Assay conditions improvement for electrochemical lateral flow assay for CRP quantification

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Lateral flow devices (LFD) are part of the diagnostic toolset that enables point-of-care (POC) testing and aims at allowing any individual to perform an affordable medical test in a short amount of time and without specialized equipment. Most LFDs are based on nanoparticle labels and are primarily used for qualitative tests via visual inspection (e.g. pregnancy tests). By taking advantage of technological advances in sensing technology, some progress has been made to apply LFDs also for quantitative results.

Our approach for a quantitative LFD is based on electrochemistry, where a measurable current is generated by using an enzyme-labelled conjugate followed by a locally electrically induced oxidation. In this context, we have studied some of the most crucial points included in the effort-, time-, and cost-intensive development of a quantitative POC LFD.

Some of these points involve an optimal composition and preparation of the conjugate, a well thought geometry and disposition of the LFD elements, and the setup of a proper and accurate sensing interface. Improving these parameters directly impacts the assay performance and, thus, all represents paramount steps during the realization of high quality quantitative LFDs.

In the end, the results gave a better insight into the mechanisms governing our electrochemical LFD approach and provided improvements regarding the concentration dependence of the signal for a quantitative C-reactive protein (CRP) LFD.