Lateral flow assays for on-farm bovine veterinary monitoring

Helena Torné-Morató[1,2]
Vinay Tripathi[1], Pier Paolo Pompa[1]
1. Nanobiointeractions & Nanodiagnostics, Center for Convergent Technologies, Istituto Italiano di Tecnologia, Via Morego 30, 16163 Genova, Italy
2. Department of Chemistry and Industrial Chemistry, University of Genova, Via Dodecaneso 31, 16146 Genova, Italy
helena.tornemorato@iit.it

Abstract

Accurate supervision of animal health and livestock management have a high impact on the productivity of meat and dairy industry. Thus, the development of Point-of-care (POC) diagnostic devices is highly demanded to bring the accuracy of molecular diagnosis into the farm. Lateral flow assay (LFA) is a popular POC test thanks to its user-friendly, time- and cost-effective design.[1] Gold nanoparticles (AuNPs) have been widely used as LFA labels by virtue of their plasmonic properties, which allow for naked-eye assessment of the test result. Herein, we developed two independent lateral flow immunoassays to enhance the ability of farmers and veterinaries to monitor two relevant veterinary parameters in cattle farming. The first test is a competitive immunoassay, to detect the level of progesterone. In the exact time window of bovine estrous, which is the optimal time for a successful insemination, the level of progesterone in blood is lower than 2 ng/mL.[2] On the other side, bovine mastitis is the inflammation of the udder due to infection or trauma. It is a disease with one of the highest economic impacts on the dairy industry. Hence, the second device classifies udder health in three levels: healthy, subclinical mastitis, and clinical mastitis. The test is based on a multiplexing strategy, targeting two biomarkers present in milk: haptoglobin and bovine immunoglobulin G. Haptoglobin is an acute phase-protein, and its concentration in milk increases hours after infection, which makes it suitable as early biomarker.[3] Immunoglobulin G is a convenient late biomarker, because its concentration increases during the secondary inflammatory stage of the disease.[4] Both in the devices were validated with their respective biological matrices. Finally, to assess the two devices' performances, an extensive on-farm validation is underway with real cow's blood and milk samples.

References

[1] Land, K. J., et al., Nature Microbiology, 4 (2019) 46–54.
[2] Wettemann, R. P., et al., Animal Science Journal, 34(6) (1972) 1020–1024.
[3] Hiss, S., et al., Journal of Dairy Science, 87(11) (2004) 3778–3784.
[4] Lehmann, M., et al., Journal of Dairy Science, 82(2) (2015) 129-134.

Figure

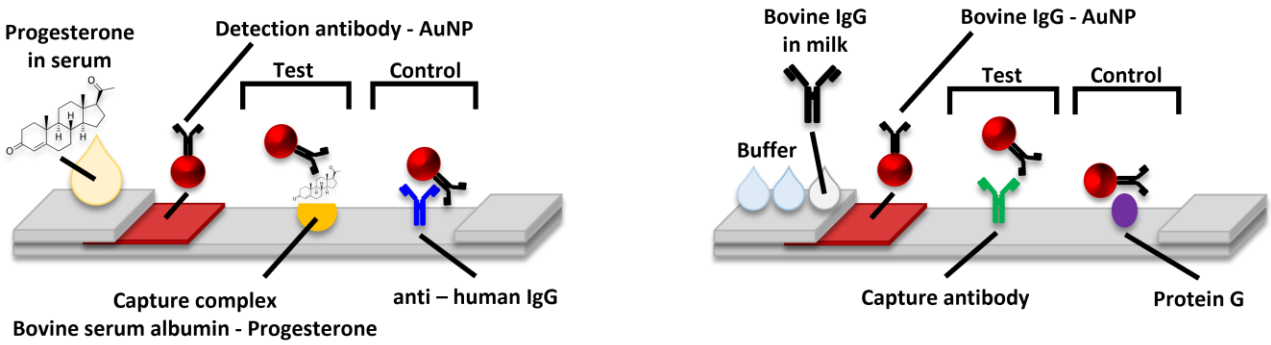

Figure 1: Lateral flow assays detection schemes for estrous determination in serum (left) and inflammatory latte mastitis phase detection in milk (right).