

**USING GENETICS, GENOMICS AND METAGENOMICS APPROACH FOR
DEVELOPING BIOREMEDIATION TECHNOLOGY FOR THE
DECONTAMINATION OF HEXACHLOROCYCLOHEXANE**

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Technical Hexachlorocyclohexane and γ -isomer (lindane) of HCH were the most intensively produced and used pesticides. The use of these pesticides for the control of agricultural pests and in health programme had benefited the world greatly in the past. However extensive and indiscriminate use of HCH and unusual process of its production have resulted in the contamination of our environment. HCH is produced by the chlorination of benzene in the presence of UV. This leads to the formation of primarily five isomers γ -HCH (10-12 %); α -HCH (60-70%); β -HCH (5-12%); δ -HCH (6-10 %) and ϵ -HCH (1-2 %). Among these isomers only γ -HCH also called lindane has the insecticidal property. In several advanced countries γ -HCH was used after purification from the HCH mixture while in developing countries technical HCH was used. The purification of γ -HCH from the HCH mixture had left huge amounts (around 4-7 million tons) of mixture of HCH isomers (α -, β -, δ - and ϵ -HCH) also called HCH muck by the side of production units. This HCH muck has now been discovered from several locations around the globe. HCH isomers in the muck especially β -HCH and δ -HCH are highly toxic, persistent and carcinogenic. The decontamination of this HCH waste is a major challenge before the scientific community. Several HCH degrading bacteria have been isolated and used by various research groups with an aim to develop HCH bioremediation technology. We have been working on this problem for the past several years. The basic work that has been carried out on the genetics and physiology of HCH degradation, culturable and unculturable bacterial diversity at the HCH dump site will be presented.



“Using Genetics, Genomics and Metagenomics Approach for Developing Bioremediation Technology for the Decontamination of Hexachlorocyclohexane”

Rup Lal is a Professor in Molecular Biology at the Department of Zoology, University of Delhi (2007-2011). Born in a village Kanoh in Himachal Pradesh, Rup Lal did his Ph.D. at the University of Delhi, Delhi, India (1980). He was the Head of Department of Zoology (2007-2010), and also Dean Faculty of Science, University of Delhi (2007-2010). He is the awardee of Alexander von Humboldt Fellowship, DBT Overseas Fellowship and ASM Indo-US Professorship in Microbiology. He has also been a visiting scientist at the University of Cambridge. He is the Editor-in-Chief of the Indian Journal of Microbiology and associate editor of BMC Biochemistry and BMC Biotechnology. He is Fellow of the National Academy of Agricultural Sciences and the Association of Microbiologist of India, and a member of the Review Committee for the ASM-IUSSTF Indo-US Professorship in Microbiology. His primary research interests include microbial diversity at pesticide polluted sites, genetics and biochemistry of hexachlorocyclohexane degradation and development of HCH bioremediation technology. His other research activities include study on evolution of *lin* genes and the genetic manipulation of the rifamycin producer *Amycolatopsis mediterranei* and sequencing genomes. He has developed a series of cloning vectors for several species of *Amycolatopsis* and the technology has been granted U.S. patent. His group is involved in genome sequencing of *Amycolatopsis mediterranei* S699 and *Sphingobium indicum* B90A and *Thermus manikernesis* RLM. By using molecular tools his group has characterized more than 40 new species of bacteria. He has nearly 100 publications in peer-reviewed journals attracting over 800 ISI citations.