STRAIN-SPECIFIC FUSED GENE ENCODING STRESS RESPONSE AND SUGAR TRANSPORT IN *RHODOPSEUDOMONAS PALUSTRIS*

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Abstract: Stress is defined as an altered physiological condition caused by factors that tend to disturb an organism's homeostasis. Microbes must be able to sense, resist, and functionally adapt to diverse environmental conditions such as pH shift, temperature extremes, heat shock, UV radiation, gamma-radiation, superoxides and hydrogen peroxide, desiccation, hypersalinity, elevated levels of heavy metals, chemicals, or starvation. Although research has revealed much knowledge concerning the role of universal stress protein (USP) domain in stress tolerance, their functional specificity in prokaryotic organisms has not been well characterized. Among the bacteria categorized by the Department of Energy's Joint Genome Institute as relevant to bioenergy research, only *Rhodopseudomonas* has the highest number of sequenced genomes as well as highest number of genes encoding proteins with the USP domain. Complete genome sequences are available for strains BisA53, BisB5, BisB18, CGA009, HaA2 and TIE-1. We are using the *Rhodopseudomonas palustris* genomes as models for studying the diversity of functions associated with USP genes in a bacterial species. Using the Integrated Microbial Genomes (IMG) system, a total of 51 USP genes were obtained and grouped according to amino acid length. One of the USP genes (RPC_3634) encodes a 565aa protein that in addition to the USP domain contains the Major Facilitator Superfamily (MFS_1) domain. This fused gene is present only in strain BisB18. Other genomes documented in the IMG system in which the two domains are fused were: *Mycobacterium smegmatis* str. MC2 155 and *Rhodospirillum rubrum* ATCC 11170. The Major Facilitator Superfamily transporters are single-polypeptide secondary carriers capable only of transporting small solutes in response to chemiosmotic ion gradients. Furthermore, membrane transporters participate in energy generation and interconversion, and they allow communication between cells and their environments. We predict that the fusion of the USP and MFS_1 domains in *R. palustris* BisB18 is an adaptive strategy for transport of sugars in stress conditions.

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