proceedings

MDPI

Abstract

Label-Free QCM Immunosensor for the Detection of Ochratoxin A †

Serife Seyda Pirincci [1,2,*], Ozlem Ertekin [1], Duygu Ercan Laguna [1], Fehime Seyma Ozen [1], Fatma Betul Guloglu [1], Zafer Ziya Ozturk [3,*], Selma Ozturk [1]

[1] TÜBİTAK, The Scientific and Technological Research Council of Turkey, Marmara Research Center, Genetic Engineering and Biotechnology Institute, 41400 Gebze, Kocaeli, Turkey; ozlem.ertekin@tubitak.gov.tr (O.E.); duygu.ercan@windowslive.com (D.E.L.); f.seymaozen@gmail.com (F.S.O.); betulag@yahoo.com (F.B.G.); selma.ozturk@tubitak.gov.tr (S.O.)

[2] Department of Medical Genetics and Molecular Biology, Kocaeli University, 41380 Umuttepe, Kocaeli, Turkey

[3] Department of Physics, Gebze Technical University, 41400 Gebze, Kocaeli, Turkey

* Correspondence: seyda.pirincci@tubitak.gov.tr (S.S.P.); zozturk@gtu.edu.tr (Z.Z.O.)

† Presented at the 5th International Symposium on Sensor Science (I3S 2017), Barcelona, Spain, 27–29 September 2017.

Published: 27 November 2017

Mycotoxins are one of the most important food and feed contaminants threatening human health. Ochratoxins are the mycotoxins produced by some Aspergillus (commonly *A. ochraceus*) and Penicillium (*P. verrucosum* and *P. carbonarius*) species. Ochratoxin A (OTA) is the most dangerous and common ochratoxin and poses a major risk for human and animal health. Cereal grains are the most common commodity contaminated with OTA. As they are both directly consumed as food and used as animal feed, the transfer of OTA through the food chain causes OTA contamination in products of animal origin such as animal tissues and dairy products. Moreover, OTA contaminated feed not only affects human health through the food chain, but also reduces the animal growth rate and impacts productivity especially in pork and poultry production. Due to its carcinogenic, nephrotoxic, hepatotoxic, neurotoxic, teratogenic and immunotoxic effects as well as direct impact on animal husbandry, OTA content in food and feed products is regulated. Although the laboratory-based methods used for the quantification of OTA; such as LC MS, GC, HPLC; provide quite sensitive and reliable results, these methods are time consuming, expensive and require a trained operator. Biosensors provide fast, easy, cheap, sensitive and specific analysis. In addition to these advantages, biosensors enable on-site monitoring of samples without the need to carry them to the laboratory.

In this study, a QCM biosensor capable of measuring OTA in the 50–200 ppb range was developed. Due to the low molecular weight of the toxin, a competitive assay format was used. In this competitive assay, OTA is immobilized on the gold surface and competes with free toxin found in the sample to be identified for binding of anti-OTA antibody. For immobilization of OTA, gold surface was functionalized with 11-mercaptoundecanoic acid in the first place and then amine groups were generated for conjugation of the toxin. The developed assay exhibited a perfect linear correlation with 99.8% R2 value within the range of 50–200 ng/mL and a detection limit of 17.35 ng/mL. The Commission of the European Communities Recommendation (2006/576) guidance values for OTA in feedstuffs are 250 ppb for cereals and cereal products, 50 ppb for feedstuffs for pigs and 100 ppb for feedstuffs for poultry. So, the developed sensor may be used for on-site monitoring of OTA in feedstuff within the limits and contribute to efficient screening of OTA by reducing the workload and dependence on laboratory-based methods. Further studies may enable the use of this sensor for food analysis by the addition of a pre-concentration step using immunoaffinity columns.