Electrochemical Immunosensor for the determination of Human IgA in real serum samples

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Introduction

Immunoglobulin A (IgA) deficiency is the most common immunodeficiency among healthy individuals, values of IgA from ca. 1 mg/mL and above are considered as a normal concentration; IgA levels below 50 to 70 μg/mL are considered to be indicative of a global immunodeficiency.

Coeliac disease (CD), gluten-sensitive enteropathy, is an autoimmune disorder of the upper small intestine that is triggered from the gluten ingestion (cereal protein that can be found in wheat, rye and barley) and affects 1% of the population around the globe. Approximately 2-3% of coeliac patients are Immunoglobulin A (IgA) deficient, which are known to produce false negative IgA tTG results, for this reason, it is recommended that serum IgA levels be measured in those individuals at a higher risk of the disease.

Methodology

1. DT2 self assembly 3 hours on a clean gold surface
2. Anti-IgA covalent attachment
3. Standard Human IgA Antibodies
4. HRP Labeled secondary antibody

Amperometric detection

- The anti-rabbit antibody labeled with horse radish peroxidase (HRP) is used to catalyze the oxidation & reduction of the hydrogen peroxide/TMB (substrate & mediator); the amplification of the signal can be recorded electrochemically by reducing the oxidized TMB and recording the signal.

Results

1. Amperometric calibration plot using IgA antibodies from human sera
2. Matrix interference amperometric plot, using IgA antibodies in Fetal bovine serum solution (FBS)
3. Electrochemistry dilution curves for the linear range determination
4. ELISA dilution curves for the linear range determination
5. Coeliac disease patients sera
6. Coeliac disease patients sera

Conclusion

The dithiol SAM based electrochemical immunosensor described in this work has been investigated and optimized by amperometric method, indicative of the robustness and sensitivity of the achieved assay. The behaviour of the electrochemical immunosensor matched the performance of classical ELISA methods not only in the capability to quantitatively determine IgA contents from real serum samples, but also allowing the testing of different concentration range samples simply by ensuring the sensor is working within a broad linear range, like in the case of ELISA methodology.

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