A Hope For Oil Spill Bioremediation

A recently published article in Environmental Microbiology reveals that indigenous microbiota of the Galician shore is readily able to degrade crude oil. Scientists from the Estación Experimental del Zaidín (Spanish Council for Research, CSIC) in Granada investigated in situ crude oil degradation after the Prestige oil spill in November 2002.

After a spill, hydrocarbons are subjected to physicochemical processes such as evaporation or photochemical oxidation which produce changes in oil composition. But the most important process acting on the spilled oil is biodegradation. It is well established that most crude oils are biodegradable to a great extent, especially components as short linear alkanes or simple aromatic hydrocarbons. However, the heavy fraction, made of long-chain saturated and polyaromatic hydrocarbons and a considerable fraction of asphaltenes and resins, is generally recalcitrant to degradation.

The team's goal was to assess the response of the natural bacterial population after the spill and to detect evidences of crude oil degradation taking place at the contaminated sites. They used stable isotopes (13C/12C) to determine the origin of dissolved inorganic carbon (DIC) in control and contaminated coastal marine water samples. Due to its biological origin, crude oil is very depleted in 13C. Therefore, its biodegradation product CO2 will also be more 13C depleted as compared with the typical marine DIC and atmospheric dissolved CO2.

The sampling area is an energetic system poor in organic mater. Consequently, the anomalous DIC isotopic composition of certain samples taken along the shore of a contaminated island in the Cíes archipelago showed degradation of a depleted 13C source such as the Prestige crude oil, pointing out to a natural population oxidizing this carbon source into CO2. This could be reproduced in the laboratory using water samples taken from the contaminated shore, although the process required nitrogen and

phosphorus amendment, these two elements being limited in marine ecosystems. The results confirmed the presence of a microbiota readily able to degrade the contaminant. Further analysis of specific organisms present in contaminated beaches revealed the presence of several populations able to degrade polycyclic aromatic compounds such as phenanthrene or naphthalene, especially in those sites that had recently been restored after an important contamination episode. Authors concluded that, probably due to the contamination record of the past in that coast, indigenous populations had evolved to select for organisms able to grow and degrade components of crude oil.

Source: Blackwell Publishing Ltd.

Posted: May 17, 2005