Gold on Paper – Paper platform for Au-nanoprobe TB detection

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Abstract

Tuberculosis (TB) remains one of the most serious infectious diseases in the world and according to the World Health Organisation is responsible for 1.1 million deaths and 8.8 million new cases in 2010 alone[1].

The development of cheap and simple methodologies capable of identifying TB causing agents belonging to the *Mycobacterium tuberculosis* Complex (MTBC) is of paramount relevance for the timely and effective diagnosis and management of patients. Diagnostics at point-of-need is crucial to TB control as the rapid identification and pathogen characterisation may allow getting patients immediately onto treatment that is vital in addressing this pandemic[2].

Here, we report on the integration of a colorimetric Au-nanoprobe assay with a paper-platform that allows colour development and a simple data analysis tool capable of specific detection of MTBC members – we call it "Gold on Paper". The Au-nanoprobe assay is processed and developed on a wax-printed microplate paper platform, allowing unequivocal identification of MTBC members and can be performed without specialised laboratory equipment. Upon integration of this Au-nanoprobe colorimetric assay onto the 384-microplate, differential colour scrutiny may be captured and analysed with a generic "Smartphone" device. This strategy uses the mobile device to digitalise the intensity of colour associated with each colorimetric assay, perform RGB analysis and transfer relevant information to an off-site lab, thus allowing for efficient diagnostics. Integration of GPS location metadata of every test image may add a new dimension of information, allowing for real-time epidemiologic data on MTBC identification. This approach combines the use of inexpensive paper-based platforms and digital image analysis to screen for relevant analytes. This concept makes use of quantitative colorimetric correlations using mobile cameras to digitalise results allowing the measurement of colour intensity[3-5].

References

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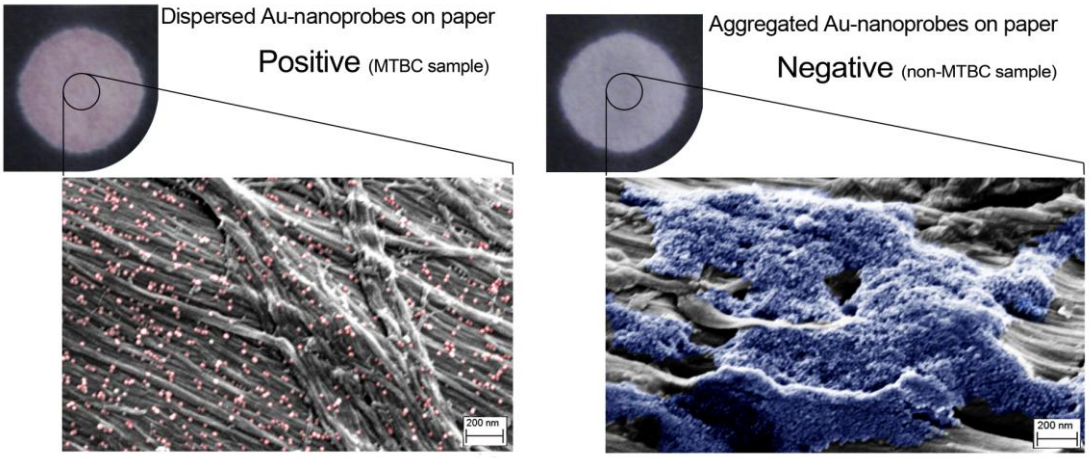

Figure 1: ***Gold on Paper*** **molecular diagnostics.** SEM imaging following the detection assay. Photo of detection on each well together with SEM image capture after detection procedure. LEFT) identification of a positive sample for *M. tuberculosis* complex (MTBC) showing the typical red colour on the spot. SEM image showing non-aggregated Au-nanoprobes; RIGHT) Negative sample (non-MTBC DNA). SEM shows the extent of Au-nanoprobe aggregation on paper.