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Toxicity of Polychlorobiphenyls and its Bioremediation

Supriyo De¹, Saroj K. Pramanik², Arthur L. Williams² and Sisir K. Dutta¹

*1. Department of Biology, Howard University, 415 College Street, NW,
Washington DC – 20059, USA*

*2. Department of Biology, Morgan State University, 1700E Cold Spring Lane,
Baltimore, MD – 21251, USA*

Supriyo De E-mail address: supriyo_de@yahoo.com

Saroj K. Pramanik E-mail address: pramanis@jewel.morgan.edu

Arthur L. Williams E-mail address: awillia5@jewel.morgan.edu

Sisir K. Dutta E-mail address: sdutta@howard.edu

Phone: (202) 806-4170; Fax: (202) 806-4176

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ABSTRACT PCBs are chlorinated aromatic compounds known to have toxic effects on humans and animals. They are well known mutagens and carcinogens and are known to affect almost all systems of the body. They have neurotoxic effects especially on infants and children and may have persisting effects in adults as well. The mechanism of action of neurotoxicity is probably through disruption of Ca²⁺ homeostasis. PCBs are known to cause hepatocarcinoma through genotoxicity and through receptor mediated deregulation of apoptosis. They have deleterious effects on the endocrine system because of their structural similarity with the steroid hormones especially estrogen. They also act as goitrogens and increase the thyroid stimulating hormone level. Polychlorobiphenyls also down-regulate the immune system probably through apoptotic pathways. As they cross placenta neurotoxic, immunomodulatory and other developmental effects are seen on the new born. Infants are also affected by PCB secreted through breast milk. PCBs are also found to cause atherosclerosis through oxidative stress and endothelial cell dysfunction. Available methods of PCB removal through incineration may lead to formation of more toxic dioxin like compounds. Partial metabolites of PCB are also equally harmful. Complete biodegradation may be the only way to clean up the PCB contamination which is persistent in the environment even after being banned from USA since 1977. Many bacteria and fungus which can degrade PCB have been identified. Since the prevalent hypothesis of degradation, first by dechlorination by anaerobic organisms followed by ring cleavage by aerobic organism has inherent difficulties, a novel finding of reductive dechlorination by the white rot fungus may help to accelerate PCB biodegradation.

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