Enzyme assisted bioremediation of Polycyclic Aromatic Hydrocarbons contaminated soil

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Polycyclic aromatic hydrocarbons (PAHs) is a group of organics causing cancer, birth defects, mutagenic persistent organic pollutants (POPs) [1]. As PAHs widely exists in environment, more than 200 PAHs were identified by the end of April 2013. Although there are some natural sources for PAHs e.g. combustion, biological synthesis but the main contamination is from oil industry, industrial process, garbage incineration and landfills, food production and direct traffic emissions [2]. The oil spills have also become a part of the artificial source PAHs. Therefore, it has been a major and timely issue how to accelerate the elimination of PAHs in the environment and how to reduce PAHs contaminated soil in particular. PAHs remain in soil stable as POP, which can exist in the natural environment for a long time. This can pose great harm and risk to human health and ecological environment.

The enzyme auxiliary microorganisms play a key role in the PAH degradation as the main way for PAHs biodegradation in the soil environment. Among two main entries of PAH digested by microorganisms, including fungi and bacteria cells, fungal oxidation is one major mechanism, as the fungus adds an oxygen atom to PAHs under action of the intracellular monooxygenase, which made C-C bonds formed on C-O bonds, and then in the same way to join another one atom of oxygen, resulting in arene oxide. It is in non-enzymatic restructure transferring one atom of oxygen into most PAHs, and under the action of epoxide hydrolase in anti-diol reduction formation. The other way is that oxygen molecules add two oxygen atoms to the PAHs at the simultaneously under action of bacterial dioxygenase, and oxidize PAHs to aromatic peroxides, and then add H to the aromatic peroxide to get cis-diol [3]. These two ways are to break the rings and reduce stability of PAHs and then to realize further biodegradation. The indigenous microbes were isolated from the agricultural soils with support of hydro-geochemistry.

[1] Hatzinger PB et al. (1995) *Env Sci & Tech*, **29** (2): 537-545. [2] Zhang YX et al. (2009) *Proc Nat Aca Sci USA*, **106** (50): 21063-21067. [3] Saidl OB et al. (2008) Mic, 104 (11): 987-997.