

Development of Antibodies Against Typical Hazards in Grain and Oil and Intelligent Point-of-care Detection Technologies

Xiaorong Huang ^{a, b}, Qi Zhang ^b, Baiyi Lu ^a, Xiaoqian Tang ^b, Peiwu Li ^{a, b}

a College of Biosystems Engineering and Food Science, Zhejiang University, Hangzhou, 310058, China.

b Oil Crops Research Institute, Chinese Academy of Agricultural Sciences, Wuhan, 430062, China.

Abstract

Grain and oil safety is critical for food safety and consumer health. Major hazards include mycotoxins (e.g., AFB₁, AFM₁, OTA, CIT), benzo(α)pyrene (BaP), and kitchen waste oil (detected via capsaicin). Due to complex matrices and trace mixed contaminants, efficient monitoring remains challenging. We developed high-quality monoclonal antibodies, recombinant antibodies, nanobodies, and based on these, established ultrasensitive POCT technologies. Specifically, a rapid dual-readout lateral flow immunoassay was developed for the simultaneous quantitative analysis of AFB₁, BaP, and capsaicin in edible oil matrices within 7 minutes, achieving quantitative limits of detection (LODs) of 0.003, 0.6, and 0.01 ng/mL, respectively [1]. An ultrasensitive rapid fluorescence polarization immunoassay was established for the analysis of OTA in rice, with a detection range of 0.03-0.8 ng/mL [2]. A screen-printed electrochemical immunosensor based on a novel nanobody was developed for analyzing AFM₁ in milk, with an LOD of 0.09 ng/mL [3]. A Fe-N-C single-atom nanozyme-linked immunosorbent assay was proposed for the quantitative detection of AFB₁ in peanuts, with an LOD of 3.3 pg/mL [4]. An ultrasensitive icELISA method was developed for the detection of CIT in grains, with an LOD of 0.05 ng/mL [5]. Validated with real samples, these immunosensor-based methods offer sensitive, cost-effective on-site monitoring for quality control and enforcement.

References

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