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Impact of Silver Nanoparticles on Thermal Inactivation of Dihydrofolate Reductase Protein

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Abstract—*Protein-nanoparticle conjugates have emerged as powerful tools for biomedical applications, enabling the treatment, diagnosis, and prevention of diseases. The use of nanoparticles (NPs) provides new opportunities for the development of more effective, safe, and commercially-viable biomedical technologies. Nanoparticles, due to the nature of their surface, rapidly adsorb surrounding proteins to form a protein complex and has an ability to influence the protein folding and aggregation which is a major challenge to human health and the environment. The retainment of thermal stability of proteins is a major issue in protein engineering as they tend to form inactive aggregates at higher temperatures. The involvement of silver nanoparticles (AgNPs) can give a close insight of the enzyme related to thermal stability and encourage us to resolve stability issues. In our present study we have used zebrafish Dihydrofolate Reductase (zDHFR) as a model protein which is responsible in folate metabolism for reducing dihydrofolic acid to tetrahydrofolic acid with the use of NADPH as an electron donor. It has been observed that AgNPs influences the growth and expression of recombinant protein in E.coli cells. We have conjugated AgNPs with zDHFR protein at different concentration where conjugation occurs at higher concentration only. We have also carried out the thermal denaturation study of native protein with and without AgNPs which leads to changes in protein conformation. The protein shows complete unfolding and loss of activity at 50°C as monitored by UV-Visible spectroscopy. The rate of thermal denaturation of zDHFR protein was significantly retarded in the presence of silver nanoparticles (AgNPs) indicating the enhancement of the thermal stability of protein.*

Keywords*: Silver Nanoparticles, Thermal denaturation, Folate, Protein aggregation, unfolding study.*

References

[1] Spicer, C.D., Jumeaux, C., Gupta, B. and Stevens, M. M., (2018). Peptide and protein nanoparticle conjugates: versatile platforms for biomedical applications. Chem. Soc. Rev., 47: 3574-3620.

[2] Fei, L. and Perett, S., (2009). Effect of Nanoparticles on protein folding and fibrillogenesis. Int. J. Mol. Sci., 10: 645-655.

[3] Roy, S and Das, T.K., (2014). Spectroscopic Studies of Interaction Between Biologically Synthesized Silver Nanoparticles and Bovine Serum Albumin. J. Nanosci. Nanotechnol. 14(7): 4899-4905.