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Structural Stabilization and Functional Enhancement of Miceller Protein α-Crystallin by ATP and Zn^{2+}

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Abstract

α-Crystallin is the most abundant protein of the eye lens. It has a micelle like associated structure and has a special chaperone-like property to prevent aggregation of other proteins. This function of α-crystallin plays a crucial role in maintaining the transparency of eye lens. Because of the absence of protein turn over in the lens, the proteins in the lens must survive the entire lifetime of the living species. This requires high structural stability of α-crystallin. In this article we present a brief review of our work on the mechanism of stabilization of α-crystallin by Zn. We have shown that some metal ions, Zn in particular play a very important role in enhancing the function of α-crystallin by enhancing its exposed hydrophobic surface. We have also characterized the Zn binding to α-crystallin by MALDI mass spectrometry and have shown that the structural stabilization occurs through intersubunit bridging by Zn. The binding region in the α-crystallin sequence has also been identified. The physiological relevance of enhanced chaperone function and structural stability is discussed.

Keywords: Alpha Crystallin, Chaperone Function, Eye Lens Protein, Metal Binding, Miceller Protein, Protein Aggregation