PREFACE

The research work was started in the year 2012 and has been documented in the dissertation entitled **"Isolation and Characterization of Environmental Aeromonads from North Bengal region with a special emphasis on their Drug Resistance and Virulence Genes.''** under the supervision and expert guidance of Prof. Soumen Bhattacharjee at the *Cell and Molecular Biology Laboratory*, Department of Zoology, University of North Bengal.

Aeromonads are a group of Gram-negative pathogenic bacteria which affect both ectothermic and endothermic animals including humans. Every year all over the World, the fishing industry suffers huge economic loss due to fin and tail-rot, ulcer, septicaemia, gill and systemic diseases in fishes caused by *Aeromonas spp*. *Aeromonas* also cause infectious diseases in animals such as ulcerative stomatitis in snakes and lizards, "red leg" disease in frogs, septicemia in dogs, septic arthritis in calves, a variety of infectious diseases in seals and seminal vesiculitis in bulls. The most frequent disease caused by *Aeromonas* in humans is gastroenteritis. Among the other diseases, *Aeromonas* causes skin and soft tissue infections, blood-borne infections, intra-abdominal infections, respiratory tract infections, urogenital tract infections and eye infections in humans. Therefore, *Aeromonas spp*. are very important bacteria which should be studied extensively.

North Bengal region, being situated in the Himalayan foothills, is the catchment area of many snow-fed rivers that flow down the Himalayas. There is a possibility of obtaining cold-adapted, and therefore, more virulent bacterial strains in this region. Therefore, the first objective of this study was designed to study the species diversity of *Aeromonas* in the aquatic environment of North Bengal region. Both biochemical and molecular characterization was done to identify endemic *Aeromonas* species from this region.

Development of antibiotic resistance among the microbes is presently posing a great challenge for our medical science in the treatment of infectious diseases. Overuse/misuse of antibiotics is the leading cause of the development of resistant varieties of bacteria in the environment. Therefore, it is important to study the antibiotic resistance/susceptibility status of the genus *Aeromonas* in the study area. Keeping this in mind, the second objective of the study was designed to study the

status of antibiotic resistance/susceptibility of the *Aeromonas* isolates obtained from this region against the commonly used antibiotics.

Bacteria spread antibiotic resistance genes to other species of bacteria and among different isolates of the same species of bacteria through mobile genetic elements, one of which is plasmid. Small-sized plasmids are easily transferred from one species to another. Therefore, the plasmid content of the *Aeromonas* isolates identified from this region was analyzed. Next, the transferability of the natural plasmids obtained from *Aeromonas* was checked using *E. coli* (JM109) as the recipient organism. When the antibiotic resistance genes get integrated into the chromosomal DNA it becomes more stable and can further enhance the chances of spread of the antibiotic resistance genes among the different isolates of the same species of bacterium.

Water samples were collected from rivers, municipality drinking water supplies, hospital and domestic drainage systems in sterile capped tubes and brought to the Cell and Molecular Biology Laboratory, Department of Zoology, University of North Bengal, where all the experiments were performed. The findings of this study are discussed in detail in the results and discussion chapter of this dissertation. Some of the findings of this study are published in academic Journal and some of them are yet to be published.