Construction of a bacterial biosensor for zinc and copper and its application to the development of multifunctional heavy metal adsorption bacteria

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In this study, we designed and applied molecular biosensors for heavy metals, zinc and copper, for use in bioremediation strategies.zraP and cusC promoters were selected from a genetic circuit of the ZraSR and CusSR two-component system and were fused to a dual-labeling reporter protein as an interactive biological component for zinc and copper to generate a signal from the constructed biosensor. The biosensor efficiently senses zinc and copper with a calculated detection limit of 16 μM and 26 μM respectively and was shown to be a sensitive and effective heavy metal monitoring bacterial system. To extend the application of the bacterial biosensor, we assembled a bioadsorption system that can trigger bacteria to sense and adsorb 13±0.3 mg/L of zinc and 11.4±0.42 mg/L of copper per gram of dry cell weight with induction at a concentration of 100 mg/L of the respective metal ion. This work was supported by a grant from the Next-Generation BioGreen 21 Program (SSAC, grant number: PJ008057), Rural Development Administration, Republic of Korea.