DOI: 10.22055/IVJ.2020.230708.2261
DOR: 20.1001.1.17356873.1401.18.2.11.1

Detection of *Escherichia coli* and its toxins in food using carbon quantum dots conjugated antibody

Masoud Veisi[1], Siavash Maktabi[2], Zahra Ramezani[3] and Mohammad Khosravi[4*]

[1] PhD Student in Food Hygiene, Department of Food Hygiene, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran
[2] Associate Professor, Department of Food Hygiene, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran
[3] Professor, Department of Medicinal Chemistry and Toxicology Research Center, Faculty of Pharmacy, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran
[4] Associate Professor, Department of Pathobiology, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran

Received: 16.05.2020 Accepted: 01.07.2020

Abstract

In this study, the possibility of using carbon quantum dots (CQD) to detect and determine the amount of antigen to finally quantify *E. coli* and its toxins in food stuffs. Carbon quantum particles were produced using citric acid and ethylenediamine. The production of the polyclonal anti- *Escherichia coli* antibody was carried out with immunization of the rabbits and purification of the IgG antibodies from the hyper immune serum using ion exchange chromatography. The production of the carbon quantum dot nanoparticles was confirmed using FTIR and atomic force microscopy with efficiency of 67%. The validation of the carbon quantum dot coupling to anti-bacterial antibodies was performed using EDC-NHS, the appropriate formation and stability of the complex for a period of 6 months, was confirmed by ELISA and fluorometry methods. The addition of high concentrations of *E. coli* bacteria to the complex reduced the diffusion of fluorescence emission of CQD at a wavelength of 440 nm by stimulating at a wavelength of 350 nm. Increasing the concentration of *E. coli* further reduced the intensity of emission which led to an increase in the difference between the emission of the conjugated and the control samples with a detection limit equal to 30 CFU/mL bacteria. Based on the results of this study, the conjugation of CQD with an antibody against a bacterium or a substance can be used to detect and determine the amount of that bacterium or substance.

Key words: Antibody, Antigen, Carbon quantum dots, Fluorescence

[*] **Corresponding Author**: Mohammad Khosravi, Associate Professor, Department of Pathobiology, Faculty of Veterinary Medicine, Shahid Chamran University of Ahvaz, Ahvaz, Iran
E-mail: m.khosravi@scu.ac.ir

Refrences