

Decrease of integral toxicity of PCB polluted soil reached by microbe remediation

Vladimir Kapranov¹, Gennady Alexeevich Zharickov², Roman Vladimirovich Borovick², Sergey Petrovich Rybalkin²,
Valentina Petrovna Dyadishcheva²

¹Rct

²RCT&HRB

The main purpose of bioremediation of PCB contaminated soil is xenobiotic degradation and decrease of soil toxicity as a result. We have developed the technology for soil remediation with the use of microorganism-degraders. Main criteria for evaluation of bioremediation process are: concentration of PCB in soil and integral soil toxicity. Materials and Methods. PCB concentration in soil was evaluated by gas chromatography. Soil toxicity was evaluated by biotesting integral toxicity and studied for warm-blooded animals. Biotesting integral toxicity of soil was aimed at general soil toxicity assessment before and after the experiment on degradation of PCB by microorganisms-degraders. PCB concentration provoking death of 50 % Daphnia (LD50) made up 2.7 mg/kg. The most convenient and extremely sensitive biotest for assessment of soil contamination are daphnia. Soil toxicity for warm-blooded animals before and after treatment by microorganisms-degraders was evaluated after lab warm-blooded animal were given to drink aqueous extract of polluted soil for a long time. In this case white rats were taken, they are the most sensitive to PCBs. The length of experiment made up 60 days. Once the experiment was completed the animals' blood was taken for morphological and biochemical analysis and internal organs were examined pathomorphologically. Results and Discussions The studies showed the death of Daphnia considerably decreased in soil samples after remediation. Experimental data proved decrease of soil integral toxicity as a result of bioremediation. Specific pathologoanatomic observation of animals'organs justified soil contamination by PCBs. PCBs affected warm-blooded animals, decreased general animals' resistance due to reduction of the amount of leucocytes in blood and affected liver activity. However gonadotoxic effect had the most diagnostic and toxic value. Soil toxicity studies following the process of bioremediation showed lack of changes of blood morphological structure and biochemical indices, either of mass coefficients of internal organs of experimental animals. Postmortem examination showed that microscopic structure of organs corresponded to the normal one. The conducted studies proved that after bioremediation toxic effect of aqueous extract of the purified soil was not discovered. This is the evidence of reduction of total amount of PCB and degradation products in soil up to non-toxic concentrations. Therefore it could be concluded that technology for soil bioremediation using microorganisms-degraders ensures both degradation of the most PCB congeners and decrease of integral toxicity of soil. Acknowledgements and References: The work was accomplished under financial support of the International Science and Technology Center (the ISTC ## 228, 2093, 3067 projects). Zviagintsev D.G., Methods of soil microbiology and biochemistry.– M.: Moscow University.-1991, 304 pages (in Russian). Krasevich Yu.N., Principles of selection of microorganisms utilizing synthetic organic compounds.– M.: – Science. – 1982, 144 pages (in Russian). Manual for soil biotesting / Mosoblcompriroda, registration # 621 of August 8, 1995. – Serpukhov, Archive of the RCT&HRB, 1994 – 13 pages. Abramowicz D.A. Aerobic and anaerobic biodegradation of PSBs: a review / CRC Critical Reviews in Biotechnology, 1990, v10, p 241-250. National patent of USA 6,284,521 National patent of USA 6,287,842