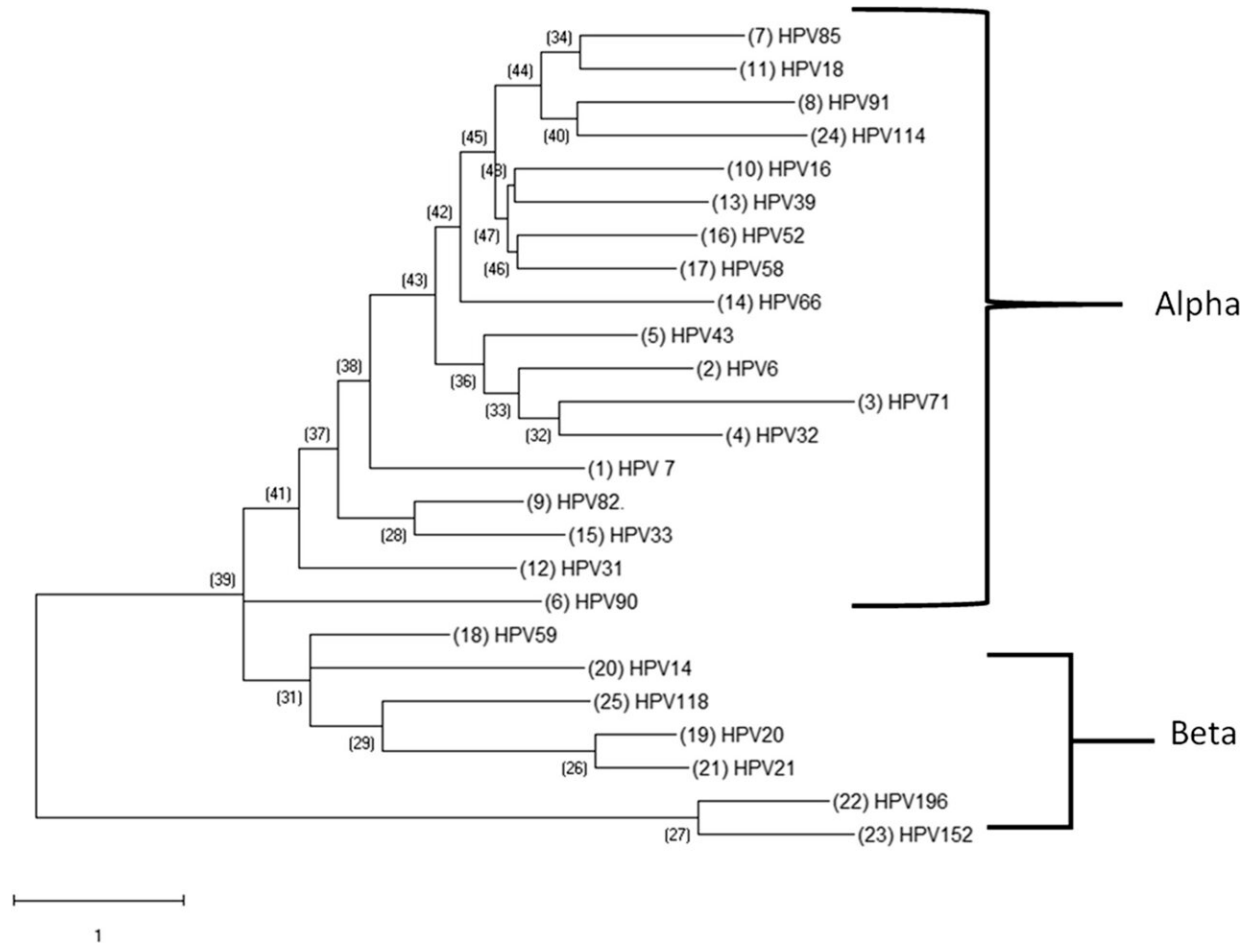


Targeting HPV to prevent cancer

September 19 2023



Phylogenetic Analysis of select Papillomavirus found in the cohort. HPV DNA sequences for each papillomavirus were obtained from PAVE and used for MEGA analysis. The resulting multiple alignments were then used to generate a phylogenetic tree to analyze the evolutionary patterns of select papillomavirus. Clades were identified related to the classical Papillomavirus genera indicated on two genera of the PV: alpha-papillomavirus genera and Beta-papillomavirus. Phylogenetic trees were constructed by the Maximum Likelihood method and

the Kimura 2-Parameter model by MEGA package. Credit: *Virology Journal* (2023). DOI: 10.1186/s12985-023-02106-y

Researchers in the University of Delaware College of Health Sciences Department of Medical and Molecular Sciences are playing a pivotal role on the global health stage as they investigate the most common sexually transmitted infection (STI) in the world.

Centers for Disease Control [statistics](#) show that 79 million Americans have human papillomavirus (HPV). With 14 million new infections each year, [80% of women](#) will get at least one type of HPV at some point in their lifetime, according to the Office on Women's Health in the U.S. Department of Health and Human Services.

Several strains of HPV cause [cervical cancer](#), which is the third most common [cancer](#) in women and the second most frequent cause of cancer-related death globally.

New research out of UD's Department of Medical and Molecular Sciences (MMSC) confirmed 25 different types of HPV prevalent in Nigeria. About half of those types of HPV cause cancer, while others cause STIs like genital warts, according to lead investigator Sam Biswas, professor of medical and [molecular sciences](#). The research was recently [published](#) in *Virology Journal*.

The discovery was made possible through an international collaboration between UD's MMSC Department and two regional Nigerian hospitals spawned by UD alumna Ngozi Dom-Chima. Dom-Chima graduated with her doctorate in medical sciences in May and now works as a research scientist at Incyte.

"There's a high cervical cancer rate in Nigeria, and there's not much research on HPV variants," Dom-Chima said. "Now that the world has become global, people are migrating and carrying diseases. The variants that are circulating in Nigeria, while they're not really seen here in the U.S., they'll eventually get here."

Dom-Chima was born in Nigeria and helped create crucial trust between UD and local Nigerian hospital systems so they would participate in this important global health research.

"When working in global health, before entering a community to talk, evaluate, or start a program, you must intimately know the community you're working with," Dom-Chima said. "If they don't participate in our study, there won't be any results. Being Nigerian, I was able to reassure them that we wouldn't mishandle patient samples and that we'd treat them with respect."

Together, Dom-Chima and Biswas obtained 90 cervical samples and spent six months processing samples using next-generation DNA sequencing to identify multiple HPV types in samples. Type-specific PCR analysis was then used to verify the HPV types circulating in Nigeria. Their research found strikingly high rates of multiple HPV infections in most patients, with as many as nine HPV types identified in a single sample.

Their discovery of 25 prevalent strains of HPV in Nigeria underscores the need for more region-specific vaccines. The leading HPV vaccine, Gardasil-9, only protects against nine cancer-causing types of the virus that are prevalent in the U.S. Just six of the 25 types of HPV circulating in Nigeria are prevented by that vaccine.

"While the vaccine is still very effective, it's not enough for a country like Nigeria," Biswas said. "We must come up with a vaccine that's

specific to the strains circulating in certain countries."

Dom-Chima hopes [pharmaceutical companies](#) are paying attention.

"Pharmaceutical companies must realize there's no one-size-fits-all approach when it comes to HPV vaccines," Dom-Chima said. "They need to look at data from different countries and develop region-specific effective vaccines since the ones we have don't cover most of the types of HPV that are prevalent in Nigeria right now."

But vaccine development is costly and that can serve as a roadblock for poorer countries like Nigeria.

"Nigeria doesn't have the money to provide vaccinations to all women," Biswas said. "With advanced health care systems in the U.S. and Europe, we have a stronger ability to combat HPV, cervical cancer, and cancer deaths, but countries like Nigeria don't have that ability. Even though we have many different types of HPV in the U.S., the death rate from cervical cancer is much lower. Infections and cancers that can be more readily treated in the U.S., could lead to someone dying every day in Nigeria."

Access to vaccines in Nigeria is also limited. Globally, just one in eight girls is vaccinated against HPV, according to the United Nations Children's Fund (UNICEF). [UNICEF](#) introduced the HPV vaccine to 52 countries, including seven countries, for the first time this year. Nigeria was one of those countries.

Until region-specific vaccines are developed and access to those vaccines is expanded, HPV continues to silently spread and silently kill. Another piece of the problem—populations of the world aren't testing for the STI.

"Laboratory tests for HPV only test for a limited number of high- and low-risk variants," said Esther Biswas-Fiss, professor and chair of the MMSC Department and a co-investigator on the research. "Hybrid capture, a test commonly used in women's health care, recognizes 13 HPV types. Like the vaccine, it's designed to detect strains that are found to be prevalent in the U.S., but it won't pick up some of the other strains that the sensitive methods used in the Biswas lab have identified."

While annual pap smears during routine gynecological visits detect HPV in women, for half the population—men—there is no approved test for HPV.

"In the U.S., many are unaware of the significance of the problem," Biswas-Fiss said. "HPV is a slow-moving virus that doesn't distinguish between men and women. Previous research tied tobacco and alcohol consumption to head and neck cancers, but now HPV is the [leading cause](#) of head and neck cancer in the U.S."

Head and neck cancers include cancers of the mouth, throat, nose, sinuses, salivary glands and middle ear.

Biswas aims to expand his research to study HPV in other countries, including the U.S.; however, obtaining patient consent to get samples can be challenging due to HIPPA. He hopes his research inspires other countries to conduct their own HPV research.

"Scientists in Africa, Asia, and South America should do similar studies to identify which types of HPV are prevalent there to aid in region-specific [vaccine](#) development," Biswas said. "The United Nations could also step in and try to solve this problem."

Ongoing research in the Biswas lab also focuses on the biology of HPV. A better understanding of the biology of the virus could lead to

treatment or even, someday, a cure.

"We've spent centuries focusing on how to kill bacteria, but viruses as infectious agents have not received comparable attention, and they can be equally as deadly," Biswas-Fiss said. "Right now, we can only test people and vaccinate them in hopes of preventing HPV. By better understanding the fundamental biology of HPV, we can develop antiviral drugs to fight back against the cancer-causing virus."

More information: Ngozi Dom-Chima et al, Human papillomavirus spectrum of HPV-infected women in Nigeria: an analysis by next-generation sequencing and type-specific PCR, *Virology Journal* (2023). DOI: [10.1186/s12985-023-02106-y](https://doi.org/10.1186/s12985-023-02106-y)

Provided by University of Delaware

Citation: Targeting HPV to prevent cancer (2023, September 19) retrieved 27 April 2024 from <https://medicalxpress.com/news/2023-09-hpv-cancer.html>

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