Mutational analysis of recombinant human hemoglobin heme pocket to enhance globin stability

Kajal Yadav
University of Delhi, India

Loss of blood or hemoglobin from the body or its under production in several situations like surgery, accidents, battle wounds, blood diseases (anemia, thalassemia, etc) and pathogen mediated infection (HIV, dengue, etc) is a serious threat to the human kind. Such medical emergencies require blood transfusion to save lives. However, the worldwide supply of donated blood for transfusion therapy is always less than the demand. Scientists have thus been forced to look for alternatives to donated blood, which are called "artificial blood substitutes", "artificial hemoglobins" or "hemoglobin based oxygen carriers (HBOC)". However, such hemoglobins suffer quite a few disadvantages like long term stability of hemoglobin, correct folding of polypeptide, rapidly dissociating into its constituent αβ dimers, heme insertion, proper orientation of the heme within the protein and rapid heme loss. Research over the years has solved many of the problems related to use of HBOCs by introducing suitable mutations at appropriate sites to control their ligand binding reactions, affinities, polypeptide dissociation, etc. To gain some further insight into Hb folding and stability I have employed insilico anlaysis. Synechocystis hemoglobin (SynHb) with its unique properties and unparalleled stability serve as an excellent reference system. The fact that the factors that dictate its stability- covalent linkage to heme by His46 or His117, have been investigated and verified, based on these results non-axial His was introduced in Mb that can covalently link heme vinyl group in the same way that His117 does in SynHb to introduce heme stability in Hb. Similarly, we can use site directed mutagenesis to change amino acids surrounding the heme pocket to His in recombinant human hemoglobin in order to increase protein stability.

Keywords:
Recombinant human hemoglobin (rHb), Site-directed mutagenesis, Protein stability, and hemoglobin-based oxygen carriers (HBOCs)

Biography
Kajal Yadav has completed her bachelors in Biological science at the age of 20 years from Sri Venkateswara college, University of Delhi and masters in Biochemistry in 2020 from University of Delhi, South campus. She is currently pursuing Ph.D in Biochemistry from same university.

kajalyadav525@gmail.com