Editorial

Detection of Bacteria in Food

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Microbiological contamination can be found in natural environment such as water, soil, air and in food chain and manufacturing process of food products. The microorganisms found in food contamination include bacteria, yeasts, molds, and viruses. Pathogenic bacteria including *Escherichia coli, Salmonella* spp., *Clostridium botulinum* and *Listeria* spp., *Vibrio cholerae,* and *Pseudomonas* spp. were detected from food, irrigation water and associated sediments which were contaminated from feces. Transmission of pathogenic agents from food-producing animals involved in human illnesses. Symptoms of bacterial infection varied from mild to severe illnesses such as stomach cramps, nausea, vomiting, and even fatality.

These microorganisms have been extensively studied due to outbreaks taking place. Foodborne disease outbreaks caused by contaminated bacteria were reported from several studies. Foodborne pathogens contaminated in retail environment increased risk of foodborne illnesses. The cross contamination is a significant public health concern. Tracking pathogens transfer from contaminated food, ready-to-eat processed foods such as deli meats and surrounding environment have been developed in order to prevent and control cross contamination.

Characteristics of microorganisms include motility, spore-forming ability, toxin production, and cellular structure involved in pathogenicity are concerned to eliminate the contaminated food. Bacterial contamination can cause food spoilage resulting in foodborne illnesses. It is crucial to detect contaminated bacteria in food for consumer protection and control the spread of infections.

The gold standard of microbial contaminations detection using a conventional method by culturing on selective media when the growth of bacteria found on solid media or turbidity appeared in liquid media. Quantification of the contamination is measured by counting the colonies grow on media. One colony is formed per bacterium in the sample. The colony count unit is Colony-forming units (CFU) per mL sample. The conventional method for foodborne detection in food is usually time consuming and laborious.[1] Therefore, the detection of pathogenic microorganisms in food has been developed in many studies to identify the contaminated microorganisms. The current detection methods are usually time-efficient, high sensitive and specific, and reducing labor work. The rapid detection methods are vital in prevention and treatment of foodborne diseases.

The rapid detection methods include nucleic acid-based, biosensor-based and immunological-based methods as briefly described below.

1. Nucleic acid-based methods such as simple polymerase chain reaction (PCR), multiplex PCR, real-time PCR, nucleic acid sequence-based amplification (NASBA), loop-mediated isothermal amplification (LAMP), and oligonucleotide DNA microarray.

• The PCR, mPCT, qPCR, and DNA microarray have been widely used for the detection of foodborne pathogens. These methods provide high sensitivity but special equipment and well trained personnel are required. In contrast, NASBA and LAMP do not require special instruments. The methods are relatively sensitive, specific, and cost efficient.

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• Quantitative polymerase chain reaction (qPCR) or Real-time PCR in combination with fluorescence detection or using specific labeling probes for microscopic monitoring was reported. This technique is simple to handle and reliable.[2,3]

2. Biosensor-based methods include optical, electrochemical, and mass-based biosensors. This method is easy, rapid and cost effectiveness. Pre-enrichment is not necessary.

Whole cell biosensing systems, using quorum sensing molecules (QSMs) which control various factors including virulence factor production, antibiotic production, biofilm formation, and gene regulation, was previously introduced for bacterial identification in food. In addition, a portable system was developed for rapidity and ease of performance to ensure the food free from pathogenic bacteria.[4]

3. Immunological-based methods include Enzyme-linked immunosorbent assay (ELISA) and lateral flow immunoassay

ELISA is one of the most commonly used immunological methods for the detection of foodborne pathogens and their toxin. Detection of pathogenic *Vibrio parahaemolyticus* in seafood with sandwich ELISA were previously reported.[5]

Various advantages and limitations of each rapid detection methods were previously reported.[6] Combination of different rapid methods is recommended for confirmation of foodborne pathogenic microorganisms. However, the efficiency and accuracy of rapid detection methods are suggested for further study to ensure safety and security of public health. As the contaminated food with pathogenic microorganisms is needed to eliminate rapidly. Therefore, the development of rapid and sensitive detection methods for eliminating contaminated food are important for rigorous surveillance, prevention and control of foodborne outbreak and infections.

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