Molecular mechanism for plant-based heavy metal remediation

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Phytoremediation is the plant-based environmental remediation technology; it is an novel emerging technology, and has merits of low cost and environmental friendliness compared to traditional physical, chemical and microbial remediation technology. Generation of efficient plants is a core technology of phytoremediation, therefore manipulation of capacity for pollutant tolerance and accumulation in plants is a key strategy. To develop transgenic plants for heavy metal clean up, we isolated various novel genes involved in metal tolerance and accumulation from plants using yeast system: metal sensitive yeasts were isolated from mini-Tn mutagenised mutant yeast pools, complemented with plant expression cDNA library, and cDNA clones were isolated and sequenced. After confirming roles of these cDNAs at least three times by transforming into WT and metal sensitive mutant yeasts, they were utilized for generating transgenic plants. Here, we would like to show molecular mechanisms for various genes cloned as above. First, *MSN1* is a multi-functional transcriptional activator from *S. cerevisiae,* and it promotes expression of *ST1*(sulfate transporter 1) involved in absorbing sulfate, selenate and chromate, thereby enhances accumulation levels of those elements in *S. cerevisiae* and *N. tabacum.* Second, *Ntcyc07* is a S-phase specific gene from *N. tabacum,* and is involved in increasing arsenite tolerance by decreasing its uptake in *S. cerevisiae* and *N. tabacum.* Third, four different genes play roles in Ub-dependent proteolysis, and they enhance tolerance to Cd and As by degrading metal-induced denatured proteins.

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