Plastic degrading marine bacteria discovered

Scientists from the Central Salt and Marine Chemicals Research Institute, Bhavnagar, have discovered three species of marine bacteria which have demonstrated their ability to degrade polyethylene[1]. Polyethylene is a commonly used raw material in manufacturing plastics, which are non-biodegradable substances that stay in the environment for an infinite period of time. According to the Central Pollution Control Board (CPCB), India generates nearly 56 lakh tonnes of plastic waste each year with only 60% of it being recycled and reused[2]. The remaining 40% causes not just littering but is hazardous to freshwater, marine and terrestrial ecosystems.

Sixty species of bacteria were collected from the pelagic zone or open seas of the Arabian Sea along the coast of Gujarat. The bacteria were cultured in the laboratory and tested for their ability to degrade small samples of low-density polyethylene taken from plastic bags. Three out of the sixty marine bacteria species – *Kocuria palustris*, *Bacillus pumilus* and *Bacillus subtilis* demonstrated their ability to help degrade polyethylene. The bacteria used carbon and protein for their metabolic activities from polyethylene samples.

The evidence confirming the biodegradation of polyethylene comes from the presence of dehydrogenases, a group of intracellular enzymes involved in metabolic activities, that indicates growth and metabolic activities of the bacteria on the polyethylene film in addition to the formation of ester, keto, vinyl and internal double bonds from catalytic enzyme reactions that were detected using the Fourier transform infrared spectra. The efficiency of the bacteria to degrade polyethylene was also determined by measuring growth and metabolic activity on the polyethylene surface. The loss in dry weight of polyethylene films used was found to be 1%, 1.5% and 1.75% after 30 days of incubation with the *K. palustris*, *B. pumilus* and *B. subtilis* isolates respectively, indicating *B. subtilis* to be the most efficient among the three bacteria. This study shows that polyethylene can undergo degradation without the need of applying any external treatments and may help provide an eco-friendly solution for management of plastic waste.

1. Harshvardhan, K. and Jha, B., *Mar. Pollut. Bull.*, 2013, **77**(1), 100–106.
2. http://articles.timesofindia.indiatimes.com/2013-04-04/pollution/38277560_1_plastic-waste-cpcb-tonnes (accessed 21 December 2013).

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The resistance gene in malaria parasite identified

The mutations in the genetic make-up of the malaria parasite *Plasmodium falciparum* causing resistance to the drug artemisinin have been identified[1]. Artemisinin-based drugs can remove the parasite from blood within two days of their use. However, the parasite strains resistant to this drug were first discovered in 2005 in Cambodia and have since spread to Thailand and southern Myanmar. Scientists are now worried about the spread of this artemisinin drug-resistant parasite strain to Africa, India and Bangladesh, which are also endemic to this disease causing many human deaths each year.

In a study by scientists from Pasteur Institute in Paris, a drug-sensitive strain of the parasite sourced from Tanzania was cultured in the laboratory. This parasite culture was exposed to an artemisinin-based drug during its growth stages. After five years of repeating such cycles, the scientists were finally successful in culturing an artemisinin drug-resistant strain in their laboratory. By examining the genome sequence of this cultured drug-resistant strain with the drug-resistant strains found in Cambodia, scientists have identified a gene coding protein kelch K13 to be the reason for this resistance. On further sequencing of the drug-resistant Cambodian strains, scientists discovered 17 mutations in the parasites genome, all associated with the kelch K13 protein. Although much is not known on the role of the protein, scientists believe that its discovery is a good beginning. They further plan to map the locations of the artemisinan-resistant parasite strains in an effort to control its spread.

1. Ariey, F. *et al.*, *Nature*, 2013; http://dx.doi.org/10.1038/nature12876; published online on 18 December 2013.

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