World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:12, No:04, 2018

Protective Role of Curcumin against Ionising Radiation of Gamma Ray

Authors : Turban Kar, Maitree Bhattacharyya

Abstract : Curcumin, a dietary antioxidant has been identified as a wonder molecule to possess therapeutic properties protecting the cellular macromolecules from oxidative damage. In our experimental study, we have explored the effectiveness of curcumin in protecting the structural paradigm of Human Serum Albumin (HSA) when exposed to gamma irradiation. HSA, being an important transport protein of the circulatory system, is involved in binding of variety of metabolites, drugs, dyes and fatty acids due to the presence of hydrophobic pockets inside the structure. HSA is also actively involved in the transportation of drugs and metabolites to their targets, because of its long half-life and regulation of osmotic blood pressure. Gamma rays, in its increasing concentration, results in structural alteration of the protein and superoxide radical generation. Curcumin, on the other hand, mitigates the damage, which has been evidenced in the following experiments. Our study explores the possibility for protection by curcumin during the molecular and conformational changes of HSA when exposed to gamma irradiation. We used a combination of spectroscopic methods to probe the conformational ensemble of the irradiated HSA and finally evaluated the extent of restoration by curcumin. SDS - PAGE indicated the formation of cross linked aggregates as a consequence of increasing exposure of gamma radiation. CD and FTIR spectroscopy inferred significant decrease in alpha helix content of HSA from 57% to 15% with increasing radiation doses. Steady state and time resolved fluorescence studies complemented the spectroscopic measurements when lifetime decay was significantly reduced from 6.35 ns to 0.37 ns. Hydrophobic and bityrosine study showed the effectiveness of curcumin for protection against radiation induced free radical generation. Moreover, bityrosine and hydrophobic profiling of gamma irradiated HSA in presence and absence of curcumin provided light on the formation of ROS species generation and the protective (magical) role of curcumin. The molecular mechanism of curcumin protection to HSA from gamma irradiation is yet unknown, though a possible explanation has been proposed in this work using Thioflavin T assay. It was elucidated, that when HSA is irradiated at low dose of gamma radiation in presence of curcumin, it is capable of retaining the native characteristic properties to a greater extent indicating stabilization of molecular structure. Thus, curcumin may be utilized as a therapeutic strategy to protect cellular proteins.

Keywords : Bityrosine content, conformational change, curcumin, gamma radiation, human serum albumin
Conference Title : ICBLS 2018 : International Conference on Biological and Life Sciences
Conference Location : Venice, Italy
Conference Dates : April 12-13, 2018