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The Temperature-Dependent Selectivity of Potential Interaction Partners for the Small Heat Shock Protein IbpA from Acholeplasma laidlawii

Vishnyakov I., Bogachev M., Salafutdinov I., Borchsenius S., Kayumov A.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2016, Springer Science+Business Media New York.Small heat shock proteins (sHsps) of α-crystalline type play a key role in the cell survival under stress conditions by preventing irreversible denaturation and aggregation of proteins. In contrast to most Mollicutes (mycoplasmas) where no sHsps were found, recently, some sHsp homologs were identified in the Acholeplasmataceae family, including Acholeplasma laidlawii, the only representative of Mollicutes that is known to survive in a host-free environment. Using pull-down followed by LC-MS, we identified the potential target proteins co-eluting with IbpA from the A. laidlawii cell extracts after exposition to low- and high temperatures. 308 and 464 proteins were co-eluted with IbpA from the cold- and heat-treated extracts, respectively, while only 240 of them were co-eluted with sHsp independently of the temperature. Most of potential IbpA targets were identified as enzymes involved in biosynthetic cycles and energy metabolism. We show IbpA specificity for target proteins on the incubation temperature. Significant differences between protein pools co-eluting specifically with IbpA at either 4 or 46 °C could be observed in terms of their aliphatic index, charge, molecular weight, and isoelectric point. Interestingly, only the isoelectric point distribution significantly differed between the protein pool co-eluting with IbpA under cooling (4 °C) and the entire proteome. In contrast, significant discrepancies in the distributions of aliphatic index, charge, hydropathy, molecular weight, and isoelectric point could be observed between the pool of proteins co-eluting with IbpA under heating (46 °C) and the entire proteome, indicating that there is likely a complex selective mechanism for proteins interaction with IbpA under heat shock conditions.

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Keywords

Acholeplasma laidlawii, Cold shock, Heat shock, IbpA, Small heat shock proteins (sHsps)