Construction of glutamate biosensor using chimeric two-component regulatory system in Escherichia coli

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In this study, there was constructed the glutamate biosensor that would be used for a high-throughput system to screen microorganisms that produce glutamate. The biosensors are based on two-component regulatory systems combined with GFP reporter protein. A chimeric DegS/EnvZ (DegSZ) TCRS was constructed by fusing the N-terminal domain of the sensor kinase, DegS from Planococcus sp. PAMC21323, with the catalytic domain of the osmosensor, EnvZ from Escherichia coli, to control expression of the gfp gene in response to glutamate. The gfp gene was controlled by the ompC promoter through the activated response regulator, OmpR-P. The chimeric TCRS-based biosensors showed a four-fold increase in fluorescent signal after the addition of glutamate. A linear correlation was observed between the fluorescence intensity and exogenously added glutamate concentration. The chimeric TCRS-based biosensor was used successfully to determine glutamate concentration at the single cell level by fluorescence-activated cell sorting.