PREFACE

In recent years, the efforts in the field of biosensors have been directed in fields of medicine, pathogens and environment. Among various types of biosensors, genosensors got much more attention in these areas particularly in detection of pathogens due to high selectivity and sensitivity in the detection. Conventional genosensors for pathogen suffers from various drawbacks as they are time consuming (culture based methods), less sensitive, skill based, costly and time required labeling procedures. In new generation genosensors the advancement came due to nanotechnology by introducing nanomaterials of large surface area with catalytic properties. Nanomaterials like noble metals nanoparticles show the merits not only due to large surface area and high surface energy but also due to having conductivity and ease of functionalization. Nanomaterials based platforms are explored to analyze the pathogens at early stage before the actual manifestation of diseases has occurred.

In view of above focus of our research work based on development of novel genosensors based on conducting polymer and natural polymers impregnated with metal nanoparticles based platforms. Novel sensing platforms were developed for food and water borne pathogen by using conservative gene sequences of pathogenic bacteria. The outcomes of the present investigations are subdivided into five chapters:

Chapter 1 is the introductory chapter deals with the brief discussions and literature review on biosensors in general and genosensors in particular. A brief classification of biosensors, components of biosensors, highlights the importance of nanomaterials and conducting polymers

as immobilization matrices are discussed in this chapter. Need of biosensors for food and water samples is also covered with extensive literature survey.

Chapter 2 includes the development of conducting polymer based sensing platform for detection of *Listeria monocytogenes* pathogen for its conservative gene **hlyA**. A brief review literature on the conventional methods of detection of this pathogen is also mentioned with comparison to my research work. 5- carboxy indole, monomer is polymerized electrochemically and characterized using various tools before forming the sensing platforms. EIS technique was used for detection of toxic gene **hlyA** of *L. monocytogenes* using complimentary oligomer (ssDNA).

Chapter 3 describes the development of platinum nanoparticles capped with chitosan (natural polymer) based sensing platform for detection of *Listeria monoctytogenes* pathogen for its conservative gene **hlyA**. EIS technique was used for detection of toxic gene **hlyA** of *L. monocytogenes* using complimentary oligomer (ssDNA). This sensing platform is also compared with the earlier developed platforms and found more efficient with better stability and selectivity. Therefore, this platform is further used for development of sensors for water borne pathogens.

Chapter 4 deals with the development of platinum nanoparticles capped with chitosan natural polymer based sensing platform as developed earlier for *Escherichia coli St* Gene. Detection was done for both the heat stable *St* 1 gene and heat labile *Lt* 1 gene. Heat stable *St* 1 gene showed more synchronous curve and better limit of detection as compared with the *Lt* 1 gene using impedance spectroscopy.

Chapter 5 Summarizes the concluding remarks /future scope of the presented investigations. Present thesis has compiled all our published results in Journal of Biotechnology/Analytical Methods/Electroanalysis.