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Fluorescence polarization immunoassays for detection of myco- and phycotoxins in food stuffs

Elena A Zvereva, Savvina O A, Eremin S A, Zherdev A V and Dzantiev B B A N Bach Institute of Biochemistry, Russia

Statement of the Problem: Myco- and phycotoxins are low molecular weight toxic metabolites produced by fungi and microalgae, respectively. Their presence in food and feed is a complex problem combining health hazards for men and animals with economic harm to agriculture. Negative effects of these compounds include inhibition of protein synthesis, immunosuppression, carcinogenesis, geno- and nephrotoxicity. Therefore, monitoring of myco- and phycotoxins in foodstuffs is an extremely important task.

Methodology: The study is focused on immunodetection of main mycotoxins (aflatoxin B1, ochratoxin B) and phycotoxins (okadaic acid, microcystin). Fluorescence polarization immunoassays (FPIAs) have been developed and characterized for this purpose. The PFIA choice was based on rapidity and simplicity of this technique.

Findings: Conjugates of toxins' derivatives with fluorescent labels were synthesized and used for the assays in combination with selected antibodies. Concentration and kinetic dependences of the analytical interactions were studied and the optimal modes of assays implementation were determined. The developed PFIAs allows testing samples without separation and wash stages and helps obtain results in 15 mins. For example, in the case of aflatoxin B1 the reached limit of detection is 0.2 ng/mL, and detectable concentrations ranged from 2 to 18 ng/mL, being in accordance with regulatory demands of safety control. The developed FPIAs were successfully applied to testing food stuffs of plant and animal origin.

Conclusion & Significance: The obtained results indicate the prospects of the developed methods for food safety monitoring.

Recent Publications:

- 1. Dzantiev B B et al. (2014) Immunochromatographic methods in food analysis. TRAC Trends in Analytical Chemistry 55: 81-93.
- 2. Li Y F et al. (2017) Immunochemical techniques for multianalyte analysis of chemical residues in food and the environment: a review. TRAC Trends in Analytical Chemistry. 88:25-40.
- 3. Lehotay S J and Chen Y (2018) Hits and misses in research trends to monitor contaminants in foods. Analytical and Bioanalytical Chemistry. 410(22):5331-5351.
- 4. Ueda H and Dong J (2014) From fluorescence polarization to Quenchbody: recent progress in fluorescent reagentless biosensors based on antibody and other binding proteins. Biochimica et Biophysica Acta: Proteins and Proteomics. 1844(11):1951-1959.
- 5. Sharma A et al. (2018) Designed strategies for fluorescence-based biosensors for the detection of mycotoxins. Toxins. 10(5):197.

Biography

Elena A Zvereva graduated from the Moscow Institute of Food Production. She is currently working as a Senior Researcher at A N Bach Institute of Biochemistry, Research Center of Biotechnology of the Russian Academy of Sciences, Russia. Her scientific interests are in the field of development of new immunochemical techniques for the detection of biologically active compounds - pesticides, hormones, antibiotics. These works cover the full cycle of the development of immunoanalytical techniques, beginning from obtaining immune reactants and finalizing by the creation of manufacturing technologies.

zverevaea@yandex.ru