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Clinical technique sets new standard for speed in battle to prevent pandemic infection

A new diagnosis technique developed by researchers at the RIKEN Omics Science Center (OSC) has succeeded in detecting influenza virus infection in only 40 minutes and with one hundred times the sensitivity of conventional methods. Clinical research conducted in 2009 and 2010 confirms the new technique accurately identified the 2009 pandemic (pdm) influenza virus in Japanese patients less than 24 hours after fever onset, much faster than standard diagnostic tests.

The human-to-human transmission of new, highly pathogenic strains of influenza virus poses today a major threat to human health and to the security of global society. With its rapid global spread, the 2009 pandemic (pdm) influenza virus reminded the world of this threat, resulting in an estimated 18,000 deaths worldwide. In Japan, infected patients over the winter season of 2009 accounted for a staggering 16% of the total population.

Tackling the challenge of such global pandemics requires new technology for rapid clinical diagnosis. To answer this need, Toshihisa Ishikawa and colleagues at the RIKEN OSC developed the RT-SmartAmp assay, a technique to rapidly detect the 2009 pdm influenza A(H1N1) virus from patient swab samples. By combining both reverse transcriptase (RT) and isothermal DNA amplification reactions in one step, the RT-SmartAmp assay does away with the need for RNA extraction and PCR reaction. The researchers adapted the RT-SmartAmp technique using a fluorescent primer to specifically detect the 2009 pdm influenza A(H1N1) virus within 40 minutes, without cross-reacting with the seasonal A(H1N1), A(H3N2), or B-type (Victoria) viruses.

The effectiveness of the RT-SmartAmp method was confirmed in clinical research carried out at Japanese hospitals during the period of October 2009 to January 2010, where it outperformed standard diagnosis tests in both speed and sensitivity. Of a total 255 clinical samples, 140 (54.9%) were identified as 2009 pdm A(H1N1)-positive by

RT-SmartAmp, compared to only 110 (43.1%) detected by standard diagnostic tests. In 72.8% of all 140 infection-positive cases, the RT-SmartAmp assay detected the presence of the pdm influenza virus within 24 hours of fever onset.

Taken together, these results set a new standard for infection diagnosis speed, providing a highly-effective tool for rapidly detecting sub-types of the H5N1 virus and oseltamivir-resistant influenza viruses and promising support in the battle to prevent global pandemic infection.

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About RIKEN

RIKEN is Japan's flagship research institute devoted to basic and applied research. Over 2500 papers by RIKEN researchers are published every year in reputable scientific and technical journals, covering topics ranging across a broad spectrum of disciplines including physics, chemistry, biology, medical science and engineering. RIKEN's advanced research environment and strong emphasis on interdisciplinary collaboration has earned itself an unparalleled reputation for scientific excellence in Japan and around the world.

About the Omics Science Center

Omics is the comprehensive study of molecules in living organisms. The complete sequencing of genomes (the complete set of genes in an organism) has enabled rapid developments in the collection and analysis of various types of comprehensive molecular data such as transcriptomes (the complete set of gene expression data) and proteomes (the complete set of intracellular proteins). Fundamental omics research aims to link these omics data to molecular networks and pathways in order to advance the understanding of biological phenomena as systems at the molecular level.

Here at the RIKEN Omics Science Center, we are developing a versatile analysis system, called the "Life Science Accelerator (LSA)", with the objective of advancing omics research. LSA is a multi-purpose, large-scale analysis system that rapidly analyzes molecular networks. It collects various genome-wide data at high throughput from cells and other biological materials, comprehensively analyzes experimental data, and thereby aims to elucidate the molecular networks of the sample. The term "accelerator" was chosen to emphasize the strong supporting role that this system will play in supporting and accelerating life science research worldwide.