Development of 6E3 antibody-mediated SERS immunoassay for drug-resistant influenza virus

Authors and Affiliations

Hyeran Kim\textsuperscript{a,1}, Hyunju Kang\textsuperscript{a,1}, Hye-Nan Kim\textsuperscript{a}, Hongki Kim\textsuperscript{a}, Jeong Moon\textsuperscript{a,b}, Kyeonghye Guk\textsuperscript{a}, Hwangseo Park\textsuperscript{c}, Dongeun Yong\textsuperscript{d}, Pan Kee Bae\textsuperscript{e}, Hyun Gyu Park\textsuperscript{b}, Eun-Kyung Lim\textsuperscript{a,f,*}, Taejoon Kang\textsuperscript{a,*}, Juyeon Jung\textsuperscript{a,f,*}

\textsuperscript{a}Bionanotechnology Research Center, Korea Research Institute of Bioscience and Biotechnology (KRIBB), 125 Gwahak-ro, Yuseong-gu, Daejeon, 34141, Republic of Korea
\textsuperscript{b}Department of Chemical and Biomolecular Engineering (BK 21+ Program), Korea Advanced Institute of Science and Technology (KAIST), 291 Daehak-ro, Yuseong-gu, Daejeon, 34141, Republic of Korea
\textsuperscript{c}Department of Bioscience and Biotechnology, Sejong University, 209 Neungdong-ro, Kwangjin-gu, Seoul, 05006, Republic of Korea
\textsuperscript{d}Department of Laboratory Medicine and Research Institute of Bacterial Resistance, Yonsei University College of Medicine, 50-1 Yonsei-ro, Seodaemun-gu, Seoul, 03722, Republic of Korea
\textsuperscript{e}BioNano Health Guard Research Center, 125 Gwahak-ro, Yuseong-gu, Daejeon, 34141, Republic of Korea
\textsuperscript{f}Department of Nanobiotechnology, KRIBB School of Biotechnology, University of Science and Technology (UST), 217 Gajeong-ro, Yuseong-gu, Daejeon, 34113, Republic of Korea
\textsuperscript{*Corresponding author.

Abstract

Influenza viruses are responsible for several pandemics and seasonal epidemics and pose a major public health threat. Even after a major outbreak, the emergence of drug-resistant influenza viruses can pose disease control problems. Here we report a novel 6E3 monoclonal antibody capable of recognizing and binding to the H275Y neuraminidase (NA) mutation, which has been associated with reduced susceptibility of influenza viruses to NA inhibitors. The 6E3 antibody had a $K_D$ of 72.74 μM for wild-type NA and 32.76 pM for H275Y NA, suggesting that it can identify drug-resistant pandemic H1N1 (pH1N1) influenza virus. Molecular modeling studies also suggest the high-affinity binding of this antibody to pH1N1 H275Y NA. This antibody was also subject to dot-blot, enzyme-linked immunosorbent assay, bare-eye detection, and lateral flow assay to demonstrate its specificity to drug-resistant pH1N1. Furthermore, it was immobilized on Au nanoplate and nanoparticles, enabling surface-enhanced Raman scattering (SERS)-based detection of the H275Y mutant pH1N1. Using 6E3 antibody-mediated SERS immunoassay, the drug-resistant influenza virus can be detected at a low concentration of $10^2$ plaque-forming units/mL. We also detected pH1N1 in human nasopharyngeal aspirate samples, suggesting that the 6E3-mediated SERS assay has the potential for diagnostic application. We anticipate that this newly developed antibody and SERS-based immunoassay will contribute to the diagnosis of drug-resistant influenza viruses and improve treatment strategies for influenza patients.
논문정보
- 형식: Research article
- 게재일: 2021년 09월 (BRIC 등록일 2021.08.10)
- 연구진: 국내연구진

Citing URL: https://www.ibric.org/myboard/read.php?Board=hbs_treatise&id=70992&ttype=0&idauthorid=8567

Copyright@BRIC. All rights reserved.