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Recombinant small heat shock protein from Acholeplasma laidlawii increases the Escherichia coli viability in thermal stress by selective protein rescue

Kayumov A., Bogachev M., Manuvera V., Lazarev V., Sabantsev A., Artamonova T., Borchsenius S., Vishnyakov I.

Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2017, Pleiades Publishing, Inc.In both prokaryotes and eukaryotes, the survival at temperatures considerably exceeding the optimum is supported by intense synthesis of the so-called heat shock proteins (HSPs), which act to overcome the adverse effects of heat stress. Among mycoplasmas (class Mollicutes), which have significantly reduced genomes, only some members of the Acholeplasmataceae family possess small HSPs of the α-crystallin type. Overproduction of a recombinant HSP IbpA (Hsp20) from the free-living mycoplasma Acholeplasma laidlawii was shown to increase the resistance of Escherichia coli to short-term heat shock. It has been long assumed that IbpA prevents protein aggregation and precipitation thereby increasing viability of E. coli cells. Several potential target proteins interacting with IbpA under heat stress were identified, including biosynthetic enzymes, enzymes of energy metabolism, and components of the protein synthesis machinery. Statistical analysis of physicochemical properties indicated that IbpA interaction partners significantly differ in molecular weight, charge, and isoelectric point from other members of the E. coli proteome. Upon shortterm exposure to increased temperature, IbpA was found to preferentially interact with high-molecularweight proteins having a pI of about 5.1, significantly lower than the typical values of E. coli proteins.

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Keywords

Acholeplasma laidlawii, mass spectrometry, pull-down assay, small heat shock protein, statistical analysis, target proteins, thermal stability of Escherichia coli

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