

ImmunoCAP - An Electrochemical Immunosensor for Bovine Progesterone Assessment

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Abstract

Profitability in the dairy industry is heavily dependent on the accuracy of progesterone (P4) measurement, with periodic assessment of hormone levels in herds being utilised to determine the most fertile ovulation time for artificial insemination [1]. Point of care and in-line instruments, coupling ELISA techniques with electrochemical detection have been explored in order to quantify P4 in bovine milk and serum [2], yet practical implementation of a sensitive, rapid, low cost test remains a technical challenge. The Immuno-CAP device proposed here may be described as a micro-capillary biosensor incorporating a thin-layer mesofluidic system involving rapid flow immunochromatography with electrochemical detection based on the redox activity of nanogold (AuNP) - the signalling element of a competitive ELISA format. Competition between P4 in the sample and AuNP labelled P4 for binding sites on the internal wall of the anti-P4 antibody coated capillary facilitates electrochemical detection of AuNP reaching the electrode which is in turn related to the free P4 concentration in the milk sample (Fig. 1).

Figure 1

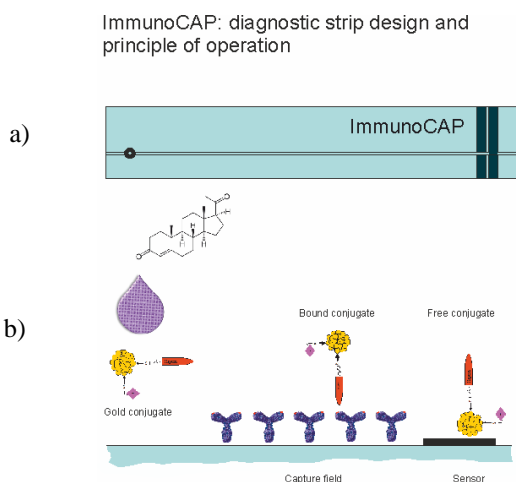


Fig. 1. a) Schematic representation of immunocapillary device (ImmunoCAP) illustrating the structure of a single-channel device (device dimensions 85 x 15 mm, channel L 74 mm, W 1 mm and D 0.16 mm **b)** exploded view of detection mechanism following the competitive immunoassay protocol for progesterone.

References

[1] Audrey Chanvallon, Stéphanie Coyral-Castel, Julie Gatién, Jean-Michel Lamy, Daniéle Ribaud, Clément Allain, Pierre Clément, Pascal Salvetti, *Theriogenology*, **82** (2014) 734–741.

[2] J.V. Samsonova, V.A. Safronova, A.P. Osipov, *Talanta*, **132** (2015) 685–689.