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An insight into bioremediation of synthetic polymer

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Synthetic polymers are extensively used in modern day life due to easy availability, light weight and durability. The major problem of the usage of these synthetic polymers is that they are not easily degraded and thus pollute the environment. However, it is extremely difficult to avoid using these materials as plastics have become an integral part of modern life. Thus the current situation makes it necessary to devise new technologies for the remediation of plastic-related environmental pollution. Microbes are known for surviving in niches that are rich in recalcitrant material such as synthetic polymers. This observation suggests that microbes surviving in such environments may have potential to utilize synthetic polymers that are apparently not biodegradable and thus such microbes could prove valuable in cost-effective remediation of plastic waste. Consistent with this, there are reports of microbial degradation of synthetic polymers. To this end, my research group also isolated several microorganisms which are capable of degrading synthetic polymers including polyurethane (PUR), polyethylene succinate (PES) and low density polyethylene (LDPE). While investigating the underlying mechanism of this degradation, we observed that cellular surface hydrophobicity and the biofilm formation ability on the polymer surface play important role in polymer degradation. The formation of biofilm is an adaptation that allows survival under varied environmental conditions. We observed that biofilm harvested cells exhibited higher metabolic activity, functional diversity, functional homogeneity and cell surface hydrophobicity than planktonic cells. All these adaptations lead to enhanced degradation of the polymer.

Biography

Alok Kumar Sil is currently an Associate Professor of Microbiology at University of Calcutta, India. He has obtained his BSc in Chemistry and MSc in Biochemistry from University of Calcutta. He has received his PhD in Biochemistry from University of Calcutta and Postdoctoral training from Penn State College Medicine, USA (1995-2000) and University of California, USA (2000-2003). He has been in the Department of Microbiology, University of Calcutta, India since 2004. His current research area includes microbial ecology with special emphasis on bioremediation of synthetic polymers and various aspects of cigarette smoke induced human diseases.

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