

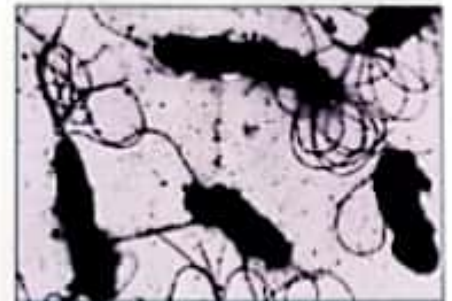
Bioremediation of Marine Oil Spills

- Useful process for removing marine oil pollutants.
- The application of oleophilic fertilizer is a useful bioremediation strategy.
- Marine oil spills are very catastrophic events which pose a great threat on the affected environment.
- Marine oil spills are mainly oils, petroleum, fuel etc. composed of complex hydrocarbons.
- Addition of microbial seeding or inoculum that are capable of degrading hydrocarbons.
- Most microorganisms considered for seeding are obtained from enriched cultures (from a previously contaminated site).
- After inoculum addition, fertilizer is added, then environmental modification is done , adequate aeration, nutrient source is a prerequisite.
- Bioremediation for marine oil spills can be approached in two different ways depending on the case at hand. This includes bioaugmentation which involves introducing oil degrading microorganisms to the affected site, and also biostimulation which involves adding supplemental nutrients to the affected site to aid the existing oil degrading microorganisms.

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Table 2.5 Representative microorganisms capable of degrading petroleum hydrocarbons (Based on Atlas, 1984; Focht and Westlake, 1987; Jordan and Payne, 1980; Leahy and Colwell, 1990)

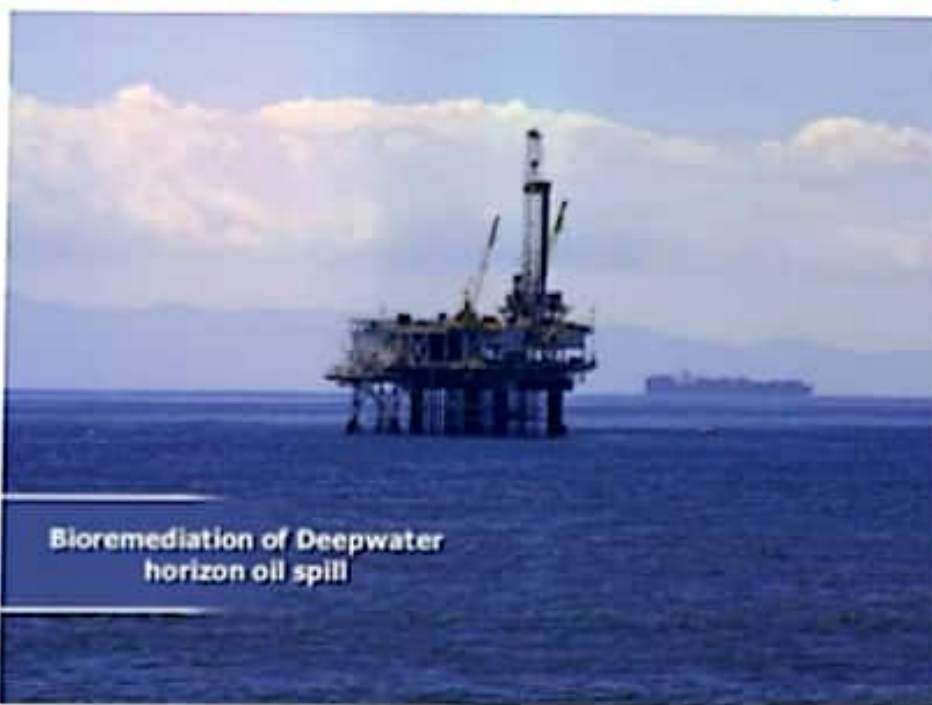
Bacteria	Yeast and Fungi
<i>Achromobacter</i>	<i>Aspergillus</i>
<i>Acinetobacter</i>	<i>Candida</i>
<i>Alcaligenes</i>	<i>Cladophorium</i>
<i>Arthrobacter</i>	<i>Penicillium</i>
<i>Bacillus</i>	<i>Rhodotorula</i>
<i>Brevibacterium</i>	<i>Sporobolomyces</i>
<i>Corynebacterium</i>	<i>Trichoderma</i>
<i>Flavobacterium</i>	
<i>Nocardia</i>	
<i>Pseudomonas</i>	
<i>Vibrio</i>	



A number of naturally occurring marine sediment microbes such as *Pseudomonas fluorescens* shown in this micrograph, have been shown to be capable degraders of oil and other and other hydrocarbons.

Photo courtesy of Agriculture and Agri-Food Canada, FECC.

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Bioremediation related technologies

- **Phytoremediation** - bioremediation through the use of plants that mitigate the environmental problem without the need to **excavate** the contaminant material and dispose of it elsewhere.
- **Bioventing** - an in situ remediation technology that uses microorganisms to biodegrade organic constituents in the groundwater system.
- **Bioleaching** - the extraction of metals from their ores through the use of living organisms.
- **Landfarming** - an **ex-situ waste treatment process** that is performed in the upper soil zone or in biotreatment cells.
- **Bioreactor** - any manufactured or engineered device or system that supports a biologically active environment.
- **Vermicomposting** - using various worms, usually red wigglers, white worms, and other earthworms to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast.
- **Rhizofiltration** - is a form of phytoremediation that involves filtering water through a mass of roots to remove toxic substances or excess nutrients.