

## HIV Spread in Central and East Africa

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**(ADAPTED FROM ORIGINAL ARTICLE WRITTEN BY JOHN D. PASTOR)**

Scientists studying biology and geography may seem worlds apart, but together they have answered a question that has defied explanation about the spread of the HIV-1 epidemic in Africa.

Writing in the September issue of *AIDS*, a research team led by scientists at the University of Florida explained why two subtypes of HIV-1—the virus that causes acquired immunodeficiency syndrome, or AIDS—held steady at relatively low levels for more than 50 years in west central Africa before erupting as an epidemic in east Africa in the 1970s.

Essentially, the explanation for the HIV explosion—obscured until now—involves the relative ease with which people can travel from city to city in east Africa as opposed to the difficulties faced by people living in the population centers of the Democratic Republic of Congo, the point where HIV emerged from west central Africa in its spread to the east.

“We live in a world that is more interconnected every day, and we have all seen how pathogens such as HIV or the swine flu virus can arise in a remote area of the planet and quickly become a global threat,” said Marco Salemi, an assistant professor of pathology, immunology, and laboratory medicine at the UF College of Medicine and senior author of the study. “Understanding the factors that can lead to a full-scale pandemic is essential to protect our species from emerging dangers.”

Investigators used databases, including GenBank from the National Center for Biotechnology Information, as well as actual DNA samples, including samples recently collected in Uganda—the vicinity where HIV entered east Africa—to follow the virus’ molecular footprints since its emergence in the 1920s. Researchers wanted to know why, the virus smoldered during the 1950s and 1960s, before spreading like wildfire through east Africa in the 1970s.

A fateful piece of the puzzle came in the form of geographic information system data, which uses satellite imagery and painstakingly takes into account the availability and navigability of roads between population centers, transportation modes, elevation, climate, terrain and other factors that influence travel.

“We were able to use geographic data to interpret the genetic data,” said Andrew J. Tatem, an assistant

professor of geography in the College of Liberal Arts and Sciences and a member of UF’s Emerging Pathogens Institute. “Genetic data showed once HIV moved out of the Democratic Republic of Congo, it expanded fast and moved rapidly across Uganda, Kenya and Tanzania, all while staying at low levels in the DRC. What was happening was the virus was circulating at stable levels in the urban centers of the DRC, but these centers were isolated. Once it hit east Africa, connectivity between population centers combined with better quality transportation networks, and higher rates of human movement caused HIV to spread exponentially.”

“If we can predict the specific routes of an epidemic, we can find the geographic regions more at risk and target these areas with medical intervention and strategies for prevention,” Salemi said. “In terms

of health-care applications, coupling genetic analysis with geographic information systems can give us a powerful tool to understand the spread of pathogens and contain emerging epidemics.”

Working with Maureen M. Goodenow, the Stephany W. Holloway university chair for AIDS research at the UF College of Medicine, UF researchers collaborated with an array of scientists hailing from the National Institute of Allergy and Infectious Diseases, the Rakai Health Sciences Program and Makerere University of Uganda, and the Johns Hopkins University.

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