petroleum inputs and their potential to biodegrade the contaminant. This research proposal will identify arctic marine microbial communities in the surface, sub-surface and deep waters in Shell Oil’s 193 lease location in the Chuckchi Sea. It will also determine if these same species are also located in near shore environments of Barrow, AK. In addition to microbial species characterization and quantification, it is also important to determine their potential to biodegrade petroleum and chemically dispersed petroleum. High throughput pyrosequencing of bacterial 16S rRNA genes will be conducted on filtered seawater samples to provide information regarding the taxonomic identity of the microbial communities. Filtered seawater samples will also be analyzed by GeoChip microarrays. This powerful technology detects hundreds of thousands of different microbial functional genes simultaneously and is a measure of the biodegradation potential of a microbial community. This research proposal will also capitalize on preexisting filtered samples from mesocosms of Alaska North Slope (ANS) crude oil and chemically dispersed ANS incubated at -1?C with indigenous microorganisms from fresh Chuckchi Sea water. Pyrosequencing and GeoChip data from these filters will be compared to deep-sea dispersed oil samples from the Deepwater Horizon blowout, in collaboration with Dr. Terry Hazen. During the Deepwater Horizon spill, Hazen et al., 2011 performed the most comprehensive molecular microbial analyses ever performed on an oil spill, which also occurred in deep, cold waters (5°C). This proposal will provide an arctic microbial community baseline and insight into how this important region of the Alaskan arctic marine ecosystem would respond to inputs of petroleum and how it compares to another well-studied cold water system.