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Human clinical trial of SAV001 prophylactic HIV vaccine and a new strategy for the development of therapeutic HIV vaccine

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Vaccination is the most powerful and cost-effective approach for prevention of infectious diseases. Several approaches have been utilized to develop a vaccine against HIV/AIDS. These include a surface protein-based vaccine (AIDSVAX by VaxGen), a recombinant Human Adenovirus type 5-based vaccine (STEP trial by Merck), a recombinant canary poxvirus based vaccine (RV144 trial by Sanofi), and a combination of a DNA-based vaccine with recombinant adenovirus-based vaccine (HVTN 505 trial by USNIAID). Unfortunately, all of these vaccines were proven to be ineffective to prevent HIV infection. WHO reports "Since the beginning of the epidemic, over 70 million people have been infected with the HIV and about 36 million people have died of AIDS. Globally, 35 million people were living with HIV at the end of 2013." We have developed the SAV001 vaccine to prevent HIV infection by employing a genetically modified HIV-1 (nef-deleted, vpu-deleted, and Env signal peptide replaced) grown in human T-lymphocytes, inactivated by chemical (AT-2 treatment) and physical (γ irradiation) methods. We have completed Phase I human clinical trial of this vaccine in August, 2013 and we are currently preparing for the Phase II human trial. The Phase I human clinical trial results showed that the vaccine is completely safe in vaccinees and stimulated adaptive immune responses to generate antibodies against HIV-1 structural proteins. The Phase I trial results forecast a favorable outcome of the Phase II trial. This killed whole-HIV vaccine is a unique approach in HIV vaccinology. This approach will present the native structural proteins of HIV-1 to the immune system which strategy has proven effective for decades in the prevention of polio, influenza, rabies, hepatitis A, and more than 15 animal viral diseases. In addition to our prophylactic HIV-1 vaccine, we are also developing a therapeutic vaccine to clear HIV-1 infected cells in HIV-1 positive people using two antigenically distinct genetically modified vesicular stomatitis viruses vectors carrying HIV-1 structural protein genes. HIV-1 gag, pol and env genes were inserted into genetically modified VSVInd and VSVNJ vectors. The HIV-1 gag, pol, and env were expressed efficiently and processed properly in cells infected with rVSV-HIV viruses. Priming with rVSVIND-HIV virus and boosting with rVSVNJ-HIV virus induced high levels $CD8^+$ CTLs and produced antibodies against Gag and Env proteins. Our results showed that genetically modified dual serotype VSV vectors, carrying HIV-1 structural genes expressed high levels of HIV-1 structural proteins and induced robust adaptive immune responses in mice. This platform technology can be applied for therapeutic HIV vaccine development and is also applicable for other vaccines.

Biography

Chil-Yong Kang, PhD, DSc, FRSC, is a Molecular Virologist and Professor of Virology in the Department of Microbiology and Immunology, Schulich School of Medicine and Dentistry at Western University in Canada (1992-Present). He did his Undergraduate studies in both Korea and Denmark and was trained at University of Toronto and continued his Postgraduate studies at McMaster University where he received a PhD in Virology in 1971. His postdoctoral training was in the U.S. at the University of Wisconsin-Madison (1971-1974). He served as a Professor of Microbiology at the University of Texas, Southwestern Medical School in Dallas, Texas (1974-1982), Professor and Chairman of the Department of Microbiology and Immunology at University of Ottawa, Faculty of Medicine (1982-1992), and Dean of Science at the University of Western Ontario (Western University) (1992-1999). Previously, he developed a second generation vaccine against hepatitis B virus and an experimental vaccine against HIV/AIDS. He has published 135 peer reviewed research papers and 149 scientific proceedings and abstracts in fields of virology, immunology molecular biology, and medicine. He holds nine international biotechnology patents. He has received numerous prizes, was selected as one of four Korean-Canadian Diasporas to Canadian Society by Canadian Government (2013) and the Scientist of the Year Award of the President of the Korean Federation of Science and Technology (2013). He was elected as a Life-time Fellow of the Royal Society of Canada Academy of Science (1993) and an elected Life-time Member of the Korean Academy of Science and Technology (1997). He serves as a reviewer for the Journal of Virology, Journal of Infectious Diseases, Virus Research, Virology, Journal of Biological Chemistry and Canadian Medical Association Journal.

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