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Microbial remediation of hexachlorocyclohexane

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The production, distribution, use, misuse, disposal, or accidental spills of many xenobiotic chemicals have polluted some environments to levels that threaten the health of humans, livestock, wildlife and, indeed, whole ecosystems. Hexachlorocyclohexane (HCH) is one such xenobiotic which has been used extensively to improve human health, standards of living and safety through advancements in production, application in agriculture and medicine, to strengthen national defense. Unfortunately, its unplanned applications into the environment have reversed the ecosystem by affecting its balance. Already tonnes of HCH have entered the ecosystem. Traditional methods for the cleanup of pollution have usually involved removal of the HCH polluted materials, and their subsequent disposal by land filling or incineration. These disposal/cleanup methods are often prohibitively expensive. Furthermore, available space for landfills and incinerators is declining. Perhaps one of the greatest limitations to traditional cleanup methods is the fact that in spite of their high costs, they do not always ensure that HCH residues are completely destroyed. The past two decades have seen a tremendous upsurge in the search for cost-effective and environmentally sound alternatives to traditional methods for dealing with HCH residue. Bioremediation is an option that offers the possibility to destroy contaminants such as HCH using natural biological activity. As such, it uses relatively low-cost, low-technology techniques, which generally have a high public acceptance and can often be carried out on site. In our laboratory, we have isolated many bacterial cultures which can degrade hexachlorocyclohexane (HCH) by long term enrichment technique. Bacterial isolates were found to degrade both individual isomers of HCH and Technical grade HCH in both water and soil. Trials were carried out in reactors (ex-situ) and in open fields (in-situ). The bioremediation was also tested by bioassay using germinating plants as markers. The talk addresses the bioremediation of HCH by the isolated bacteria and studies on enzymes and genes involved in their degradation.

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