Accepted Manuscript

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PII: S1001-8417(17)30271-1
DOI: http://dx.doi.org/doi:10.1016/j.cclet.2017.07.026
Reference: CCLET 4144

To appear in: *Chinese Chemical Letters*

Please cite this article as: Yudong Wu, Weipan Peng, Qian Zhao, Jiafang Piao, Bo Zhang, Xiaoli Wu, Hanjie Wang, Zhihong Shi, Xiaoqun Gong, Jin Chang, Immune fluorescence test strips based on quantum dots for rapid and quantitative detection of carcino-embryonic antigen, Chinese Chemical Lettershttp://dx.doi.org/10.1016/j.cclet.2017.07.026

Communication

Immune fluorescence test strips based on quantum dots for rapid and quantitative detection of carcino-embryonic antigen

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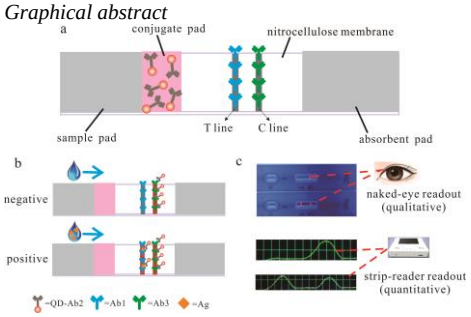
Graphical abstract



A QDs-based immune fluorescence test strips was built up for carcino-embryonic antigen detection to realize cancers POCT diagnostic, with a sensitivity of 0.72 ng/mL in 25 min.

ARTICLE INFO
Article history:
Received
Received in revised form
Accepted
Available online

ABSTRACT
At present, many researchers focused on the point-of-care testing (POCT), a method of disease markers detection without large-scale instruments and specialized persons. However, most POCT diagnostic methods were suffered from poor detection sensitivity or inefficiency in quantitative detection. Herein, we developed a newly QD-immune fluorescence test strips (QD-IFTS) based on quantum dots (QDs) as the fluorescence nanocarrier to prepare the immune fluorescence probes in the classical immunochromatography detection system for sensing carcino-embryonic antigen (CEA), a kind of glycoprotein produced by intestinal tissue and a broad spectrum of tumor marker for cancer diagnosis. And we designed a homemade strips fluorescence reader for detection of fluorescence intensity of QDs on the QD-IFTS. Under the optimized reaction conditions, chromatographic time of the newly QD-IFTS was only 25 min, sample volume of the newly QD-IFTS was only 40 μL and the LOD of the newly QD-IFTS was 0.72 ng/mL. In addition, the efficiency and robustness of the newly QD-IFTS were confirmed by successfully application in 300 clinical serum samples, and the results revealed great potential in clinical POCT of other biomarkers.

Keywords:
Point-of-care testing
Immunochromatography assay
Quantum dots
Carcinoembryonic antigen
Quantitative detection

Recently, quantitative detection of tumor markers without the help of large-scale instruments and specialized persons was one of the research hotspots in the field of disease diagnosis, known as POCT [1-4]. The main advantages of POCT were easy to operate, cost-effective and time-saving, which were contributed to the broad spectrum screening of tumor markers with an on-site detection method. At present, commonly used POCT diagnostic formats mainly included immunochromatography assay (ICA) [5,6], dry-chemical assay