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Proteomic analyses of B. *subtilis* (natto) mutants that express the TTT-transformed-type yabJ gene

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Poly-gamma-glutamic acid (γ-PGA), which is a biodegradable, non-immunogenic, and unusual anionic amino-acid polymer consisting of D- and L-glutamic acid units, has been used in a wide array of applications, including as a food additive and in medical applications. Bacillus subtilis is a well-known organism that is used in the fermentation for the synthesis of γ-PGA. The synthesis of γ-PGA is directed by the pgsBCA operon. The expression of the pgs operon is regulated by the quorum-sensing components, ComPA, DegQ, DegS, DegU, and the cell motility related SwrA. Disruption of the degQ gene causes loss of the ability to produce γ-PGA, which can restored by an amino-acid substitution mutant in the yabJ gene. The YabJ protein is highly conserved in bacteria and fungi, as well as in plants and animals. To explain this recovery of γ-PGA production, B. subtilis (natto) yabJ gene mutants were analyzed by proteomics. A 2D-electrophoresis analysis of proteins synthesized by YabJ mutants, including the null-mutant and an amino-acid substituted mutant (S103F), revealed the presence of several protein spots of interest, which were subjected to MS-MS analysis to allow for protein identification. This MS-MS analysis demonstrated that the identified proteins were suppressed in the null-mutant and were highly expressed in the amino-acid substituted mutant, or conversely. Interestingly, under stress conditions, the YabJ amino-acid substituted mutant was more sensitive to osmotic stress than YabJ null-mutant or the wild type strain. Furthermore, DegQ and DegU were found to have important roles in the cell stress response, as well as in γ-PGA production. It is tempting to think that the YabJ mutant protein has an important role as part of a novel biocontrol mechanism, as well as in the production of γ-PGA.