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Kerosene degraders justified with gas chromatographic and genetical analyses

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Statement of the Problem: Extraction, refining, processing and transportation of hydrocarbons have resulted in leaks and accidental spills to the environment. As a result, contamination by hydrocarbons can be hazardous to plants, animals and humans since most of the hydrocarbon components are toxic and persistent. Kerosene, one of the most commonly spilled petroleum products, is composed of alkanes, cycloalkanes, benzene and naphthalene. Bioremediation is a safe, effective and economic method for the cleaning up of hydrocarbons from the contaminated areas. Bacteria are one of the best candidates for bioremediation because they have variety of catabolic genes and enzymes responsible in degradation. Alkane monooxygenases, coded by alkB gene, are the key enzymes in aerobic degradation of alkanes. These enzymes hydroxylate alkanes to alcohols, which are further oxidized to fatty acids and catabolized by the bacterial β-oxidation pathway. Therefore, the aim of this study is to determine bacteria genetically capable of degrading kerosene to use in possible bioremediation efforts.

Methodology & Theoretical Orientation: 22 bacteria were isolated from river water samples next to a petroleum refinery were tested for their growth ability in Bushnell Haas Medium containing 1% kerosene as a sole source of carbon. Kerosene degradation ability of the isolate was shown through gas chromatographic (GC) analyses and presence of alkB gene was investigated by polymerase chain reaction (PCR).

Findings: Out of 22 bacteria, 19 were able to degrade kerosene. GC analyses showed that seven isolates namely *Acinetobacter calcoaceticus* Fe10, *Acinetobacter johnsonii* Sb01, *Delftia acidovorans* Cd11, *Pseudomonas koreensis* Hg11, *Pseudomonas plecoglossicida* Ag10, *Staphylococcus aureus* Ba0 and *Stenotrophomons rhizophila* Ba11degraded kerosene over 70% within 21 days. Kerosene degraders were also confirmed by investigating the presence of alkB genes through PCR analysis.

Conclusion & Significance: The effective removal of complex hydrocarbons like kerosene from contaminated waters usually requires a microbial population or consortium. Therefore, degradation abilities of the selected isolates should be further tested in bioremediation field studies.

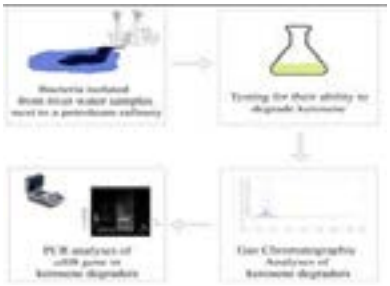

Fig.1. Schematic overview of the study

Biography

B Icgen received his MSc and PhD in Biotechnology at Middle East Technical University (METU) of Ankara in 1994 and 2000, respectively. He conducted two-year-post-doctoral research at the Department of Chemical Engineering, Bioprocess Engineering Research Unit of University of Cape Town (UCT) in South Africa. In 2008, he became an Associate Professor and took up a faculty position at Kirikkale University (KU) till 2012. Since then, he has been a faculty at METU in the Department of Environmental Engineering. Meanwhile, as a Visiting Faculty, he visited Princeton University (PU) Department of Civil and Environmental Engineering and Massachusetts Institute of Technology (MIT) Department of Earth, Atmospheric and Planetary Sciences (EAPS) in 2011 and 2015, respectively. His interests lie in the fascinating and often complex array of processes taking place in microbial environment and the behavior of the microorganisms under different environmental conditions. He likes using molecular biological methods to investigate the occurrence and distribution of bacteria in the environment in order to provide direct information on community structure for variety of environmental and industrial applications. His team focuses on microbial biotechnology, with a recent focus on environmental genomics, transcriptomics and proteomics.

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