Antibody conjugated magnetic nanoparticles in agglutination assay for dengue biomarker detection

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Dengue fever is a mosquito borne viral infection affecting billions living in the tropical parts of the world [1]. To tackle the spread of dengue at the community level, proper course of testing and treatment is necessary. Early diagnosis for the disease can be of important clinical care, surveillance of an outbreak, academic research etc. [2]. Rapid Diagnostic Tests (RDT) have been instrumental regarding speed of testing and usability. However, RDTs have drawbacks in terms of sensitivity, and it does not provide information about the previous infections [3]. There is a need for developing a test, with speed of a RDT or screening test and high accuracy of a laboratory test like ELISA. We present, a novel agglutination based optomagnetic assay for the detection of Dengue fever biomarkers [5]. Magnetic nanoparticles (MNPs) are conjugated with a ligand specific to dengue virus, and agglutinate in the presence of Dengue virus like particles (DVLPs). The MNPs bind to the analyte and enable formation of MNP chains. A homogenous magnetic field is applied to speed up reaction kinetics o the agglutination. The chains rotate and align under a magnetic field, and in an alternating magnetic field the chains repeatedly align and modulate the intensity of the transmitted light (Figure 1A). MNPs were conjugated with Dengue antibody using carbodiimide reaction to demonstrate the detection of dengue fever biomarkers in solution. These conjugates were characterized using BCA assay to estimate the amount of ligand conjugated on the MNPs, DLS and tested in agglutination assay using DVLPs, to determine the limit of detection in the agglutination assay (Figure 1B). The conjugates demonstrate a dose-response behavior with increasing concentration of DVLPs and show a potential to be implemented in an assay with patient samples.

References

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[3] A Naz, et. al. Pakistan Journal of Medical Sciences (2014) – Vol. 30(1).

Figures

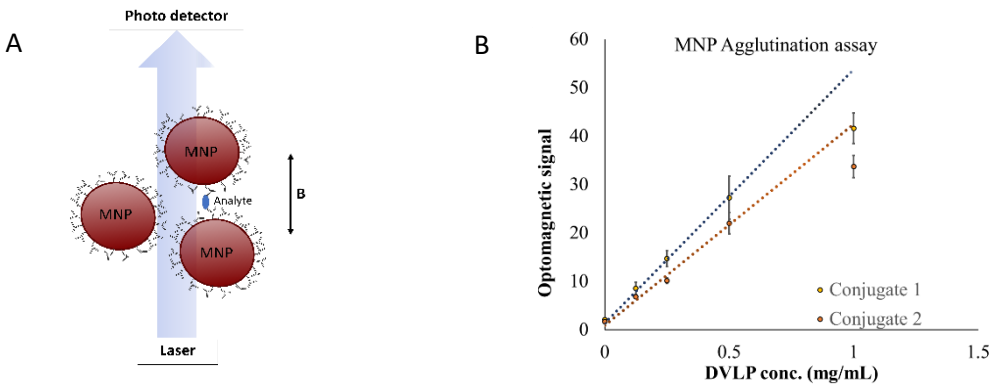

Figure 1. A) Sketch of optomagnetic detection of MNPs in a magnetic field and formation of MNPs chain in the presence of an analyte. **B**) optomagnetic signal versus DLVP concentration for two different conjugates. Error bars are calculated from 3 replicates. Lines are linear fit for concentrations below 1 mg/ml. Further DLS was performed to obtain hydrodynamic size. The conjugate -1 has a hydrodynamic size of 186.8 ± 1.5 nm and conjugate – 2 169.2 ± 0.3 nm.