Bioremediation of petroleum hydrocarbons

**Petroleum** is a rich source of organic matter, and because of this, microorganisms readily attack hydrocarbons when petroleum is pumped to Earth’s surface and comes into contact with air and moisture.

The term **bioremediation** refers to the microbial cleanup of oil, toxic chemicals, or other environmental pollutants, usually by stimulating the microorganisms’ activities. Microbial bioremediation is a widely used technique for treating petroleum hydrocarbon pollution in both terrestrial and aquatic ecosystems.

 Biodegration is both oxic and anoxic.

**Hydrocarbon Decomposition**

Diverse bacteria, fungi, and a few green algae oxidize petroleum products aerobically. hydrocarbon oxidation is most extensive if the temperature is warm enough and supplies of inorganic nutrients (primarily N and P) are sufficient. Because oil is insoluble in water and is less dense, it floats to the surface and forms slicks. There, hydrocarbon-degrading bacteria attach to the oil droplets and eventually decompose the oil and disperse the slick. Certain oil-degrading bacteria are specialist species; for example, the bacterium Alcanivorax borkumensis grows only on hydrocarbons, fatty acids, or pyruvate. This organism produces surfactant chemicals that help break up the oil and solubilize it.

**In large oil spills**,volatile hydrocarbons, both aliphatic and aromatic, evaporate

quickly without bioremediation, leaving nonvolatile components for cleanup crews and microorganisms to tackle. Microorganisms consume oil by oxidizing it to CO2. When bioremediation activities are promoted by inorganic nutrient application, oil-oxidizing bacteria develop quickly after an oil spill and under ideal conditions, 80% or more of the nonvolatile oil components oxidized within one year. However, certain oil fractions, such as those containing branched-chain and polycyclic hydrocarbons, are not preferred microbial substrates and remain

in the environment much longer. Spilled oil that finds its way into sediments is even more slowly degraded and have a significant long-term impact on fisheries.

 **Removal of petroleum hydrocarbon pollutants**

Many methods for controlling oil contamination have been investigated including physicochemical and biological treatment. In physicochemical treatment, incineration, thermal desorption, coker, cement kiln, solvent extraction and land filling are used but they have some disadvantages. Numerous physicochemical techniques decontamination methods are expensive due to the cost of excavation and transportation of large quantities of contaminated materials for ex-situ treatment. Green technologies for pollutant cleanup by biological means are used for bioremediation of petroleum polluted site.

Bioremediation provides the most cost-effective and eco-friendly measurements for the remediation of petroleum contaminated soil and water to bring back its native environment. Remediation refers to removing, degrading or transforming contaminants to harmless or less harmful substances.It includes methods that reduce mobility and migration of the contaminants, preventing their spreading to uncontaminated areas; toxicity of the contaminants remains unaltered, but the risk they pose to the environment is reduced.