Summary and conclusion

Food is biological in nature and is capable of supplying consumers with nutrients; it is equally capable of supporting the growth of contaminating microorganisms. Food and waterborne diarrhoeal diseases, for example, are leading causes of illness and death in developing countries, killing an estimated 2.1 million people annually, most of whom are children.

Food borne bacterial intoxication is caused by the ingestion of food containing preformed bacterial toxin, such as the toxins produced by *S. aureus* resulting from bacterial growth in the food. *S. aureus* intoxication remains one of the most common causes of food borne diseases. Quantities between 100 and 200 ng of consumed enterotoxin can cause symptoms of staphylococcal intoxication. These toxin levels are presumably reached when *S. aureus* population exceeds $10^5$-$10^6$ CFU per gram. The amount of toxin needed to cause disease is less than 1 µg. In developing countries, a large segment of the population, including children, students and the urban poor, depends largely on street foods, which are unhygienic, to meet their daily nutritional needs, as it is cost-effective. In recent years, there has been an increase in food-poisoning outbreaks, resulting in serious health problems. Studies have shown that consumption of unhygienic foods contaminated with microorganisms, with or without their metabolic products, is the possible outbreak of serious food-borne illness. In street vended foods, pathogens may invade the interior surfaces of the food during peeling, slicing, handling, trimming, and other processes, such as packaging, storing and marketing.

In our study enterotoxigenic staphylococcus strains were isolated from food samples. *Staphylococcus* spp other than *S. aureus* were found to be pathogenically important. Enterotoxigenic genetic element like enterotoxin genes and plasmid enterotoxigenicity like resistant to antibiotic and metal ions are present in non *S. aureus* spp. It is non expressive because of the insertion of transposon. So molecular techniques are required to detect the presence of genetic element.

The detection of pathogenic organisms in food is of great importance to ensure the well-being of human kind. The proper detection and subsequent characterization of pathogenic microorganisms and toxins produced by them are important from biological point of view as they pose potential hazards to health. An effective food quality control programme is largely dependent upon the methods used in detecting the potential hazardous microorganisms. Rapid microbiological methods can be used nearly at all
steps of the HACCP system. Data can be collected quickly and accurately which can be utilized to develop in house database to form the basis of risk assessment. Rapid microbiological methods are being established for on-line monitoring as part of the HACCP system. These objectives have been achieved through newer biotechnological and nucleic acid based methods.

Enterotoxigenic staphylococcal strains isolated from the food samples in Mysore, Karnataka, India, were evaluated using loop-mediated isothermal amplification (LAMP) method. LAMP was found to be 100-fold more sensitive than PCR. Thus, LAMP has been proven to be a powerful tool, which is useful for detection and obtaining a reliable identification of the toxin genes of the pathogen from diverse food sources. In developing countries, such as India, where food-borne illness is of serious concern, loop-mediated isothermal amplification method may serve as a powerful tool for rapid diagnosis of food-borne pathogens in food safety analysis as it is cost-effective.

In this study, the use of Triton X-100 for the extraction of DNA was found to be cost-effective over other methods reported so far, wherein costlier reagents like guanidium thiocyanate, paramagnetic nanoparticle, combination of organic solvents (diethyl ether), detergents (SDS), alkali (NaOH) and petroleum ether were being used. The template DNA extraction method developed in this study for food samples is simple, rapid and cost effective. LAMP was found to be less sensitive to matrix effect of food, compared to PCR. The method is suitable for direct detection of staphylococcus without any enrichment in contaminated food samples and hence finds its application in food safety analysis, in permutation with LAMP. Thus, LAMP has been proven to be a powerful tool, which is useful for the detection and reliable identification of enterotoxin genes of pathogen from diverse food source, especially for resource-limited laboratories in developing countries. For routine use in food analysis, detection methods need to be simple, specific, robust and reliable. DNA extraction method in combination with judicious choice of LAMP can be extended to detect pathogens present in food samples, reducing the ill-effects of food contamination owing to the time taken for their identification.