

Stand-alone ClpG disaggregase confers superior heat tolerance to bacteria

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Abstract

AAA+ disaggregases solubilize aggregated proteins and confer heat tolerance to cells. Their disaggregation activities crucially depend on partner proteins, which target the AAA+ disaggregases to protein aggregates while concurrently stimulating their ATPase activities. Here, we report on two potent ClpG disaggregase homologs acquired through horizontal gene transfer by the species *Pseudomonas aeruginosa* and subsequently abundant *P. aeruginosa* clone C. ClpG exhibits high, stand-alone disaggregation potential without involving any partner cooperation. Specific molecular features, including high basal ATPase activity, a unique aggregate binding domain, and almost exclusive expression in stationary phase distinguish ClpG from other AAA+ disaggregases. Consequently, ClpG largely contributes to heat tolerance of *P. aeruginosa* primarily in stationary phase and boosts heat resistance 100-fold when expressed in *Escherichia coli*. This qualifies ClpG as a potential persistence and virulence factor in *P. aeruginosa*.

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