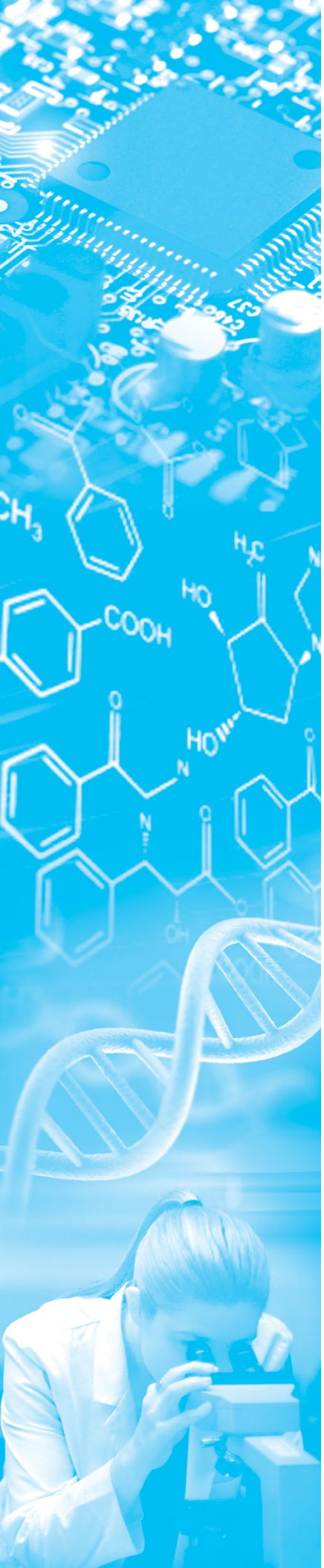

NSU Florida
NOVA SOUTHEASTERN UNIVERSITY

Novel Vaccine for Human Immunodeficiency Virus

Each year millions of people are infected with Human Immunodeficiency Virus (HIV) and if untreated they suffer from Acquired Immunodeficiency Syndrome (AIDS). Currently, over 1.2 million people in the US and about 38 million people in the world are living with AIDS. In 2019, roughly 690,000 people died from AIDS-related illness and 1.7 million people became newly infected with HIV. Although antiretroviral therapies have been able to slow disease progression or reduce chances of death, to date there is no cure for AIDS. Considering the fatalities and deleterious effects of AIDS all around the world, the development of an effective vaccine is a global health priority. To address this urgent need for efficacious vaccines researchers at NSU's College of Dental Medicine attempted to develop immunogens that can be protective against HIV. Their goal was to produce an HIV vaccine that can elicit broadly neutralizing antibodies (bnAbs) or protective antibodies that bind the HIV envelope glycoprotein variable regions 1 and 2 (V2 apex).

Technology

This technology will enable the development of a vaccine that will prevent HIV infection and AIDS. The immunogen developed by Dr. Cayabyab and Dr. Bontempo consists of HIV-1 envelope glycoprotein trimers that can mimic the natural envelope glycoprotein of the HIV-1 virion and can be used to create a vaccine. Over the past three decades, there have been seven different HIV vaccine clinical trials, and only one of them, the 2009 Thai RV144 vaccine, could elicit modest (31%) protection against HIV. The main challenge scientists have faced historically while trying to create an AIDS vaccine is the ability to develop an immunogen that can elicit broadly neutralizing antibodies (bnAb) to achieve adequate efficacy to account for the substantial global genetic diversity of HIV. This new immunogen developed by researchers at NSU is a novel HIV-1 transmitted-founder (T/F) clade C 1086.c SOSIP gp140 trimer that can potentially elicit bnAb. The clade C viruses found primarily in Sub-Saharan Africa are the most prevalent strain representing 50% of HIV infections worldwide while the 108.6c virus is neutralization resistant T/F virus and these viruses are known to circulate and be responsible for person-to-person transmission of HIV. Therefore, the clade C 1086.c Env was selected as the trimer immunogen. NSU researchers constructed a novel HIV-1 clade C 1086.c ENV SOSIP trimer as an HIV vaccine immunogen and assessed its biochemical, structural, and antigenic properties. The findings from these antigenicity studies indicated that 1086.c SOSIP trimer bound with considerable affinity to 16 of 19 bnAbs that recognize conserved epitopes in the V2 apex, CD4 binding site, and V3/glycan patch. This immunogen holds significant promise as a possible vaccine candidate against HIV infection.

Application

This novel clade C 1086.c SOSIP trimer immunogen that contains various bnAb epitopes, as well as possible protective epitopes in the V2 apex region, can be an ideal candidate for a vaccine against HIV.

Advantages/Benefits

- The novel vaccine candidate has a high affinity to 16 of 19 bnAbs that recognize conserved epitopes in the V2 apex, CD4 binding site, and V3/glycan patch.
- Unlike any other trimers, the 1086.c SOSIP trimer appeared to have a dynamic V2 apex structure containing both bnAb epitopes and potentially protective epitopes recognized by monoclonal antibodies isolated from RV144 trial vaccine candidates.

Status of Development

- The inventors designed and conducted biochemical, structural, and thermal stability analyses for the 1086.c. SOSIP trimer.
- Antigenicity study of the V2 apex of 1086.c trimer showed that it is recognized by not only RV144-related antibodies that were associated with protection, but also by potent bnAbs capable of neutralizing the majority of global strains of HIV.

Intellectual Property Status: Provisional patent application submitted on March 30th, 2021.

Information on Inventors

Mark Cayabyab, Ph.D - Dr. Cayabyab has over 20 years of research experience in the field of HIV/AIDS vaccine development. He is currently an Associate Professor and Director of Virology and Mucosal Immunology at NSU College of Dental Medicine. Dr. Cayabyab has authored over 25 peer-reviewed scientific articles and holds 2 patents. His research interest is focused on developing innovative vaccine strategies and therapies against HIV, COVID-19, and other diseases.

Alexander Bontempo, Ph.D – Dr. Bontempo is a Postdoctoral research scholar at NSU College of Dental Medicine. He has authored multiple peer-reviewed publications and holds one patent. Dr. Bontempo's research interests involve oncology, vaccine development and HIV. Currently he is working on Env-based immunogen for developing an effective vaccine against HIV infection.

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