Detection of Avian Influenza Virus by Fluorescent DNA Barcode-based Immunoassay with Sensitivity Comparable to PCR

In this paper, a coupling of fluorophore-DNA barcode and bead-based immunoassay for detecting avian influenza virus (AIV) with PCR-like sensitivity is reported. The assay is based on the use of sandwich immunoassay and fluorophore-tagged oligonucleotides as representative barcodes. The detection involves the sandwiching of the target AIV between magnetic immunoprobes and barcode-carrying immunoprobes. Because each barcode-carrying immunoprobe is functionalized with a multitude of fluorophore-DNA barcode strands, many DNA barcodes are released for each positive binding event resulting in amplification of the signal. Using an inactivated H16N3 AIV as a model, a linear response over five orders of magnitude was obtained, and the sensitivity of the detection was comparable to conventional RT-PCR. Moreover, the entire detection required less than 2 hr. The results indicate that the method has great potential as an alternative for surveillance of epidemic outbreaks caused by AIV, other viruses and microorganisms.

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