平成２４年度　環境科学院　修士論文内容の要旨

Genetic Engineering for the Improvement of Phytoremediation of Heavy Metals

（遺伝子工学を用いた重金属のファイトレメディエーション改良）

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環境起学専攻　環境適応科学コース

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Abstract

Heavy metals such as mercury, cadmium, arsenic, and lead, copper are a cause of serious health hazards among population because of potential bio-accumulation into the food chain. The contaminants are released to our environment sometimes from anthropogenic sources. Phytoremediation is the application of removing toxic metals from soil and water using certain plants. Ideal plants for phytoremediation should have a high biomass, deep roots and fast growing characteristics apart from the tolerance of poisonous effects of heavy metals and be capable of accumulation of metals in their aerial and harvestable parts. The term hyper-accumulators have been coined by scientists for the plants that have evolved as certain metal tolerant species capable of accumulating a comparatively large amount of metals in their shoots and leaves. However, most heavy metal hyper-accumulators have a very low biomass which tends to reduce the effectiveness of phytoremediation. Engineering some superior plants with high biomass production capable to tolerate and hyper-accumulate heavy metals through genetic modifications is leading the way. Identifying key genes and corresponding mechanisms responsible for heavy metal hyper-accumulation by genetic engineering is presently of great importance. The system of genetic engineering revolves around a very basic transfer of DNA from *Agrobacterium* to a plant nucleus. This bacterium uses horizontal gene transfer to cause tumors in plants and thus has become a very effective vehicle to carry foreign genes into the plants. This is one of the important genetic engineering tools. New DNA may be inserted into the host genome by first isolating and copying the genetic material of interest, then inserting it via the mentioned bacterium. The genes that are being inserted sometimes come from bacteria, sometimes from one plant to another and sometimes even from mammals to target plants. A number of different plant species carrying a transgenic material expressing desired traits are expected to be successful.