Evaluation of microbial globin promoters for oxygen-limited processes using Escherichia coli.

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Abstract

Oxygen-responsive promoters can be useful for synthetic biology applications, however, information on their characteristics is still limited. Here, we characterized a group of heterologous microaerobic globin promoters in Escherichia coli. Globin promoters from Bacillus subtilis, Campylobacter jejuni, Deinococcus radiodurans, Streptomyces coelicolor, Salmonella typhi and Vitreoscilla stercoraria were used to express the FMN-binding fluorescent protein (FbFP), which is a non-oxygen dependent marker. FbFP fluorescence was monitored online in cultures at maximum oxygen transfer capacities (OTRmax) of 7 and 11 mmol L-1 h-1. Different FbFP fluorescence intensities were observed and the OTRmax affected the induction level and specific fluorescence emission rate (the product of the specific fluorescence intensity multiplied by the specific growth rate) of all promoters. The promoter from S. typhi displayed the highest fluorescence emission yields (the quotient of the fluorescence intensity divided by the scattered light intensity at every time-point) and rate, and together with the promoters from D. radiodurans and S. coelicolor, the highest induction ratios. These results show the potential of diverse heterologous globin promoters for oxygen-limited processes using E. coli.

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