The microbial hydrocarbon diet

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Bioremediation of industrial sites and petrochemical spillages often involves finding microbes that can gorge themselves on the toxic chemicals. This leaves behind a non-toxic residue or mineralized material. Writing in the *International Journal of Environment and Pollution*, researchers in China describe studies of a new microbe that can digest hydrocarbons.

Hong-Qi Wang and Yan-Jun Chen College of Water Sciences, Beijing Normal University, working with Bo-Ya Qin of the Ministry of Environmental Protection of China, have investigated the activity of enzymes from the bacterium Bacillus cereus DQ01, which can digest the hydrocarbon n-hexadecane. The bacterium was initially isolated from the Daqing oil field in North East China where it had evolved the ability to metabolize this chemical.

Bioremediation of hydrocarbons usually involves the application of a cultured bacterium that has been optimized to feed on the specific contaminants, such as particular hydrocarbons. The microbes are cultured first in the presence of sugar or another standard feedstuff in conjunction with a small amount of the pollutant material. Successive generations are fed an increasing proportion of the pollutant until their growth is optimized for digestion of that compound rather than the sugar.

These optimized microbes are applied to the contamination site or spill in large but controlled volumes and digest their way through the pollutant material, multiplying and digesting until no pollutant remains. The

byproducts are non-toxic carbon dioxide and water, and mineralized matter.

The team has now found the optimal conditions for the Daqing microbe to feast on hydrocarbon, which could point the way to a more effective approach to bioremediation of spill sites.

The key step in the degradation of hydrocarbons normally depends on the presence of a multi-component enzyme system, the team explains. Understanding exactly which components are needed for degradation and the temperature and pH of the soil best suited to the process could help researchers develop the perfect microbial cleanup culture.

The team has now found that enzymes within the microbial cell and in its membrane inner membrane are responsible for degradation of n-hexadecane. The team found that neutral pH and a temperature of 30 Celsius are optimal for the microbe to produce the main degradation enzyme. They also point out that adding a small amount of a surfactant material, rhamnolipid, can also stimulate enzyme production and improve degradation efficiency.

Source: Inderscience Publishers (news : web)