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Effect of pH on high-temperature production of bacterial penicillin acylase in Escherichia coli.

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Abstract

High-temperature-oriented production of bacterial penicillin acylase (PAC), which is usually expressed at low temperatures (less than 30 degrees C), was demonstrated in this study via heterologous expression of the Providencia rettgeri (P. rettgeri) pac gene in Escherichia coli (E. coli). While it is possible to produce PAC at a temperature as high as 37 degrees C, the environmental condition (specifically, culture pH) critically affected culture performance. Production of PAC at 37 degrees C was feasible only when culture pH was close to neutral (i.e., 6.5-7.5). Outside this pH range, cell physiology for the host/vector system was seriously affected, resulting in poor culture performance. In acidic culture environments, temperature significantly affected the pac expression level and specific PAC activity decreased with an increase in culture temperature. In basic culture environments, cell growth was seriously inhibited though the pac expression level was minimally affected by temperature. Such unusual types of pH and temperature effects on pac expression were never reported for bacterial PACs. The results suggest that culture pH should be precisely controlled for the current host/vector systems being applied on the overproduction of P. rettgeri PAC in E. coli at high temperatures.

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