

ENRICHMENT OF CHLOROBENZENES DEGRADING CULTURES FROM ZEEBRUGGE HARBOR RIVER SEDIMENTS

G. Atuga¹, Y. Lu², S. Atashgahi³ and H. Smidt⁴

¹Kenya Marine and Fisheries Research Institute, English point, Mombasa, Kenya

^{1,2,3,4}Wageningen University, Department of Microbiology, Wageningen, The Netherlands

Email: atuga2004@yahoo.com

Abstract

Chlorobenzenes (CBs) compounds are persistent in the environment. The accumulation of these compounds in the environment may lead to their biomagnification in the food chain. Chlorobenzenes have been found to be toxic to human and marine life. The objective of this study was to evaluate anaerobic reductive dechlorination of enrichment cultures from Zeebrugge harbour, Belgium. Anaerobic enrichment cultures which were initially amended with one of specific chlorinated benzene, i.e. HCB, 1,2,4,5-TeCB, and 1,2,3,4-TeCB were spiked with 50 µM of the respective CBs serving as electron donor, and lactate as electron acceptor. Two serial transfers were conducted. The reductive dechlorination of enrichment cultures was studied using Gas Chromatography Flame-Ionization Detector (GC-FID) for 44 days, after which a second transfer was done. Quantitative real-time PCR (qPCR) was performed on the samples at day zero of first transfer and day 26 of the second transfer targeting putative *Dehalococcoides* spp. Based on the achieved results, reductive dechlorination was observed in all samples. HCB was dechlorinated via two major degrading pathways i.e. HCB via PCB, 1,2,4,5-TeCB, 1,2,4-TCB, 1,4-DCB to MCB, or HCB via 1,2,3,5-TeCB to 1,3,5-TCB. The 1,2,4,5-TeCB enrichment samples also showed two degrading pathways i.e. 1,2,4,5-TeCB via 1,2,4-TCB to 1,3-DCB, or 1,2,4,5-TeCB via 1,2,4-TCB to 1,4-DCB to MCB. The dechlorination pathway of 1,2,3,4-TeCB dechlorination process of 1, 2, 3, 4-TeCB was observed but at a very slow pace. qPCR analysis of the enrichment cultures showed total quantities of bacteria for the first and second transfer of 10⁵ to 10⁷ copies/ml respectively for HCB. *Dehalococcoides* spp were also detected in all other samples. These organisms have been found to be involved in reductive dechlorination of CBs. To make any meaningful conclusion, further knowledge is needed to understand the role of other microbial communities in dechlorination.

Key words: Reductive dechlorination, chlorobenzenes, enrichment cultures