

Engineering bacterial two-component system to construct novel fumarate sensing recombinant *Escherichia coli*

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DcuS/DcuR two component system (TCS) was firstly employed for the expression of the *gfp* gene under the *dcuB* gene promoter in aerobic condition to develop high throughput screening system able to screen microorganisms producing high amount of fumarate. However, the DcuS/DcuR TCS could not produce a signal strong enough to mediate the expression of the *gfp* gene responding fumarate concentration. Thus, DcuS/DcuR TCS was engineered by recruiting the EnvZ/OmpR system, the most-studied TCS in *E. coli*. A chimeric DcuS/EnvZ (DcuSZ) TCS was constructed by fusing the sensor histidine kinase of DcuS with the cytoplasmic catalytic domain of EnvZ, in which the expression of the *ompC* gene was mediated by the *ompC* gene promoter through the cognate response regulator, OmpR. The output signals were enough to detect fumarate concentration quantitatively, in which the expressions of the *gfp* gene and the *ompC* gene were proportional to the fumarate concentration in the medium. Moreover, principal component analysis of C4-dicarboxylates showed that DcuSZ chimera was highly specific to fumarate. This work was supported by a grant from the Next-Generation BioGreen 21 Program (SSAC, grant number: PJ00954904) by RDA, and Basic Science Research Program by the MEST (2011-0022392).