

Portable device for influenza virus detection using GMR sensor

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Key points:

- Portable, hand held device for detection of influenza A virus (IAV) based on giant magnetoresistance (GMR) biosensor has been developed
- Although in its developmental stage, if successful this test has the potential for rapid on-site testing of influenza viruses in swine.

Our objective:

To develop portable diagnostic platform that is capable of performing on site testing of influenza viruses in swine with minimum sample handling and laboratory skill requirements

Our approach:

Recently we have developed a simple and sensitive method for the detection of IAV based on GMR biosensor. Here we report further improvements to this method by integrating into portable, hand-held diagnostic platform. The test has been developed using antibodies to IAV nucleoprotein (NP) and magnetic nanoparticles (MNPs). Influenza virus, if present in the sample, will cause MNPs bind to the GMR sensor through antibodies (Fig. 1 A) resulting in change in resistance, which transforms into an electrical signal. The real time electrical signal can be detected by portable, hand held system, which has smart-phone capabilities such as data processing, display, wireless communication and GPS location services (Fig 1B). Signals can be transmitted via Bluetooth to a smartphone, tablet and laptop or via USB connection to a desk top computer.

Findings:

- Using different concentrations of IAV H3N2v, which is expressed as 50% tissue culture infectious dose (TCID₅₀)/mL, we found the limit of detection (LOD) of this hand held platform is 125 TCID₅₀/mL (Fig 1C) and it is better than ELISA that had LOD of 250 TCID₅₀/mL
- This test achieved approximately 4 log dynamic range of detection showing increase in signal with increase in virus concentration from 1.25 x10² to 1.0 x 10⁵ TCID₅₀/mL.

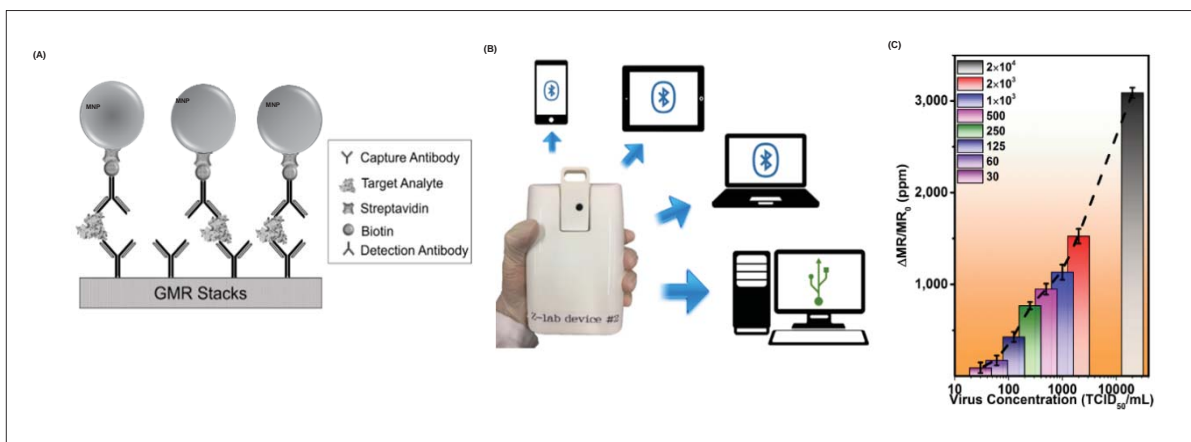


Figure 1: (A) Schematic illustration of magnetic sandwich assay for influenza A virus detection. (B) Portable, hand-held device. (C) Signals from 50µL of different concentrations of influenza A virus H3N2v.