RATIOMETRIC OPTICAL VISUAL IMMUNOSENSOR BASED ON QUANTUM DOTS FOR CA 19-9 PROTEIN DETECTION

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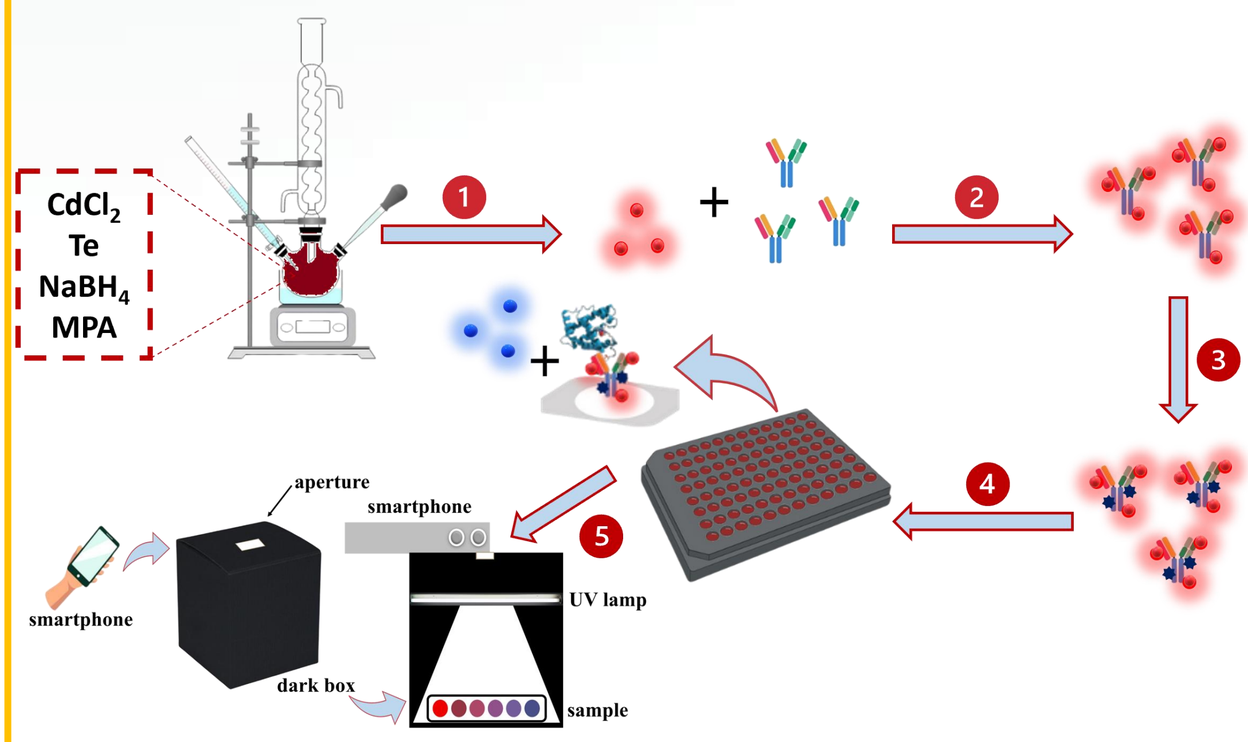
INTRODUCTION

Cancer is a global health challenge, where early detection is crucial to increasing survival rates [1]. Non-invasive, rapid, and affordable diagnostic methods are urgently needed. Immunosensors emerge as promising alternatives to traditional methods such as ELISA, allowing point-of-care (PoC) analyses [2]. This study aims to develop a highly sensitive and selective optical immunosensor for detecting CA 19-9. The results demonstrate successful detection of CA 19-9 over a wide concentration range from **1.77 to 501.87 U mL^{-1}** in 1000-fold diluted human serum in just 10 minutes, with high precision. This device offers rapid, sensitive, and affordable detection, making it suitable for clinical PoC applications.

METHODOLOGY



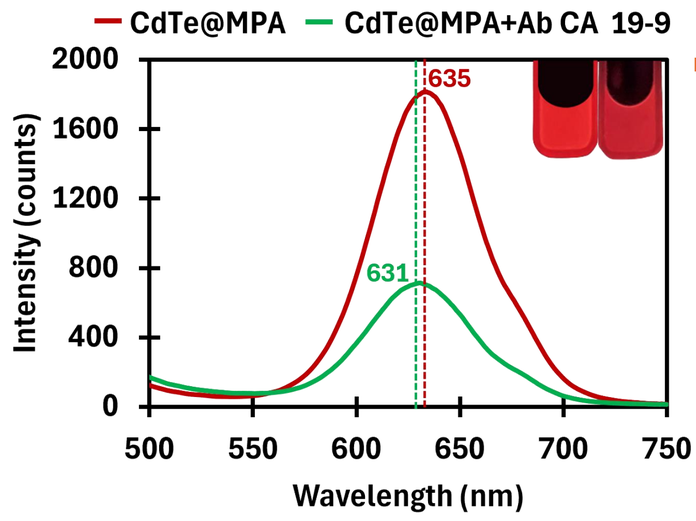
Schematic representation of the synthesis and preparation of QD conjugates involves **(1) QD Synthesis**: Creating QD nanoparticles; **(2) Covalent Bond Formation:** Linking carboxylic groups on QDs to amine groups on antibodies via EDAC/NHS reaction; **(3) Blocking:** Blocking unbound sites to prevent non-specific binding; **(4) Binding:** QD conjugates bind to the CA 19-9 protein; **(5)** Acquisition of immunosensor performance.

GENERAL CONSIDERATIONS

- **The immunosensor developed showed good analytical performance.**
- **Linear response range of the immunosensor: 1.77 to 501.9 U mL^{-1}.**
- **Effective tool for screening cancer biomarkers in PoC tests.**

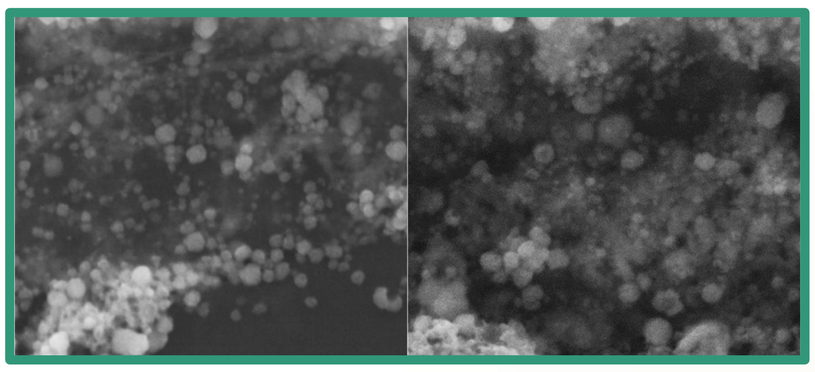
RESULTS

Fluorescence assembly of the Ab CA 19-9 immunosensor



- **Emission spectra of CdTe@MPA QDs and CA 19-9 antibody conjugates were measured at 300 PMT voltage and 420 nm excitation.**

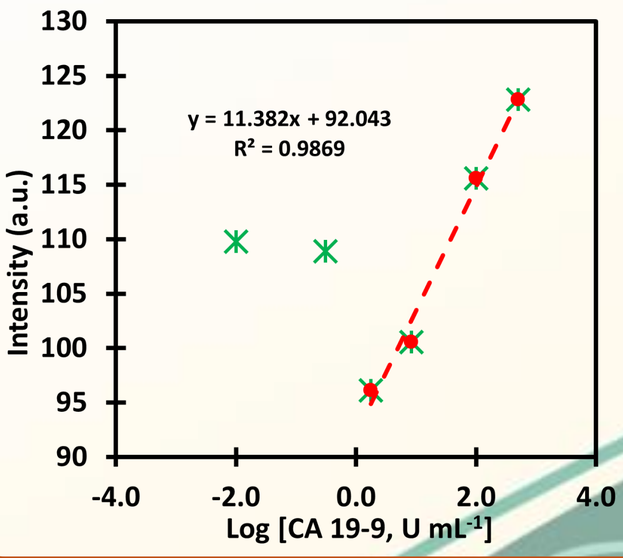
Surface QD conjugates modification characterization



- **SEM image of red-emitting CdTe@MPA QDs conjugates.**

Analytical performance of the immunosensor

- **Photographs of the fluorescence sensor showing color change in the presence of CA19-9.**



- **Good response over the concentration range of 1.77 – 501.9 U mL^{-1}.**
- **Higher sensitivity.**
- **Improved linearity.**

REFERENCES

[1]. Griffin, S., 2017, S&T's Peer to Peer: Vol.1, Iss.2.
[2]. Sarhadi, V. K., Armengol, G., 2022, Biomolecules, 12 (8), 1021.

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