

## INVESTIGATION OF THERMAL AND CHEMICAL STABILITY OF INTERRELATIONSHIP BETWEEN FOLDING AND UNFOLDING OF OVALBUMIN INDUCED BY UREA AND $\beta$ -ME BY ULTRASONIC STUDIES

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### ABSTRACT

This study attempts to assess the level of denaturation of ovalbumin in a chicken egg. The intensity of denaturation induced by urea and  $\beta$ ME( $\beta$ -mercaptoethanol) was measured at pH 7.0. Ovalbumin is identified as a **Serpin** class of protein. The denaturation by “ultrasonics” and “densitometry” in terms of partial specific volume,  $\bar{v}^0$ , and partial specific adiabatic compressibility,  $\bar{\beta}_s$ , of ovalbumin molecule in buffer solution and mixture of denaturant-buffer solution. The average hydration contribution to  $\bar{v}^0$  and  $\bar{\beta}_s$  was determined as functions of temperature using measured and calculated parameters by application of linear regression analysis. The negative values of  $\bar{v}^0$  were obtained due to the low concentration of ovalbumin and high value of hydration effect, while positive value of  $\bar{\beta}_s$  showed a significant contribution of the cavity effect in case of compressibility of protein molecule. The maxima obtained for the partial specific volume of ovalbumin in buffer versus temperature was shifted from 315 K to 323 K on addition of  $\beta$ ME in ovalbumin-buffer solution, which reflects conformational changes due to breakage of disulfide bridges. The magnitude of  $\bar{\beta}_s$  of ovalbumin increase with increase of concentration of protein and on addition of  $\beta$ ME. These changes support the idea of conformational change of denatured protein. The partial specific adiabatic compressibility of ovalbumin decrease with increase of temperature upto 323 K and then increases, the extent of decrease is higher in presence of  $\beta$ ME indicating the flexibility of ovalbumin increases on addition of  $\beta$ ME, so it becomes more susceptible to digestion. In general, our results emphasize the conformational fluctuation, changes in free energy of denaturation and the hydration properties of ovalbumin in presence of denaturants urea and  $\beta$ ME. The partial specific adiabatic compressibility of ovalbumin decrease with increase of temperature upto 323K and then increase, the extent of decrease is high in presence of  $\beta$ ME indicating the flexibility of ovalbumin increase on addition of  $\beta$ ME, so it becomes susceptible to digestion.

**KEYWORDS:** Ultrasonic Interferometer, Interrelationship, Denaturation, Ovalbumin, Urea,  $\beta$ -BME, Partial Specific Adiabatic Compressibility