Rapid and sensitive detection of Salmonella in agro-Food and environmental samples: A review of advances in rapid tests and biosensors

ABSTRACT

Salmonella is as an intracellular bacterium, causing many human fatalities when the host-specific serotypes reach the host gastrointestinal tract. Nontyphoidal Salmonella are responsible for numerous foodborne outbreaks and product recalls worldwide whereas typhoidal Salmonella are responsible for Typhoid fever cases in developing countries. Yet, Salmonella-related foodborne disease outbreaks through its food and water contaminations have urged the advancement of rapid and sensitive Salmonella-detecting methods for public health protection. While conventional detection methods are time-consuming and ineffective for monitoring foodstuffs with short shelf lives, advances in microbiology, molecular biology and biosensor methods have hastened the detection. Here, the review discusses Salmonella pathogenic mechanisms and its detection technology advancements (fundamental concepts, features, implementations, efficiency, benefits, limitations and prospects). The time-efficiency of each rapid test method is discussed in relation to their limit of detections (LODs) and time required from sample enrichment to final data analysis. Importantly, the matrix effects (LODs and sample enrichments) were compared within the methods to potentially speculate Salmonella detection from environmental, clinical or food matrices using certain techniques. Although biotechnological advancements have led to various time-efficient Salmonella-detecting techniques, one should consider the usage of sophisticated equipment to run the analysis by moderately to highly trained personnel. Ultimately, a fast, accurate Salmonella screening that is readily executed by untrained personnels from various matrices, is desired for public health procurement.