Graphene quantum dots based optical biosensor system for rapid detection of *Salmonella spp*

Emine Kayhan
Sumeyra Savas, Harun Ozbay, Ilyas Ozer
Uşak University, Ankara İzmir Yolu 8.km Bir Eylül Kampüsü, Uşak, Turkiye
emine.kayhan@usak.edu.tr

Abstract

Globally, contaminated food is responsible for 600 million cases of foodborne illnesses each year, nearly 1 in 10 people, resulting in 420,000 fatalities [1]. It is estimated that tainted food costs approximately USD 110 billion annually in terms of lost productivity and medical expenses [2]. Rapid detection of foodborne pathogens is crucial for protecting supply chains and public health [3,4]. However, the current approach involves labor-intensive laboratory work and extended processing times [5,6]. To address these challenges, a novel nanomaterial-based lateral flow immunoassay (LIFA) integrated with an optical detection system utilizing the exceptional properties of graphene quantum dots (GQDs) was introduced. This innovative system is designed for the detection of *Salmonella spp.*, the most common foodborne pathogen responsible for severe illnesses and disruptions. The synthesized GQDs have been incorporated into the LIFA kit, which is integrated into an optical system developed by our project team. Beyond enabling rapid detection and quantitative analysis, our system facilitates image processing and allows for the transfer of test results to smartphones. This optical biosensor system boasts remarkable attributes, including fast (<20 min), portability (200 g), point-of-care functionality, and high sensitivity (1-10 cfu/mL).

References

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Figures

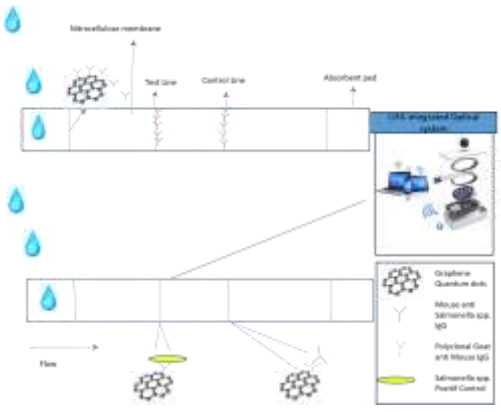

Figure 1: Scheme illustrating GQDs based LIFA integrated optical system for *Salmonella spp.* detection