Designing and reading magnetic lateral flow strips for point-of-use food and clinical applications

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Point-of-care devices are desired for multiple bio-applications ranging from medical screenings in the health centre, urgent diagnosis by the first responders to in situ industrial bio-analysis (point-of-use). The primary needs to accomplish are portability, rapidity, and low cost.

Lateral flow immunoassays (LFI) in nitrocellulose strips meet those conditions and can be made quantitative and precise if the goal bio-analyte is labelled by magnetic nanoparticles. In this work we report magnetic LFI for histamine detection in liquids and a portable reader [1] to quantify in the range of interest for wine tests.

Histamine is produced during the fermentation process of wine (and other food products) [2,3]. The ingestion of histamine above certain levels may cause serious toxicological problems. For this reason, it is very interesting to set a rapid and inexpensive method for the detection and quantification of histamine in wineries.

Figure 1 schematises the development of the test in competitive format: (a) The sample containing histamine is mixed up with anti-histamine antibody and deposited at one end of the nitrocellulose strip, along which it flows by capillarity; (b) The free antibodies in the sample occupy sites in the test line; (c) Protein G-nanoparticle conjugates get attached to the antibodies in the test line, providing a signal which is inversely proportional to the amount of histamine in the original sample; (d) LFI strips for different concentration of histamine (increasing from left to right).

These magnetic tests can be also applied in the clinical field as diagnostic tool. With this purpose, sandwich immunoassays at the tests strips have been developed for detection of Prostate Specific Antigen (biomarker of prostate cancer) and troponine (biomarker of cardiac diseases). The magnetic sensor developed in this work was applied for quantification.

References

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Figures

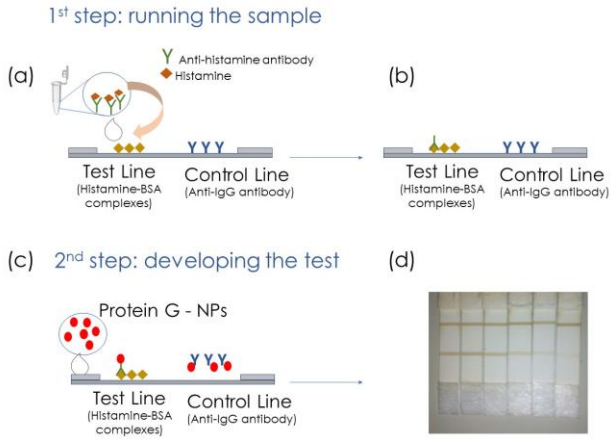

Figure 1: Competitive lateral flow immunoassay (LFI) for histamine detection.