High-speed Hazelnut Lateral Flow Immunoassay Prototyping from Surface Plasmon Resonance.

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Abstract

Lateral flow immunoassays (LFIA) allow for rapid, low-cost, screening of many biomolecules such as food allergens. As LFIA rely on the interaction between an antibody and its target antigen, it is critical to select antibodies with high specificity, speed and sensitivity. Despite being classified as rapid tests, the majority of LFIA's still take 10-20 minutes to carry out. In order to have a really high-speed LFIA it is necessary to assess antibodies association kinetics. By using a label free optical technique such as surface plasmon resonance (SPR), it is possible to screen crude monoclonal antibody (mAb) preparations for their association rates against a target compound. This saves time and money compared with first purifying the whole panel of antibodies before testing. Herein, we describe an SPR based method for screening crude anti-hazelnut antibodies for their association rates, for application as bio-recognition elements in high-speed LFIA. Additional SPR methods were developed for cross-reactivity testing and pairwise selection of sandwich pairs for application in high-speed LFIA. Applying these methods, it was possible to select two sets of antibody pairs, based on their kinetics, to compare in sandwich format LFIA. Following purification of only these two mAbs, two carbon nanoparticle labelled LFIAs have been developed, one using the antibody pair that the SPR experiments selected as the fast antibody (50-6B12) for a high speed LFIA and one using a slower antibody (50-5H9) pair. The antibody kinetics observed in SPR were confirmed in LFIA, with the formation of the test line appearing in a smartphone video recording at 30 seconds for 50-6B12 and at 52 seconds for 50-5H9. Additionally, the LFIA's have demonstrated

their ability to detect hazelnut traces in a matrix extract of a cookie, exemplifying their future applicability to real life samples. These LFIA's provide a qualitative result when read visually, or (semi)quantitatively with a freely downloadable smartphone apps.

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