„Small heat shock proteins IbpA and IbpB cooperate in sequestration of misfolded substrates to promote their refolding"
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Small heat shock proteins (sHSPs) are a conserved class of ATP-independent chaperones that bind to unfolding, aggregation-prone polypeptides in stress condition. sHSPs encage them in so called sHSPs-substrate assemblies, shielding them from further aggregation and facilitating subsequent solubilization and refolding by Hsp70 and Hsp100 ATP-dependent chaperones.

Most of γ-proteobacteria express a single sHSP, that not only has to tightly bind unfolding polypeptides upon heat shock, but also should effectively dissociate upon Hsp70 action to allow disaggregation initiation. This work is dedicated to investigate the two-sHSP system that has evolved to overcome this bind-or-release trade-off. Initial phylogenetic analysis shows that a single sHSP gene duplication event in the ancestor of *Enterobacterales* (a subgroup of γ-proteobacteria) has given rise to the two sHSPs - IbpA & IbpB, which are now found in the majority of contemporary descendant species, e.g. in *Escherichia coli*.

Both *in vitro* and *in vivo* experiments designed to unravel the molecular basis of IbpA & IbpB cooperation show fundamental differences in their activities, identifying IbpA as a strong canonical polypeptide binder, similar to other single sHSPs. On the other hand, its non-canonical IbpB partner cannot stably bind aggregating substrates. Instead, IbpB presence alongside IbpA enhances dissociation of both sHSPs from polypeptides upon substrate disaggregation from sHSPs-substrate assemblies.

The analysed two sHSP cooperation provides substantial reduction in demand on Hsp70 necessary to perform efficient substrate disaggregation and refolding. It is achieved without compromising the ability of the sHSP system to scavenge aggregating polypeptides upon heat shock, which is hardly achieved by analysed single sHSPs.

The emergence of this effective sHSP system most certainly has an impact on the cells' ability to handle stress conditions, as it allows for employing less Hsp70 in disaggregation when the overall cellular demand for Hsp70 is particularly high. This might have provided the fitness that was necessary to fix both gene copies in the population along bacteria speciation. IbpA and IbpB function drift across the evolution might be considered a neosubfunctionalization as IbpB appeared with new functional properties that provide the new quality but only when in cooperation with IbpA.