Design and fabrication of microarray-based lateral flow immunoassay.

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Lateral flow immunoassay (LFIA) is one of the most complete biosensing platforms on the market today, allowing the detection of target analytes in extremely short times at the point of interest at a highly competitive price [1]. These features have been the key to LFIA becoming the analytical method of choice for monitoring the recent covid-19 pandemic [2]. Although improvements in analytical sensitivity, multiplexing, and quantification have been addressed in recent years through the use of nanomaterials with outstanding properties [3], one of the aspects that remain to be resolved is the amount of information that the end user receives once the assay has been performed. For instance, in most cases, the LFIA consists of a two-line format (test line and control line) and the end user must check for the presence of a signal in both lines to determine whether the assay is positive. However, the generation of faint bands due to the sample's matrix effect, the hook effect [4], or poor execution of the test usually difficult the result interpretation. Therefore, in this tutorial lecture, we will introduce the LFIA with microarray layout, as a strategy to integrate up to 36 assays in a very small area of the detection zone of a single LFIA strip. These consist of assay replicates, internal signal calibrators, and positive, negative and hook effect control assays **(Figure 1)**. Fundamental aspects of the design and fabrication of the microarray-based LFIA will be addressed, emphasizing the importance of immobilizing each element in the right place within the microarray to boost its functionality. Finally, a demonstration of the simultaneous quantification of almond and peanut allergens in a snack bar using the proposed LFIA will be performed.

References

[1] Parolo C., et al., Nat Prot., 15 (2020) 3788–3816.
[2] Weiss C., et al., ACS Nano, 14 (2020) 6383–6406.
[3] Sena A., et al., PhD Thesis, Universitat Autònoma de Barcelona (2020).
[4] Ross G.M.S., et al., Anal Chem., 92 (2020) 15587–15595.

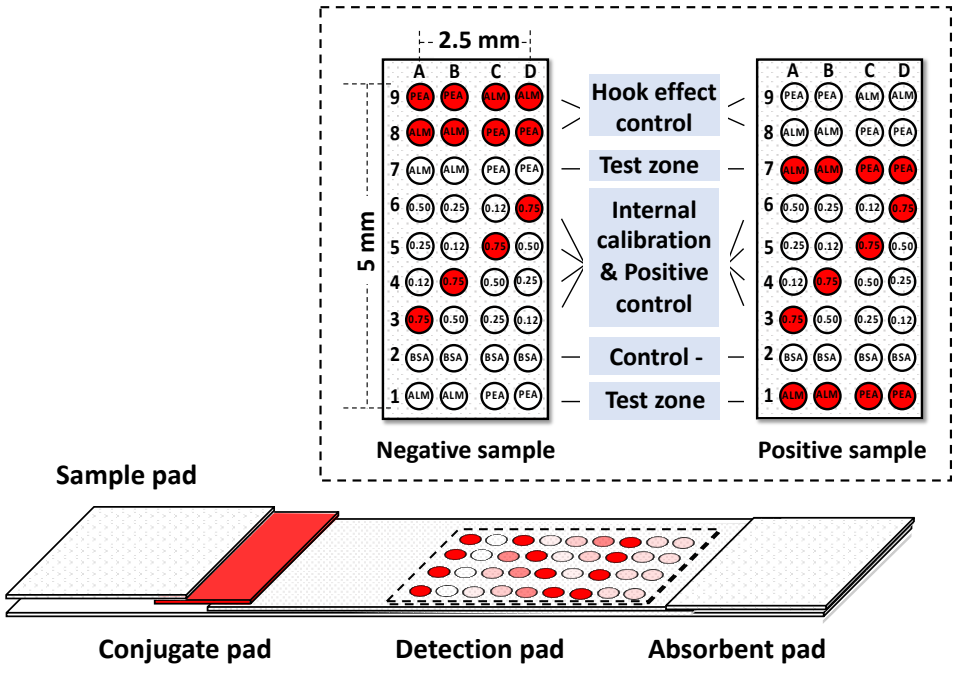

Figure 1: Schematic representation of the microarray-based lateral flow immunoassay using AuNPs as colorimetric reporters for the simultaneous quantification of almond and peanut allergens.