INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.

Thesis Title: Development of aptasensors for malaria using *Plasmodium falciparum* Glutamate dehydrogenase as target antigen

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SHORT ABSTRACT

The current investigation focuses on the development of specific aptamer against *Plasmodium falciparum* glutamate dehydrogenase (PfGDH) with an aim of developing novel malaria diagnostic platforms well-endowed with efficient biosensing parameters such as sensitivity, specificity and stability. For generating specific aptamer against PfGDH, we selected recombinant PfGDH as target antigen and human glutamate dehydrogenase (HGDH) as control protein. Both these proteins were cloned and expressed in BL21 (DE3) pLysS bacterial cells. The structural and functional integrity of the expressed proteins were confirmed by various physical and enzymatic methods. We performed systemic evaluation of ligand by exponential enrichment (SELEX) technique and developed a novel specific ssDNA aptamer (NG3) against PfGDH. The PfGDH binding affinity of the developed aptamer as discerned by circular dichroism (CD) and surface plasmon resonance spectroscopy (SPR) were 0.5 ± 0.04 μM, 79.16 ± 1.58 nM, respectively. The specificity of the 90 mer long aptamer towards the target was confirmed by gel electrophoresis and CD studies. The presence of two quadruplex forming regions, two big and four small stem loop structures of aptamer with a ΔG of -7.99 kcal $mole^{-1}$ were deduced by computational studies. The developed aptamer was utilized in four different independent approaches for detection of PfGDH in serum samples. (A) Protein induced fluorescence enhancement based detection of PfGDH (B) Development of capacitive aptasensor for PfGDH (C) Development of aptaFET sensor based and extended gate field effect transistor for PfGDH detection and lastly (D) Instrument based or instrument free detection of Plasmodium lactate dehydrogenase (PLDH) and PfGDH in serum samples following optical transduction principles.