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The LysR Transcription Factor, HexS, Is Required for Glucose Inhibition of Prodigiosin Production by *Serratia marcescens*

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ABSTRACT

Generation of many useful microbe-derived secondary metabolites, including the red pigment prodigiosin of the bacterium *Serratia marcescens*, is inhibited by glucose. In a previous report, a genetic approach was used to determine that glucose dehydrogenase activity (GDH) is required for inhibiting prodigiosin production and transcription of the prodigiosin biosynthetic operon (*pigA-N*). However, the transcription factor(s) that regulate this process were not characterized. Here we tested the hypothesis that HexS, a LysR-family transcription factor similar to LrhA of *Escherichia coli*, is required for inhibition of prodigiosin by growth in glucose. We observed that mutation of the *hexS* gene in *S. marcescens* allowed the precocious production of prodigiosin in glucose-rich medium conditions that completely inhibited prodigiosin production by the wild type. Unlike previously described mutants able to generate prodigiosin in glucoserich medium, *hexS* mutants exhibited GDH activity and medium acidification similar to the wild type. Glucose inhibittion of *pigA* expression was shown to be dependent upon HexS, suggesting that HexS is a key transcription factor in secondary metabolite regulation in response to medium pH. These data give insight into the prodigiosin regulatory pathway and could be used to enhance the production of secondary metabolites.

KEYWORDS

Pigment; Antibiotic; Transcription Factor; Secondary Metabolite

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