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Overproduction of poly- β -hydroxybutyrate in *Azotobacter vinelandii* mutant with ArrF gene deletion

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Abstract:

Azotobacter vinelandii contains an iron-regulatory small RNA ArrF whose expression is dependent upon the levels of iron and ferric uptake regulator. Deletion of this ArrF-encoding gene resulted in a 300-fold increase in the production of poly- β -hydroxybutyrate (PHB), a polymer of industrial importance. This $\Delta arrF$ mutant exhibited wild-type growth and growth-associated PHB production. Limited iron and aeration elevated the PHB production in the mutant as well as wild type. Real-time RT-PCR revealed that *phbB*, *phbA*, and *phbC* were upregulated

~61-, 18-, and 8 fold, respectively, in the mutant. The *phbR* transcript of the activator PhbR for

this operon was also ~11 times more abundant. The analysis of *phbR* transcript predicted a

region of complementarity near its Shine–Dalgarno sequence that could potentially basepair with the conserved region of ArrF. These results suggest that ArrF represses the expression of PhbR in an antisense manner and derepression of this activator in the mutant elevates the expression of *phbB*, *phbA*, and *phbC*, resulting in the PHB overproduction.

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