



RESEARCH LETTER

Expression of the Na⁺/H⁺ antiporter gene (*g1-nhaC*) of alkaliphilic *Bacillus* sp. G1 in *Escherichia coli*

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Abstract

A Na⁺/H⁺ antiporter gene was isolated from alkaliphilic *Bacillus* sp. G1. The full-length sequence of the Na⁺/H⁺ antiporter gene was obtained using a genome walking method, and designated as *g1-nhaC*. An ORF preceded by a promoter-like sequence and a Shine–Dalgarno sequence, and followed by a terminator-like sequence was identified. The deduced amino acid sequence consists of 535 amino acids, and a calculated molecular mass of 57 776 Da. *g1-nhaC* was subsequently cloned into pET22b(+) and expressed in *Escherichia coli* BL21 (DE3). Recombinant *E. coli* harboring the *g1-nhaC* gene was able to grow in modified L medium at various concentrations of NaCl (0.2–2.0 M) at different pH values. The recombinant bacteria grew well in the medium with concentrations of NaCl as high as 1.75 M at pH 8.0–9.0. Minimal growth was observed at 2.0 M NaCl, pH 8.0–9.0. At pH 10, the recombinant bacteria grew well in a medium with a low concentration of NaCl (0.2 M). These results suggested that the *g1-NhaC* antiporter from *Bacillus* sp. G1 plays a role in Na⁺ extrusion at lower pH values and in pH homeostasis at pH 10 under Na⁺-limiting conditions.