Chapter 6

Summary and Conclusion

- This study reports the ability of *Brevibacillus* RRL-01 to cause UTI and due to its inherent haemagglutination property a mouse model for pyelonephritis could not be developed

- *E. coli* RRL – 36, was able to cause pyelonephritis in mice, seven days post infection by trans-urethral catheterization

- Its biofilm forming capability could be attributed to the expressed adhesions, high degree of hydrophilicity, cell adhesion rate and production of exopolysaccharide

- Chandraprabhavati, a Siddha drug, was capable of inhibiting the progression of infection in a bacteriostatic manner, and subsequently restore the levels of AMPs and inflammatory markers in the pyelonephritic mouse model

- The Cardamom seed and pod extracts, by a bactericidal mode of action, prevented the uropathogens from establishing UTI, and effectively restored the levels of the AMPs and inflammatory markers

- The synergistic effect of Chandraprabhavati and Cardamom seed extracts at 500mg/kg body weight and 150 mg/kg body weight with the presence of copper, iron and zinc was capable of treating UTI and in bringing down the elevated AMPs and inflammatory markers

- The levels of THP were found to be drastically reduced in infected mice. This indicates that it plays an important role in the prevention of UTI

CONCLUSION

A pyelonephritic mouse model was generated by trans-urethral catheterization using $2.5 \times 10^8$ cfu of *E.coli* RRL - 36/ (30 µl of PBS). The generated model exhibited histo-pathological changes such as destruction of tubular architecture, infiltration of neutrophil's in to the tubular region with inflammation with focal pyelonephritis, with damage to the podocyte architecture and increase of the glomerular space in the Bowman’s capsule. The strain *E. coli* RRL – 36, was
found to form an effective biofilm, which is a characteristic feature of uropathogenic strains to survive in the host tissues. In the pyelonephritic model, a drastic alteration in the levels of the antimicrobial proteins – Tamm Horsfall Glycoprotein, Transferrin, Cathelicidin, Lipocalin, Ficolin and the inflammatory markers – TNF – α and NF - κβ were observed. When the animals were treated with Chandraprabhavati or Cardamom seed or pod extracts or the combined extracts of the same, a regulation in the levels of Tamm Horsfall protein, were noticed. This indicated that this protein could have a probable role in preventing urinary tract infection, however further studies are required to shed light on the mechanism involved. The levels of the other AMP’s and inflammatory markers were also restored in normal, except in the case of CPV + C.Pod extract, where tubular necrosis was noticed. This study also reports the probability of using Chandraprabhavati, in combination with cardamom extracts or alone as an effective alternative treatment strategy for UTI.