Detection of foodborne bacteria and bacterial toxins using immunoassays.

Enrico Cortesi*

Department of Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada

Introduction

Food safety is a critical concern worldwide, as foodborne illnesses continue to pose a significant threat to public health. These illnesses often result from the consumption of contaminated food, including bacteria and bacterial toxins. Detecting and identifying these pathogens swiftly and accurately is essential to prevent outbreaks and ensure the safety of our food supply. Immunoassays, a group of powerful analytical techniques, play a crucial role in the detection of foodborne bacteria and bacterial toxins, offering rapid and precise results. This article explores the principles, types, advantages, and applications of immunoassays in food safety [1].

Immunoassays are analytical methods that utilize the specific binding between antibodies and antigens to detect and quantify various substances, including bacteria and bacterial toxins. The fundamental principle behind immunoassays is the high specificity and affinity of antibodies for their corresponding antigens. When antibodies are exposed to the target antigen, they form an immune complex, which can be measured to determine the concentration of the analyte [2].

Several immunoassay formats are used in food safety to detect foodborne bacteria and bacterial toxins. The most commonly employed types include

ELISA is one of the most widely used immunoassay techniques in food safety. It involves immobilizing antibodies specific to the target antigen on a solid surface (e.g., a microplate). After adding the sample containing the antigen, a secondary enzyme-linked antibody is used to generate a detectable signal, typically through a color change. ELISA offers high sensitivity and is adaptable to various targets, making it a versatile tool in foodborne pathogen detection [3].

LFAs, also known as lateral flow immunoassays or rapid tests, are simple and user-friendly tests commonly used for on-site detection. They consist of a test strip containing antibodies specific to the target. When the sample is applied, the antigen-antibody interaction produces a visible line or signal. LFAs are quick, cost-effective, and suitable for detecting a range of foodborne pathogens and toxins [4].

Fluorescence immunoassays rely on the detection of fluorescence signals generated by antibody-antigen interactions. They offer high sensitivity and specificity and are often used in laboratories equipped with fluorometers or fluorescence microscopes. These assays are particularly useful for detecting low concentrations of bacterial toxins [5].

Immunoassays are known for their exceptional sensitivity and specificity. They can detect low concentrations of foodborne bacteria and toxins while minimizing false positives or false negatives.

Many immunoassay formats provide quick results, making them suitable for rapid detection during food production, distribution, and preparation. This speed is crucial for preventing foodborne illness outbreaks.

Immunoassays, especially lateral flow assays, are user-friendly and require minimal training to perform. This feature is advantageous for on-site testing and in areas with limited laboratory resources.

Immunoassays can be customized to detect various foodborne pathogens and their toxins. They are adaptable to different sample matrices, making them versatile tools in food safety [6].

Immunoassays are used to detect bacteria like Salmonella, Escherichia coli (E. coli), Listeria, and Campylobacter in food samples. These assays help ensure that food products are free from harmful pathogens before they reach consumers.

Immunoassays are crucial for the detection of bacterial toxins such as Staphylococcal enterotoxins, Clostridium botulinum toxins, and Shiga toxins in food. Rapid toxin detection prevents contaminated products from entering the market.

Immunoassays are employed by food manufacturers to monitor the quality and safety of their products during various production stages. This helps prevent contaminated products from reaching consumers and reduces the risk of recalls [7].

Immunoassays are used in environmental monitoring to assess the presence of foodborne pathogens in water sources and other environmental samples. This helps identify potential sources of contamination.

Immunoassays are used at borders and ports of entry to inspect imported food products, ensuring they meet safety standards and are free from contaminants.

While immunoassays have greatly improved food safety, there are still challenges to address. Cross-reactivity, matrix interference, and the need for continuous assay optimization are some common issues. Researchers and food safety professionals continue to work on enhancing the sensitivity and specificity of immunoassays to overcome these challenges [8].

***Correspondence to:** Enrico Cortesi, Department of Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada, E-mail: Enricocortesi@gmail.com

***Received:** 27-Dec-2023, Manuscript No. AAJFNH-24-135307; **Editor assigned:** 01-Jan-2024, Pre QC No. AAJFNH-24-135307(PQ); **Reviewed:** 15-Jan-2024, QC No. AAJFNH-24-135307; **Revised:** 22-Jan-2024, Manuscript No. AAJFNH-24-135307(R), **Published:** 29-Jan-2023,DOI:10.35841/aajfnh-7.1.195*

***Citation:** Cortesi E. Detection of foodborne bacteria and bacterial toxins using immunoassays. J Food Nutr Health. 2024; 7(1):195*

In the future, the development of multiplex immunoassays capable of detecting multiple pathogens and toxins simultaneously will further streamline food safety testing. Additionally, the integration of immunoassays with emerging technologies like microfluidics and biosensors promises to make foodborne pathogen detection even more rapid and precise [9].

Immunoassays are invaluable tools in ensuring the safety of our food supply by detecting foodborne bacteria and bacterial toxins with speed, accuracy, and specificity. Their adaptability, user-friendliness, and ability to deliver rapid results make them essential in various aspects of food safety, from production and distribution to environmental monitoring and import inspection. As technology continues to advance, immunoassays will play an increasingly vital role in preventing foodborne illnesses and protecting public health [10].

Reference

1. Wong A. The use of a specialised amino acid mixture for pressure ulcers: A placebo-controlled trial. J Wound Care. 2014;23:259–60.
2. Vandewoude MF. Fibre-supplemented tube feeding in the hospitalised elderly. Age Ageing. 2005;34:120–124.
3. Beck AM. Oral nutritional support of older (65 years+) medical and surgical patients after discharge from hospital: Systematic review and meta-analysis of randomized controlled trials. Clin Rehabil. 2013;27:19–27.
4. Munk T. Individualised dietary counselling for nutritionally at-risk older patients following discharge from acute hospital to home: A systematic review and meta-analysis. J Hum Nutr Diet. 2016;29:196–208.
5. Aubry E. Facts zum Management der Klinischen Ernährung—Eine Online-Befragung. Aktuel Ernahr. 2018;42:452–460.
6. Adams KM, Kohlmeier M, Powell, et al. Nutrition in medicine: nutrition education for medical students and residents. Nutr Clin Pract. 2010;25(5):471–480.
7. Flynn M, Sciamanna C, Vigilante K. Inadequate physician knowledge of the effects of diet on blood lipids and lipoproteins Nutr J. 2003;2:19.
8. Levine BS, Wigren MM, Chapman DS, et al. A national survey of attitudes and practices of primary-care physicians relating to nutrition: strategies for enhancing the use of clinical nutrition in medical practice. Am J Clin Nutr. 1993;57:115–119.
9. Soltesz KS, Price JH, Johnson LW, et al. Family physicians' views of the preventive services task force recommendations regarding nutritional counseling. Arch Fam Med. 1995;4:589-593.
10. Temple NJ. Survey of nutrition knowledge of Canadian physicians. J Am Coll Nutr. 1999;18:26–29.

Citation: *Cortesi E. Detection of foodborne bacteria and bacterial toxins using immunoassays. J Food Nutr Health. 2024; 7(1):195*