A team of 25 internationally collaborative scientists with longstanding expertise in the biology, surveillance, control, and prevention of globally devastating viruses and other infectious pathogens spread by mosquitoes.
UNIQUELY POSITIONED TO CONDUCT URGENTLY NEEDED RESEARCH ON ZIKA VIRUS

Our end-to-end response to emerging infectious disease includes the following notable assets:

- Extensive knowledge of *Flavivirus* – the genus that includes Zika virus – and *Aedes aegypti*, the mosquito species most adept at transmitting Zika virus
- Close partnership with the Centers for Disease Control and Prevention, Division of Vector-Borne Diseases; the agency’s branch in Fort Collins, Colo., is adjacent to AIDL
- Access to BioMARC, a state-of-the-art university facility that manufactures vaccines and biological products for research (Learn more: biomarc.colostate.edu)
- Affiliation with CSU Ventures and its MicroRx® division, which commercializes technologies from Colorado State’s infectious disease research
- Ongoing field research programs in Burkina Faso, Chile, Liberia, Mexico, and Senegal, countries hard-hit or threatened by the current Zika virus epidemic
- Laboratories approved for research with National Institutes of Health Category A-C arboviruses
- Biosafety Level 3 facilities, approved for use with select agents
- One of the nation’s largest insectary complexes permitted for Arthropod Containment
ABOUT ZIKA VIRUS

Zika virus, a Flavivirus related to West Nile and dengue viruses, poses a serious emerging threat to public health around the world. Mosquito-borne Zika virus first entered the Western Hemisphere in 2013. Three years later, it is locally transmitted in dozens of countries in the world’s equatorial regions. Zika virus is spread to humans by Aedes mosquitoes; sexual transmission also is strongly suspected. In adults, Zika infection usually triggers no symptoms or mild fever and rash. But an ongoing Zika outbreak in Brazil has been associated with a 20-fold increase in infants born with microcephaly, characterized by an abnormally small skull and severe brain damage; this has prompted some countries to warn against pregnancy in regions hard-hit by Zika virus. Rapid spread of Zika virus through Central and South America indicates that the virus will become a threat to human health in the United States. The Aedes aegypti mosquitoes that most effectively transmit Zika virus are distributed throughout the southern and eastern United States; the mosquito species recently was reported in California. Despite the dangers posed to human health, there are currently no vaccines to prevent Zika infection and no treatment options beyond supportive care.

READY TO CONFRONT A PUBLIC HEALTH EMERGENCY OF INTERNATIONAL CONCERN

During its 30 years, the Arthropod-Borne and Infectious Diseases Laboratory has developed internationally recognized facilities and expertise needed to understand a new mosquito-borne international health concern. Our scientists engage in basic and applied research to promote a more complete understanding of pathogen transmission, persistence, and emergence with the goal of developing improved control of vector-borne and other zoonotic diseases. We are a broadly based, interactive, multi-disciplinary research and training unit that seeks to improve public health through the study of emerging zoonotic pathogens.

Our investigators are prepared to conduct high-priority research in the following areas:

- vaccine development
- antiviral drug development
- arbovirus biology and transmission
- medical entomology of the primary mosquito vector, Aedes aegypti
- insecticide resistance
- development of small animal models for translational studies
- evaluation of human-virus-vector interactions using next-generation sequencing, population genomics and metabolomics – burgeoning fields in virology and vector biology

PREPARING THE U.S. FOR ZIKA VIRUS: CRITICAL QUESTIONS

- Are other species of mosquitoes competent vectors of Zika virus? Specifically, are Aedes albopictus, Culex pipiens, Culex quinquefasciatus, Culex tarsalis, or Aedes vexans potential vectors?
- Are U.S. populations of Aedes aegypti competent vectors?
- Zika is found in primate populations in Africa and was recovered from a gerbil in Senegal. Are there animal reservoirs for Zika virus in South, Central, and North America?
- Are there significant genetic differences between Old World and New World Zika virus strains that result in the recently observed neurological clinical signs and sequelae? What is the genetic diversity of Zika virus on a global scale?
- To what extent will Zika virus adapt to the American mosquito species Aedes aegypti and Aedes albopictus, and what are the epidemiological consequences of this?
- How might existing anti-vector interventions be effectively implemented to control the spread of Zika virus?
- Are there critical interfaces in the human-virus-mosquito nexus that can be exploited to interrupt transmission with vaccines, to impact disease outcome, or to provide prognostic indicators?
- Are there key viral genetic determinants that permit Zika virus to cause such severe pathology in the fetus?
- Can we use metabolomics to develop diagnostic and prognostic biomarkers of poor fetal outcome during pregnancy or to identify key host-virus interactions that can be used to disrupt transmission?
- To what extent does sexual transmission impact pathogenesis in the fetus and/or contribute to patterns of disease epidemiology and transmission?
- Are there long-term consequences from Zika infection on subsequent pregnancies?
HIGHEST LEVELS OF EXPERTISE
Dr. Barry Beaty, founder of the Arthropod-Borne and Infectious Diseases Laboratory in 1987, is a member of the National Academy of Sciences, a fellow of the American Academy of Microbiology, and a University Distinguished Professor of Virology. His work has focused on understanding and controlling dengue virus, which is closely related to Zika virus, as well as the Aedes aegypti mosquito that transmits both viruses to humans.

ON THE LEADING EDGE: CLONING ZIKA VIRUS
Dr. Gregory Ebel, director of AIDL, is leading work in his laboratory to clone Zika virus – an essential first step for answering basic questions about virus biology and its mutations in affected regions. The Ebel Laboratory recently received funding to study interactions between mosquito vectors and Zika virus.

FIRST ALERT: SEXUAL TRANSMISSION
The potential for sexual transmission of Zika virus has become a critical concern as viral infection has escalated in the globe's equatorial regions and beyond. Dr. Brian Foy, a vector biologist with AIDL, was among the first scientists worldwide to raise the specter of sexual transmission with publication in 2011 of a research paper, titled “Probable Non-Vector-borne Transmission of Zika Virus, Colorado, USA.” It appeared in the CDC journal Emerging Infectious Diseases. As the current epidemic exploded, Foy was interviewed by international news media including the New York Times, Washington Post, BBC, CNN, and leading outlets in Brazil, among others. A case of sexual transmission was confirmed in Dallas in February 2016, lending Foy’s insights greater attention and further validating the need for more research.

GROUNDBREAKING WORK, GLOBAL SCALE
Our laboratory is a cornerstone for infectious disease research and education at Colorado State University. AIDL researchers have studied the following mosquito-borne pathogens: chikungunya virus, dengue virus, equine encephalitis viruses, La Crosse encephalitis virus, malaria parasites, West Nile virus, and yellow fever virus. Our work has been funded by the National Institutes of Health and the Bill and Melinda Gates Foundation, among others.

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