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Effect of pH changes on protein structure

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Abstract

Introduction: Protein stability and activity are affected by different factors, such as temperature, salinity, and pH. The understanding of these effects is necessary for using proteins in practical processes. Except pH, the others have been much studied. This review discusses the influence of different pH (acidic to basic) on the stability and structure of the holo-protein as well as of the apo-protein, Intestinal Fatty Acid Binding Protein, Ribonucleotide reductase, Bovine pulmonary surfactant protein C (SP-C) and capsid protein of hepatitis E virus.

Methods: For studying the effect of pH on the stability, folding and structure of the proteins aforementioned, UV-visible absorption, far-UV, visible circular dichroism spectroscopy, fluorescence, dynamic light scattering (DLS) and infrared have been used.

Results and discussion: The results show that, the stability of the holo-protein as well as of the apo-protein on lowering the pH in the presence of the denaturant was considerably decreased, although there was no effect in the absence of denaturant which it could be due to the existence of histidine residues; on the Ribonucleotide reductase, when pH was below 6.5 an aggregated structure was observed and the protein was rich in β-structure; in solution at low pH, dSP-C is a-helical in nature, but converts to an amyloid fibril structure composed of short b-strands or b-hairpins at neutral pH; on the capsid protein of hepatitis E virus, with decreasing pH proteins a-helicity and thermal stability increased; however, on the Intestinal Fatty Acid Binding Protein, the mechanism of folding and unfolding did not change over the pH range from 6 to 9 and folding was reversible pH values between 5-10.

Conclusion: According to this study, it can be deduced that the changes in the structure of proteins, on the changes of pH, correlates with the existence of partial residuals in these proteins.

Keywords: pH, Proteins, Structure, Fluorescence, CD, DLS;

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