

Gold Nanoparticles for ELISA applications



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The application of AuNPs to the commercially available ELISA test can be useful to improve important immunoanalysis procedures where a more confident result is needed.

SITUATION

Important medical decisions are made in relation to **biomarker analysis results**. Tumor markers are substances, most often proteins that can be found in the blood or urine when cancer is present. CA 15-3 is a glycoprotein mainly used to watch patients with **breast cancer**. Elevated blood levels are found in less than 10% of patients.

A more accurate analytical procedure should be developed in order to avoid misjudgements.

APPROACH

Gold nanoparticles (AuNPs) can be easily synthesized; simple biofunctionalization procedures are available and, therefore, represent an **interesting solution to improve ELISA kits** improving analytical performances without increasing significantly the complexity of the procedure.

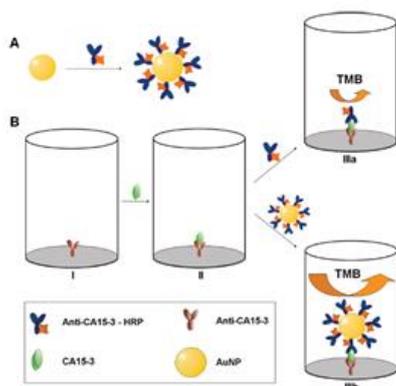


Figure 1_Schematic (not in scale) of (A) the preparation of the complex Au-anti-CA15-3-HRP and (B) the sandwich-type ELISA procedure without (IIIa) and with (IIIb) the application of AuNPs as the signal enhancer.

AuNPs can be used as a **multienzyme carrier** to the enzyme based immunoassay for the detection of CA15-3 breast cancer biomarker. The use of AuNPs allows the attachment of a multiple enzyme system which can generate an amplified optical signal, while keeping low background signals.

RESULTS

Real human blood serum dilutions were analyzed using both the classical ELISA procedure, without the use of AuNPs as enhancers, and the ELISA procedure using the Au-anti-CA15-3-HRP nanobioconjugate as a signaling tag.

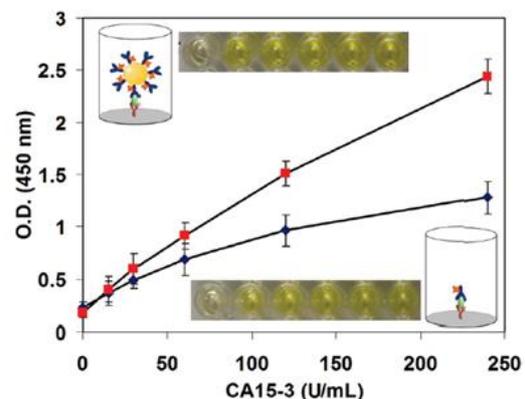


Figure 2_ELISA test performed in the presence (red) and absence (blue) of AuNPs.

Using AuNPs as enhancers resulted in:

- ◆ Almost 2x sensitivity
- ◆ Less incubation time (5 min vs 30 min)
- ◆ Higher inter- and intra-assay precision

Gold nanoparticles could be used to improve the sensitivities, lower the detection limits, and also shorten the assay time for all the assays