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STAPHYLOCOCCAL PROTEIN A AS POWERFUL AND VERSATILE KEY PLAYER FOR PAPER-BASED BIOSENSORS DEVELOPMENT

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In the last decades, the huge need to perform analytical tests outside of the laboratory caused the exponential diffusion of the so-called "point-of-use" tests. These tests must be portable, affordable, user-friendly and allow to perform the analysis directly *in situ*.
Among these systems, the paper-based biosensor, also known as Lateral Flow Assay (LFA), has become one of the most successful analytical format for point-of-use testing.
The lateral flow assay technology is also very versatile as combines a number of variants such as test formats, recognition elements, signal reporters, and detection systems. All these features make LFA particularly attracting for different fields, including clinical, veterinary, food safety, forensic and environmental analysis [1].
Most existing LFAs exploit the unique properties of the antigen-antibody interaction to enable high sensitive and selective analysis. The most popular detection is the visual one based on colored probes, and colloidal gold nanoparticles (GNPs) are the most widely employed probes in color-based lateral flow assays [1-3].
A critical point for the successful development of a visual paper-based biosensor is to obtain a stable and efficient labelled conjugate between antibodies (Ab) and GNPs.
Since proteins - and particularly, immunoglobulins (IgG) - spontaneously adhere to the surface of GNPs capped by citrate through several types of non-covalent interactions [4], the direct adsorption of antibodies onto citrate-capped GNPs is the most commonly used method to prepare GNP-Ab probes. As a consequence, the analytical antibodies are randomly adsorbed onto GNPs and it has been estimated that only ca. 25 % of the passively adsorbed antibodies are able to bind the antigen [5].
A more efficient GNP-Ab conjugate can be obtained through the use of a binding mediator between GNPs and analytical antibodies themselves.
Staphylococcal protein A (SpA) is a high stable surface receptor with a molecular weight of 42 kDa. It is known that SpA is able to bind IgG from several mammalian species, with high affinity for the Fragment crystallizable portion of IgG. Therefore, the use of SpA as biochemical mediator allows to suitably orientate the specific antibody, yielding to a highly active probe (more than 90% of the antibodies bound through protein A are available for the binding [5]).
Moreover, it is possible to use the SpA as recognition element in point of care diagnostics for infectious diseases, where the goal is to detect the Immunoglobulins [6].
We exploited the affinity-based binding properties of the SpA for the development of robust and versatile paper-based biosensors. In this communication, the results of the study will be discussed pointing out the major advantages and drawbacks.

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