Characterization of phenanthrene-degrading bacteria isolated from Antarctic soil

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Polycyclic aromatic hydrocarbons (PAHs), including phenanthrene (PHE), found in petroleum products such as diesel fuel are persistent compounds widely present in the environment. These compounds are genotoxic, carcinogenic, and teratogenic, pose serious health risk to living organisms when released untreated into the environment. PAHs are also found in Antarctica, where diesel fuel is used by human activities. Bioremediation using microbial metabolism may be the most sustainable remediation method in Antarctica because of its low environmental impact. The objectives of this study are to isolate and identify PHE-degrading bacteria from Antarctic soils and investigate their ability to efficiently degrade PHE. Soil samples collected in Antarctica were added to a minimal salt medium (MSM) with a PHE concentration of 0.1% (w/v) and incubated at 15°C with 135 rpm shaking. After enrichment culture, a Gram-positive rod-shaped bacterium was isolated. This isolated bacterium was designated as strain BS28. Based on morphological observation and 16S rRNA gene sequence analysis, strain BS28 is believed to belong to *Pseudarthrobacter* sp. group. PHE degradation experiments were performed in test tubes. 50 µL of 10% (w/v) PHE dissolved in acetone was added and evaporated prior to addition of MSM medium and strain inoculation. These test tubes were incubated at 15°C and 30°C, respectively. Residual PHE in the test tubes was extracted and the PHE concentration was determined by gas chromatography hydrogen flame ionization detector (GC-FID). This strain was able to degrade 30.50% of PHE at an initial concentration of 500 mg L^{-1} in 12 days. This strain was able to degrade PHE at 15°C, but the PHE concentration did not show appreciable decrease at 30°C. The strain may also utilize various PAHs and heterocyclic compounds commonly present at contaminated sites as the sole source of carbon and energy. From the current findings, strain BS28 has high potential for bioremediation of PHE-contaminated environments in Antarctica and other cold regions.