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Highly sensitive and selective detection of atrazine using microfluidic-based immunosensing platform

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Atrazine [6-chloro-N-ethyl-N 1-(1-methylethyl)-1,3,5-triazine-2,4-diamine, ATZ], one of the most heavily used herbicides worldwide, has led to increasing concern because of their effect on aquatic ecosystems and non-target organisms. ATZ is aslo a putative endocrinic disruptor posing a potential health risk to humans and to wildlife even at very low levels. For example, reproductive and developmental abnormalities may occur to humans or animals with long-term exposure to low ATZ concentrations. ATZ is routinely detected in various natural water systems, including groundwater and surface water, because of its moderate solubility and relative persistence. The US Environmental Protection Agency has classified ATZ as a possible human carcinogen and has mandated a drinking water standard limit of 3 μg/L. Herein, an innovative integrated microfluidic immunosensing platform was developed for the rapid and sensitive detection of ATZ. The capturing molecular ATZ-BSA was covalently immobilized onto the fiber optic sensor surface. With an indirect competitive detection mode, samples containing different ATZ concentrations were premixed with a certain concentration of fluorescence-labeled anti-ATZ antibody, which binds to ATZ with high specificity. Then, the sample mixture was pumped onto the sensor surface. Less fluorescence-labeled antibody bound onto the sensor surface as ATZ concentration was increased, which led to lower fluorescence signal. The quantification of ATZ ranged from 0.45 μg/L to 75 μg/L, with a detection limit of 0.06 μg/L. This initial proof-of-concept study showed that the presented biosensing platform can provide rapid and sensitive quantitative information on ATZ in natural water. The proposed method can be further developed for the rapid and sensitive monitoring of other small analytes in various application fields ranging from environmental to biochemical areas.

Biography

Feng Long is Associate Professor at Renmin University of China. He received his Ph.D. from Tsinghua University in 2008 and recently obtained postdoctoral training from Massachusetts Institute of Technology. He has extensive experience in conducting frontier research and developing tangible technologies such as nanostructure biosensors and evanescent wave optical biosensors. He also demonstrated excellence of track record in technology development, publication, patenting and technology transfer. He is a member of the Optical Society of America, American Chemical Society, the Society of Environmental Toxicology and Chemistry and Water Environmental Federation. He has served as reviewer of nearly 20 journals.

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