AHA1 and the closely related gene HCH1 encode cochaperones that regulate the activity of members of the HSP90 family. The presence of Aha1p and Hch1p, although not required for ATP hydrolysis, is able to stimulate the ATPase activity of Hsp82p/Hsc82p five- to twelve-fold. The N-terminal domain of Aha1p, which is equivalent to the entirety of Hch1p, binds to the middle domain of Hsp82p/Hsc82p and promotes a conformational change in the chaperone proteins that enhances their ability to bind ATP. Overexpression of Aha1p stimulates the ATPase activity of Hsp82p/Hsc82p, restores the cochaperone interactions and compensates for the functional defects of a phosphomimetic mutation in HSP82/HSC82. Expression of AHA1 is induced by stress, a process mediated by the transcriptional activator Hsf1p which binds to three heat shock elements in the AHA1 promoter. AHA1 is not required for growth under optimal conditions but is essential for survival in cells under stress. Aha1p is a highly conserved protein with similar proteins identified in S. pombe, worms, plants, flies, mice, and humans.