

SPR for Food Safety and Monitoring: Melamine in Milk Samples

In 2008, the illegal adulteration of infant milk products with melamine (structure shown in FIG 1) led to an outbreak of adverse kidney and urinary effects in thousands of children in China.[1] Clandestine addition of melamine in milk products was to boost the detectable protein contents. Because of the severe impact of melamine on human health, the World Health Organization (WHO) has mandated that melamine in infant milk powder and in feedstock not to exceed 1 mg/kg and 2.5 mg/kg, respectively.[2] The scheme in FIG 1 illustrates an SPR assay for Melamine detection reported by Fodey et al. [3] An amine-modified melamine analog is immobilized onto a carboxymethyl dextran chip, which produces an SPR response when the polyclonal melamine antibody is injected into the SPR flow cell. The presence of melamine in solution will decrease the SPR signal, as it competes for the antibody molecules pre-added into the sample solution.

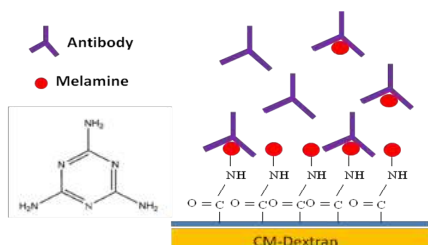


FIG. 1 Schematic representation of the competitive binding assay of melamine. Structure of melamine (bottom left).

When repeating the experiment using a BI-3000 SPR instrument, a detection limit as low as 500 nM was achieved (FIG. 2), which is about 10 times lower than that reported by Fodey et al.[2] Moreover, the chip coated with amine-modified melamine can be regenerated and used for multiple measurements. We found that at least 10 successive measurements can be performed without obvious signal degradation. Compared to other existing analytical techniques employed for melamine analysis, the SPR approach is simple, reproducible, and fast. Moreover, the portability of BI-PSR instruments could facilitate field measurements of melamine, which is a highly desirable feature for food quality monitoring and enforcement of safety regulations.

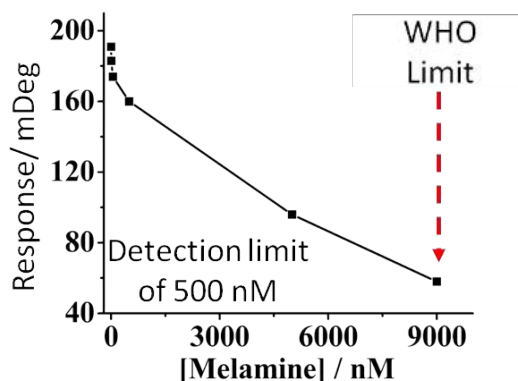


FIG. 2 Concentration response curve for Melamine detection in milk. The Detection limit with BI-SPR instrument is well below the WHO limit. Numerous successive tests could be performed for simple, reliable, and fast testing of melamine in milk.

References

- [1] McDonald, S. Associated Press (September 22, 2008).
- [2] "International experts limit melamine levels in food", World Health Organization, 2010-07-06.
- [3] Fodey et al. *Anal. Chem.* **2011**, 83, 5012-5016.