A Nanobiosensor Based on Immunomagnetic Beads and Quantum Dots for Rapid Detection of Fluoroquinolone in Poultry

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ABSTRACT

Due to the potential possibility of being accumulated in human body and causing health problems, fluoroquinolone has attracted increasing concern in the recent years. Thus effective and rapid detection of fluoroquinolone in the food supply chain is of significant importance. Here, a competitive nanobiosensor based on quantum dots (QDs) and immunomagnetic beads (IMBs) is developed for rapid detection of enrofloxacin (ENR) (a kind of fluoroquinolone) in poultry. In this assay, magnetic beads are conjugated with antibodies for the capture of analytes. After magnetic separation and washing, antigen-immobilized QDs (QDs-BSA-ENR), served as competitors, were introduced for fluorescent signal generation. By combining the high separation efficiency property of IMBs with excellent optical characteristics of QDs, this biosensing platform has initially achieved rapid, sensitive and specific detection of enrofloxacin in real food samples.

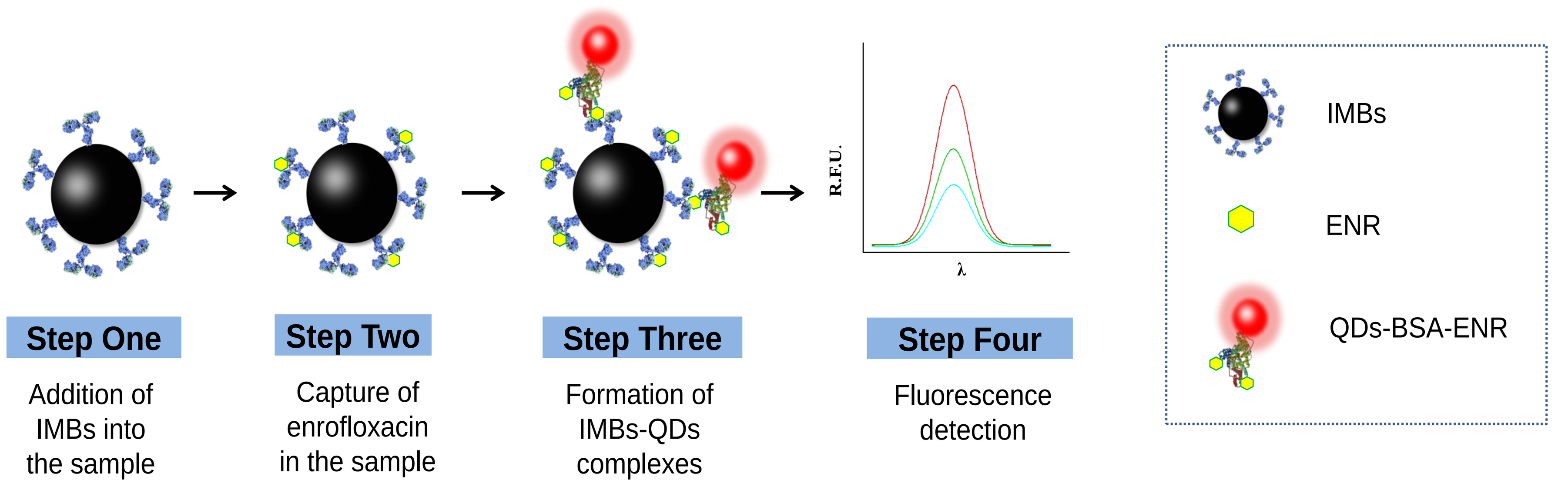

Fig. 1. Conceptual scheme for competitive assay.

Technology Roadmap

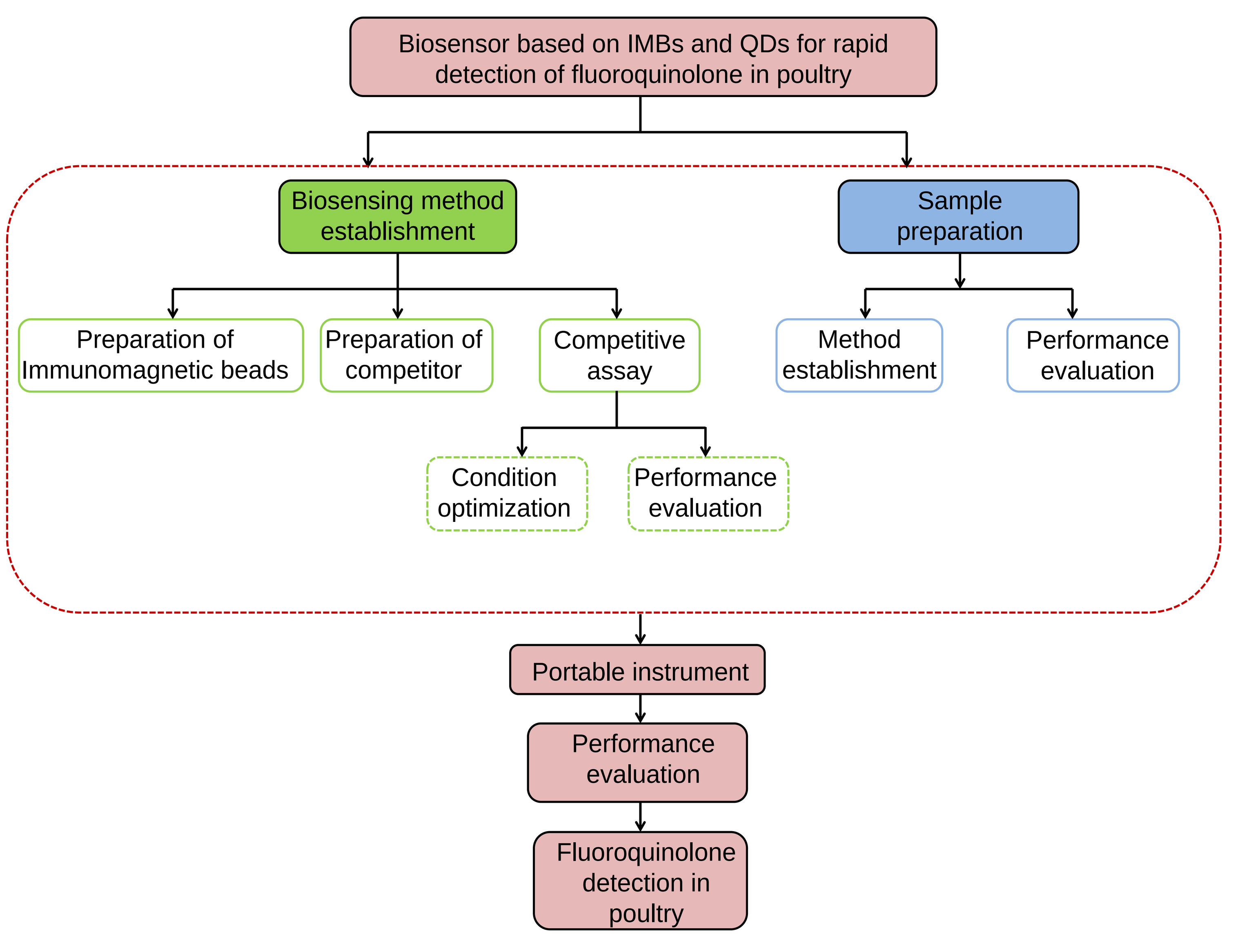

Fig. 2. Technology roadmap of the detection method.

Result

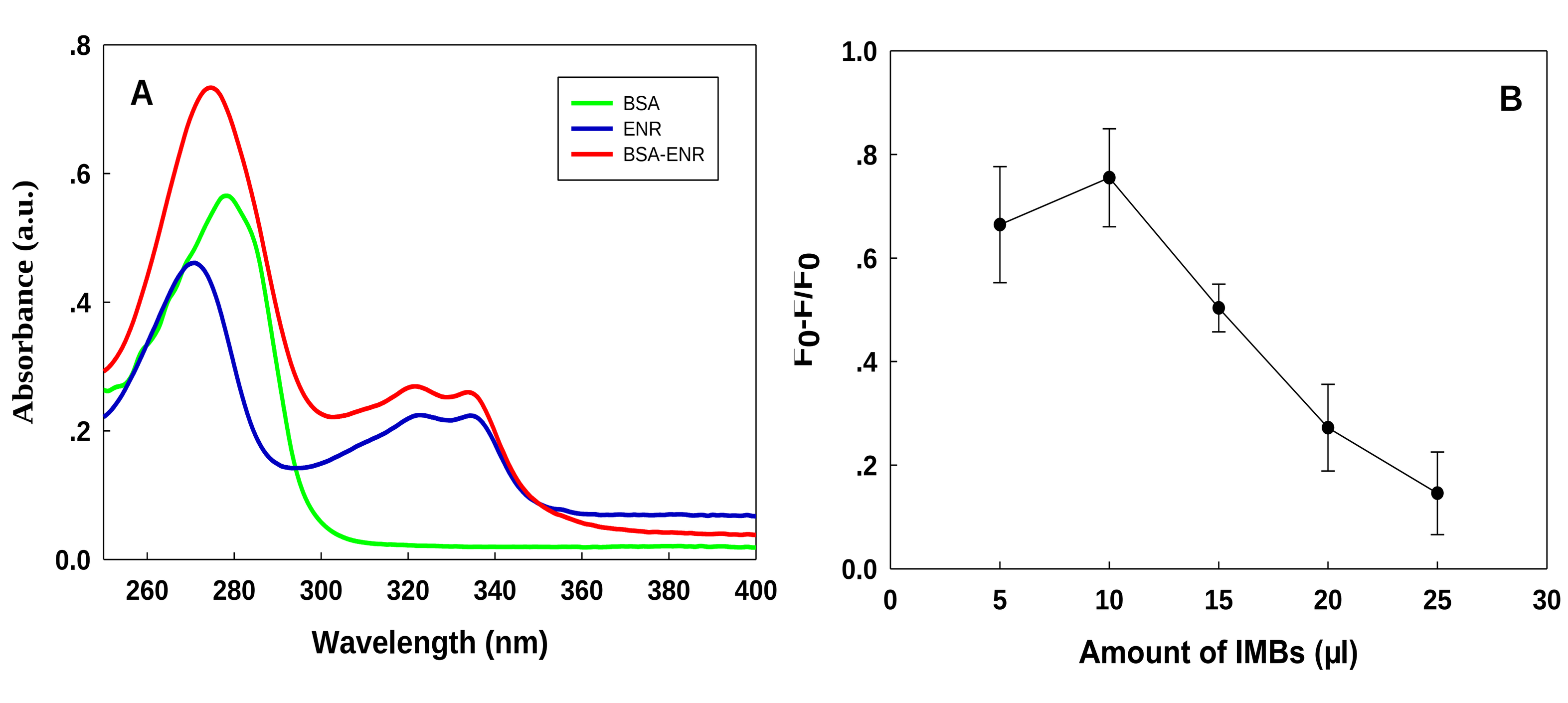

Fig. 3. (A) UV-Vis absorption spectra of BSA, ENR and BSA-ENR; (B) Optimization of IMBs amount.

Absorption peaks at 275 nm, 322 nm and 334 nm indicated the successful preparation of BSA-ENR complexes.

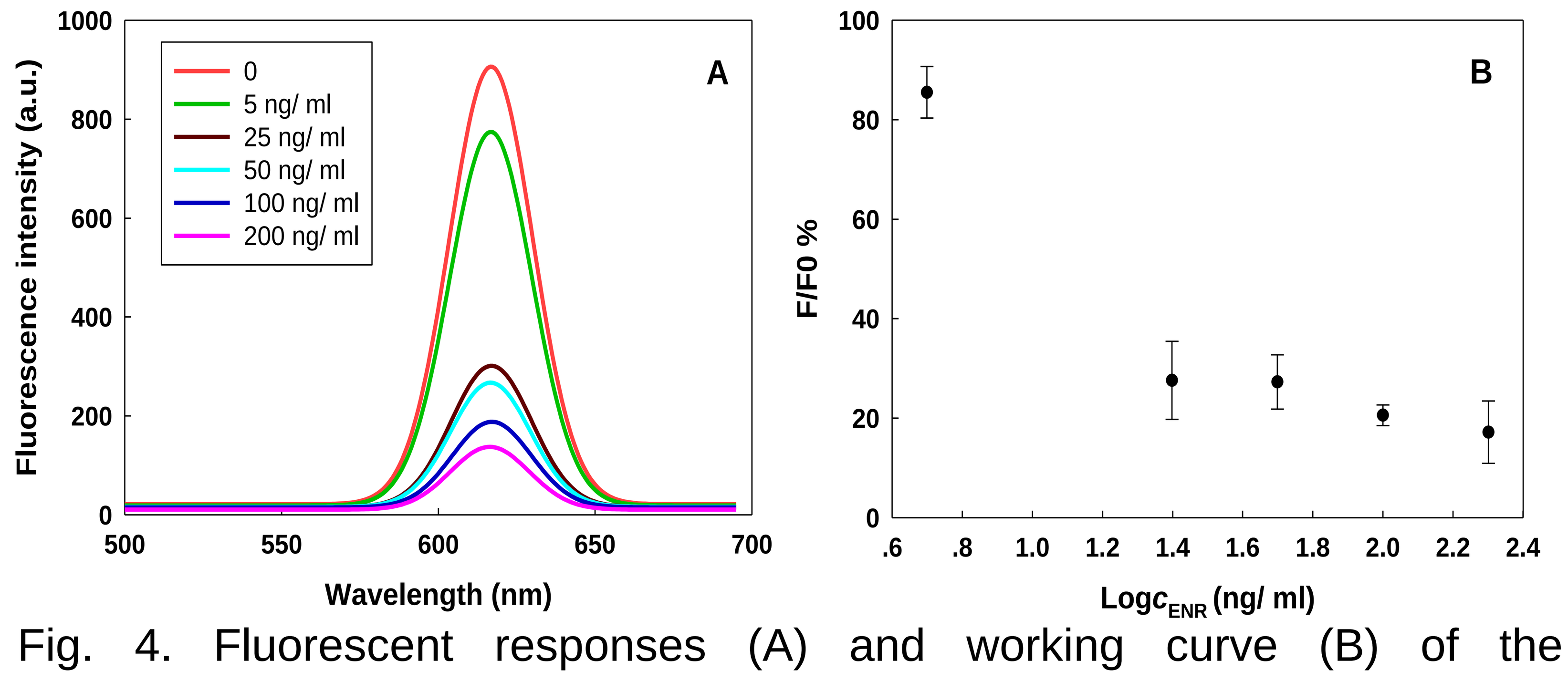

Fig. 4. Fluorescent responses (A) and working curve (B) of the nanobiosensor to different concentrations of enrofloxacin.

The fluorescence intensity decreased with the increasing of enrofloxacin concentrations, indicating it's practical application in enrofloxacin detection.

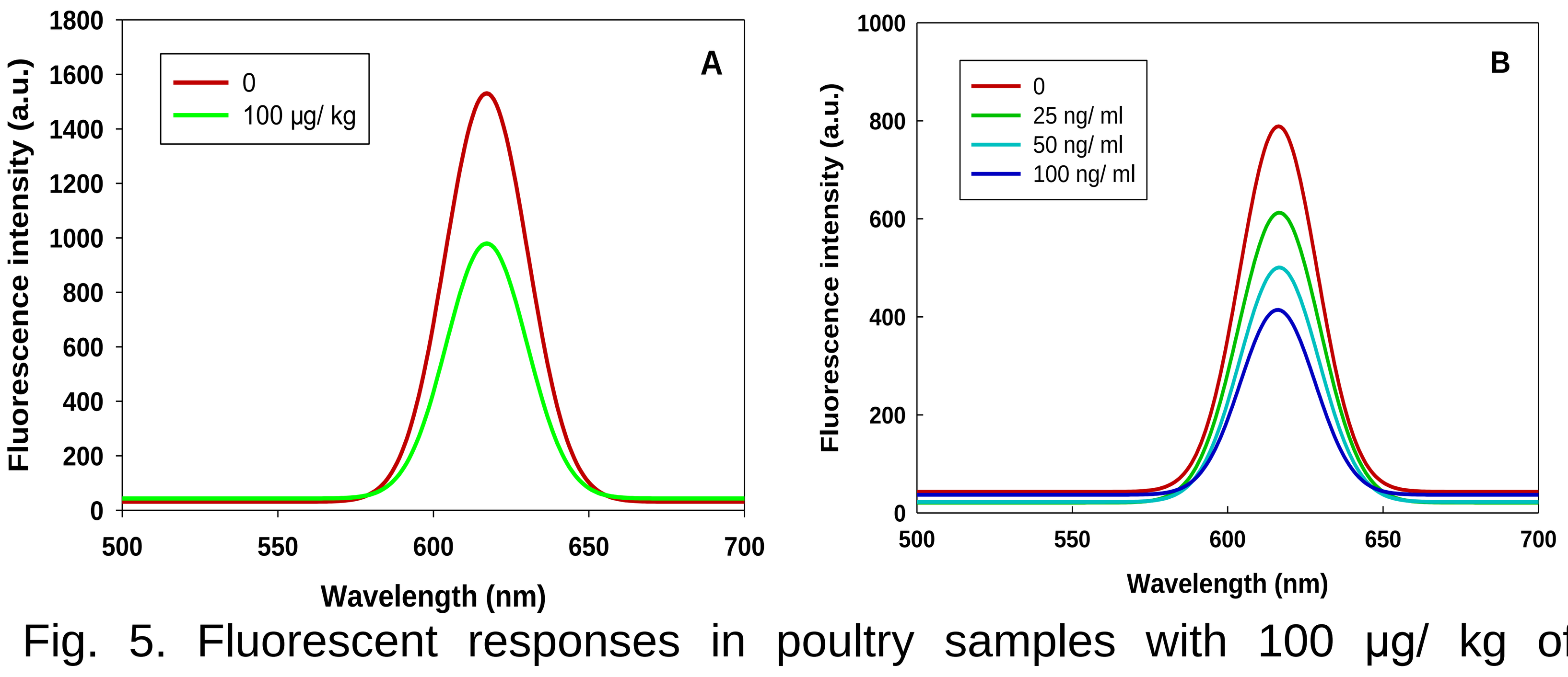

Fig. 5. Fluorescent responses in poultry samples with 100 μg/ kg of enrofloxacin (A) and different concentrations of enrofloxacin (B).

100 μg/ kg of enrofloxacin induced an obvious decrease in fluorescent response and the fluorescence intensity decreased with the increasing of enrofloxacin concentrations, indicating it's possibility for enrofloxacin detection in real food samples.

Conclusion

- A nanobiosensor was developed for fluoroquinolone detection.
- By combining with our homemade portable instrument, this platform has the potential for in-field detection of fluoroquinolone in the food supply chain.

Reference

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Acknowledgement

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