BIOFUNCTIONALITATION OF MAGNETIC NANOPARTICLES FOR INMUNOMAGNETIC BIOSENSORS

S. Puertas, V. Grazú, M. Moros, M. Arruebo, J.M. de Teresa, J. Sesé, C. Marquina, R. Ibarra, J.M. de la Fuente

Universidad de Zaragoza, Instituto de Nanociencia de Aragón (INA)
C/Pedro Cerbuna 12,50009,Zaragoza, Spain
selmer@unizar.es

Lateral-flow biosensors are well known strategies for the detection of specific analytes. One of the most common lateral flow biosensor is the pregnancy test. Lateral-flow assays consist of a nitrocellulose membrane with micrometric pores allowing the flow of liquid via capillarity. In this support, a biological recognition agent is previously deposited in the test line and traps the targeted analyte if present in the flowing liquid. The biological recognition events are labelled with colloidal particles giving identifiable colour the test line when the test is positive. The test is considered positive when the amount of analyte is large enough so that the labelling colloidal particles can be detected by eye view. However, this kind of tests does not allow the quantification of the analyte.

For the last 30 years, there is a growing interest in the use of magnetic nanoparticles for application in quantitative and highly-sensitive biosensors. The use of them as labels of the biological recognition events and their detection by means of some magnetic methods makes one way to realize quantitative high-sensitive lateral-flow assays.

We present here different approaches for the functionalization of magnetic nanoparticles with specific antibodies for their use in immunomagnetic biosensors based on lateral-flow assays. Our analyte model is the human chorionic gonadotropin hormone (hCG) produced during pregnancy. Different types of commercial available magnetic nanoparticles with a mean diameter around 200 nm have been chosen. Depending on the strategy used, we can get a perfect control in the presentation of the antibody (IgG anti-hCG) on the surface of the nanoparticles. The sensitivity of the biosensor has been increased by one order of magnitude when the antibodies are right oriented on the nanoparticle. With these results, we show the importance of the antibodies immobilization for the right molecular recognition in biosensing assays.

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References:

[1] De Teresa J.M., Grazú V., Moros M., et al. Biosensors and Bioelectronics.Submitted
[2] Fuentes M., Mateo C., Guisán J.M., Fernández-Lafuente R., 2005. Biosensors and Bioelectronics 20, 1380-1387.
[3] Turkova J., 1999. J. Chromatogr. B 722,11-31.

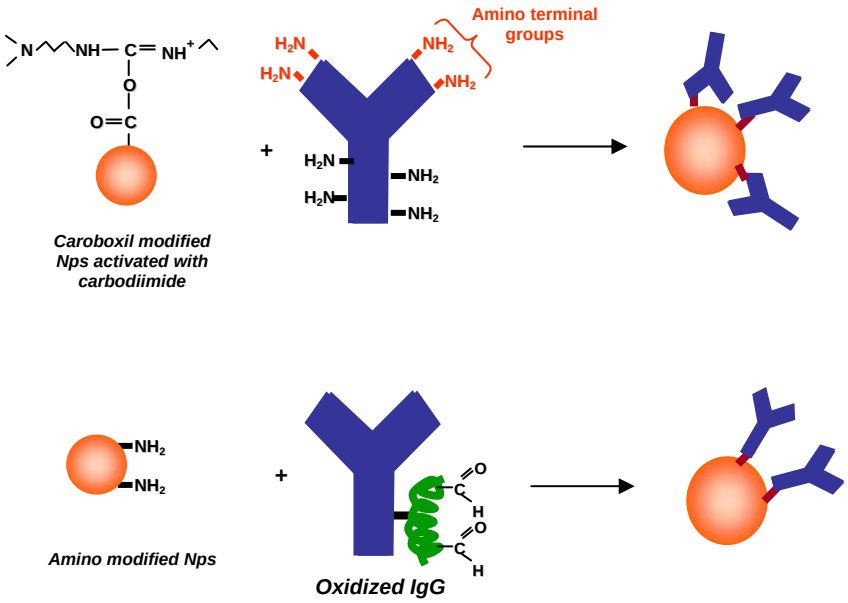

Figure 1. Inmobilization strategies.

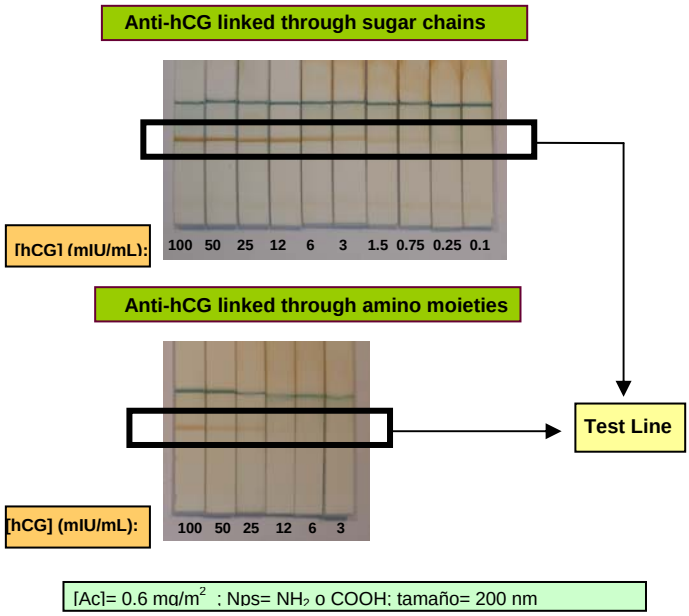

Figure 2. Lateral-flow assay results using different antibodies immobilization strategies.