

International Research Center for Infectious Diseases

Department of Special Pathogens

高病原性感染症系

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The aim of this laboratory is to launch an interdisciplinary research platform to comprehensively understand the behavior of viruses from macroscale to microscale. COVID pandemic alarmed the importance of understanding viral transmissibility and spreading pathway. These knowledges are brought from epidemiology and public health (science at macroscale). Viral surveillance, molecular phylogenetic and bioinformatics provide information of the variant currently spreading (science at macroscale). "Science at mesoscale", the use of animal models and cell cultures, performing experiments, and assessing clinical data, provide the knowledge of viral pathogenicity, features and drug efficacy. When certain variants that are resistant to antivirals or vaccines emerged, the molecular mechanisms of actions should be understood. For that, the understanding based on structural biology is essential (science at micro scale). Our study will launch the platform to perform multiscale investigation of viruses.

1. Antiviral efficacy of SARS-CoV-2 variant-adapted vaccine

Kaku, Y.^{1,2}, Fujiwara, M.^{3,4}, Uriu, K.³, Yo, M. S.^{3,4}, Kawakubo, S.³, Ito, J.^{3,5}, Itoh, N.^{1,2,6}, Uwamino, Y.⁷, Saito, F.⁸, Satoh, H.⁹, The Genotype to Phenotype Japan (G2P-Japan) Consortium & Sato, K.^{3,4,5,10,11,12,13,14,15}
Humoral immunity after LP.8.1 monovalent vaccines against a broad range of SARS-CoV-2 variants including XEC, LP.8.1, NB.1.8.1, XFG, and BA.3.2. *Lancet Infect Dis.*, in press.

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After the emergence of SARS-CoV-2 Omicron variant at the end of 2021, Omicron has highly diverged into various sublineages: e.g., BA.5 in 2022, XBB.1.5 in 2023, JN.1 in 2024. Currently, several JN.1 subvariants including XEC, LP.8.1, NB.1.8.1 and XFG are circulating worldwide. Additionally, BA.3.2, a descendant of BA.3, has been spreading and exhibits profound immune evasion potential.

To prevent COVID-19, several countries including

Japan have continuously developed and approved variant-adapted vaccines: e.g., ancestral/BA.5 bivalent vaccine in 2023, XBB.1.5-based monovalent vaccine in 2023, JN.1-based monovalent vaccine in 2024 and LP.8.1-based monovalent vaccine in 2025. Furthermore, in Japan, XEC-based vaccines are also produced by the Japanese pharmaceutical companies.

Elucidating antiviral efficacy by variant-adapted vaccines is crucial to assessing vaccine effect in the human population and to considering more effective vaccine development. This year, we evaluated humoral antiviral immunity induced by the most recent COVID-19 vaccines, LP.8.1-adapted and XEC-adapted vaccines. Our results indicate that these vaccines induce an antiviral humoral immunity against JN.1 subvariants effectively as well as non-JN.1 subvariants including BA.3.2.

Publications

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