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PII: S0731-7085(17)31297-9
DOI: http://dx.doi.org/doi:10.1016/j.jpba.2017.07.042
Reference: PBA 11422

To appear in: *Journal of Pharmaceutical and Biomedical Analysis*

Received date: 22-5-2017
Revised date: 28-7-2017
Accepted date: 29-7-2017

Please cite this article as: Leila Farzin, Mojtaba Shamsipur, Recent advances in design of electrochemical affinity biosensors for low level detection of cancer protein biomarkers using nanomaterial-assisted signal enhancement strategies, Journal of Pharmaceutical and Biomedical Analysishttp://dx.doi.org/10.1016/j.jpba.2017.07.042

Recent advances in design of electrochemical affinity biosensors for low level detection of cancer protein biomarkers using nanomaterial-assisted signal enhancement strategies

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Highlights

- Control and early diagnosis of cancer via low level detection of tumor markers in biological samples.
- Design of electrochemical affinity biosensors for low level detection of cancer protein biomarkers.
- Application of nanomaterial-assisted signal enhancement strategy.
- Use of antibodies, aptamers, lectins and peptides as biorecognition probes.
- Cancer biomarkers: AFP, APT, CA125, CA15-3, CA19-9, CEA, HE4, HER2, ILs, MUC 1, PDGF, PSA, SCC-Ag, TNF-α, VEGF165.

ABSTRACT

The main advances in control and early diagnosis of cancer is greatly aided by low level detection of tumor markers in biological samples. Extensive efforts have been devoted to developing some ultrasensitive electrochemical biosensors for detection of cancer markers with high selectivity. These efforts include the development of the bioreceptors with high specificity and affinity, synthesis of novel signal amplifiers based on nanomaterials and the exploration of appropriate design strategies. Electrochemical measurement protocols are suitable for mass fabrication of miniaturized devices. They have a major role in the move towards rapid and simplified testing for point-of-care usage. This review discusses the remarkable advances of the last 6 years in the electrochemical affinity biosensors for determination of protein and glycoprotein tumor markers, with a particular focus on antibodies and aptamers as biorecognition probes.