Electrochemical devices have played a major role in development of biosensors. Such devices are capable for simple, inexpensive, accurate and sensitive sensing in diagnostics field. Recently with advent of functional polymers and nanotechnology, we see use of functional conducting polymers and nanomaterials like nano metals, metal oxides and nanocomposites in modification of sensing probes and in enhancement of catalytic activity of the transducers. Conducting polymers got much more attention due to their conductivity as well as excellent matrix for immobilization of biomolecules. Similarly, metal nanomaterials are emphasized and used; due to its large surface energy provides the absorption of large number of small biomolecules, ease of functionalization, greater sensitivity and catalysis in bio-reactions with fast electron transfer. Metal nanoparticles are used as probe in detection and imaging of biomolecules. In certain cases nanoparticles are functionalized and made biocompatible to specifically and efficiently bind to a target analyte. Biocompatible nanomaterials are basically composite of metal nanoparticles and biopolymers like chitin, chitosan providing functionality for attaching the biomolecule. In the biosensors, stability, sensitivity and reproducibility are key factors and mainly depends on immobilization. Therefore, we focused on our research work on development of a stable sensing platform and second immobilization based on chemical binding with conducting polymer as well as nanoparticles dispersed polymer matrixes for water & food borne pathogens based on DNA as sensing species. DNA/oligonucleotides along with the conducting polymer and nanomaterials polymer composite matrix have proven to show increased catalytic activity and as well as increases the sensitivity of the modified electrode and finds wide applications in field of water & food borne pathogens sensors.

The thesis entitled "**Development of biosensors for pathogenic bacteria based on ssDNA probes**" is summarized under five chapters as given below.

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.

In *chapter 2* electrochemically synthesized conducting polymer 5 C Pin as biorecognition layer is used (it permits the homogenous immobilization of ssDNA). Further for stable and optimum binding EDC-NHS coupling was employed for attaching the DNA with the conducting polymer by covalent interaction. 5CPin was selected since shows biocompatibility and lesser toxicity in comparison to other conducting polymers. The experimental conditions are optimized and the change in charge transfer resistance (ΔR_{CT}) is calculated for varying concentrations of *E. coli* DNA. Nyquist plot and R_{CT} vs. log Conc. plot were given clearly demonstrates the high limit of detection in wide linear range 1×10^{-4} to 1×10^{-12} M in case of hybridization of DNA under optimized conditions.

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 (LOD of 1×10^{-12} M). 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 (LOD of 3.4×10^{-14} M) 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.

Still exhaustive study and further experimentation needs to be done to increase the scope of matrices to various applications. Demand for development of biosensor which can perform real time monitoring of bioanalytes. Miniaturization of biosensor (low cost, portable and disposable) for point of care diagnostics (specific for genosensors) need to be developed. Still advancements are needed for increasing stability of the bio-electrodes with respect to time in real time readings. Hazardous molecules detection within bio samples also required to be explored for increasing the applications area.