Ecological application outline:

Using Genetically Modified Microorganisms for Bioremediation of Hazardous Substances

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Problem

Arsenite can be used in pesticides or dyes and soaps. It is a toxic substance that can be present in natural waters.

Proposed Solution

Target the genes that encode for a certain enzyme that like the experiment that targeted the TTHB128 and TTHB127 genes can encode an enzyme that degrades. These genes encode the subunits for Arsenite oxidase. These genes were then made into a plasmid so that it could be inserted into a bacterium P. putida AS-01. Once incorporated into the genomic dna the incubation period of 28 hrs happened. 87.6% of the Arsenite was oxidized by the genetically edited microorganisms (GEM) and in the wild type bacterium only oxidized 28.9%. This suggests that taking certain enzyme encoding genes that could assist in bioremediation would be beneficial if inserted in other bacterium's.

Regulatory Issues

There is no way to know what these modifications could mutate into in future generations or if these newly synthesized bacterium's transfer it's dna it a pathogenic bacterium there is no way to know how that pathogen would use the modifications.

Proposed Regulation

Use genetically modifications microorganisms that were treated with certain degradation responsible genes and with killer and anti killer genes that allow the GEM to self destruct when toxic substance is no longer present.

References

Chunyan Yang, Lin Xu, Limin Yan & Yanhua Xu (2010) "Construction of a genetically engineered microorganism with high tolerance to arsenite and strong arsenite oxidative ability", Journal of Environmental Science and Health, Part A, 45:740-745

This research article targets the genes that encode the small and large subunits of arsenite oxidase. These genes are targeted in order to allow the microorganism to have a high tolerance to arsenite along with a strong oxidative ability for arsenite.

Pandey, G. , Paul, D. , Jain, R. K. (2005) "Conceptualizing "Suicidal Genetically Engineered Microorganisms" for Bioremediation Applications." Biochemical and Biophysical Research Communications. 327:637-639.

This article discusses some of the suggestions that could be implemented to help mitigate some of the risks associated with releasing the microbes into the environment.

Ezezika, O. , Singer P. A. "Genetically engineered oil-eating microbes for bioremediation: Prospects and regulatory challenges" Technology in Society, 2010, Vol.32(4), pp.331-335

Discussed regulatory issues and how oil rating microbes could be generated.