

Lessons from The *Exxon Valdez* Experience and Other Spills

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The Gulf oil spill from the *Deepwater Horizon* well accident raises questions about the roles indigenous hydrocarbon degrading microorganisms play in mitigating ecological impact and what can be done to speed the removal of the oil. Studies on the IXTOC-1 well blowout and Amoco Cadiz spill showed that oil entering the Gulf of Mexico was rapidly colonized by diverse naturally occurring hydrocarbon degrading bacteria that were able to degrade many oil components. A re-examination of the *Exxon Valdez* experience illustrates the efficacy, benefits, and limitations of bioremediation by adding fertilizer to speed microbial degradation. The application of bioremediation to the *Exxon Valdez* oil spill followed extensive laboratory and field testing to demonstrate efficacy and safety. Field tests showed that the rate of oil degradation was a function of the ratio of nitrogen/ biodegradable oil. Adding fertilizers increased the rate of polycyclic-aromatic-hydrocarbon (PAH) degradation in this relatively undegraded oil by a factor of 2, and the degradation rate of total GC-resolvable hydrocarbons by 5 relative to the controls. A total of 107,000 pounds of nitrogen were applied from 1989-1991 in 2,237 separate shoreline applications. The fertilizer was shown not to result in toxicity to fish or to cause algal blooms. Most of the oil in contact with moving water has largely been eliminated by microbial biodegradation and other natural weathering processes. Some small patches of subsurface oil, however, became sequestered and still remain more than 20 years after the spill. Even this oil is for the most part highly weathered, depleted in alkanes and most polynuclear aromatics. While there are limits to the application bioremediation and differences between Prince William Sound and Gulf of Mexico, appropriately applied, as in the case of the *Exxon Valdez* oil spill, it is an effective technology for treating contaminated shorelines that present an ecological danger and which otherwise cannot be cleansed by physical means. But, even with treatment some oil may persist for long periods of time.