



Abstract

Electrochemical Immunosensor for Simultaneous Determination of Emerging Autoimmune Disease Biomarkers in Human Serum [†]

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Abstract: Rheumatoid arthritis is an autoimmune disorder characterized by persistent erosive synovitis, systemic inflammation and the presence of autoantibodies, which play an important role in inducing inflammation and joint damage, releasing pro-inflammatory cytokines from monocytes and macrophages [1,2]. Likewise, neutrophil activating protein-2 (CXCL7) is a platelet-derived growth factor belonging to the CXC chemokine subfamily, which is expressed in serum, synovial fluid and synovial tissue of patients developing rheumatoid arthritis during the first twelve weeks, being useful to reflect local pathological changes [3]. Besides, matrix metalloproteinase-3 (MMP-3), which is induced by inflammatory cytokines such as interleukin-1 (IL-1) and tumor necrosis factor alpha (TNF- α) in rheumatoid synovium, degrades several extracellular matrix components of cartilage and plays central roles in rheumatoid joint destruction [4]. Therefore, monitoring serum CXCL7 and MMP-3 levels is useful for predicting the disease activity in rheumatoid arthritis. In this work, the construction and analytical performance of a dual electrochemical platform for the simultaneous determination of CXCL7 and MMP-3 is described. After the optimization of experimental variables involved in the preparation and implementation of the biosensor, the analytical usefulness of the developed configuration was demonstrated by its application to the determination of these biomarkers in serum samples from healthy individuals and patients with rheumatoid arthritis. To carry out the simultaneous determination of CXCL7 and MMP3 in human serum, just a fifty-fold sample dilution in PBS of pH 7.4 was required. In addition, the results obtained using the dual immunosensor were compared with those provided by the respective ELISA immunoassays, yielding no significant differences between the two methods. It is important to highlight that reagents consumption, four times smaller using the dual immunosensor than that required in the ELISA protocol, and an assay time of 2 h 50 min versus almost 5 h, counted in both cases after incubation of the capture antibody, are advantageous features of the dual immunosensor [5].

Keywords: rheumatoid arthritis; CXCL7; MMP-3; immunosensor; simultaneous determination; human serum samples



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