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Enhancing erythrocyte–influenza virus specificity by glycan-conjugated gold nanoparticle: Validation of hemagglutination by aptamer and neuraminidases

Abstract

This study demonstrated the terminated sialo-sugar chains (Neu5Acα2,6Gal and Neu5Acα2,3Gal)-mediated specificity enhancement of influenza virus and chicken red blood cell (RBC) by hemagglutination assay. These glycan chains were immobilized on the gold nanoparticle (GNP) to withhold the higher numbers. With the preliminary optimization, a clear button formation with 0.5% RBC was visualized. On the other hand, intact B/Tokio/53/99 with 750 nM hemagglutinin (HA) displayed a nice hemagglutination. The interference on the specificity of RBC and influenza virus was observed by anti-influenza aptamer at the concentration 31 nM; however, there is no hemagglutination prevention was noticed in the presence of complementary aptamer sequences. Spiking GNP-conjugated Neu5Acα2,6Gal or Neu5Acα2,3Gal or a mixture of these two to the reaction promoted the hemagglutination to 63-folds higher with 12 nM virus, whereas under the same condition the heat-inactivated viruses were lost the hemagglutination. Neuraminidases from Clostridium perfringens and Arthrobacter ureafaciens at 0.0025 neuraminidase units are able to abolish the hemagglutination. Other enzymes, Glycopeptidase F (Elizabethkingia meningoseptica) and Endoglycosidase H (Streptomyces plicatus) did not show the changes with agglutination. Obviously, sialyl-Gal-terminated glycan-conjugated GNP amendment has enhanced the specificity of erythrocyte–influenza virus and able to be controlled by aptamer or neuraminidases.

Keywords

Glycan; host-virus interaction; Nanoparticle; Surface antigen; Whole blood