

COMBATING ZIKA

RTI INTERNATIONAL IS EXPANDING KNOWLEDGE OF ZIKA VIRUS TRANSMISSION, EPIDEMIOLOGY, AND LONG-TERM EFFECTS

RTI's researchers are experts on reducing the impact and curbing the spread of global infectious diseases. Powered by our work on malaria, tuberculosis, Ebola, and seven neglected tropical diseases, RTI is working on a number of projects in North Carolina, Guatemala, Nicaragua, Puerto Rico, Colombia, and Brazil. We are also analyzing the use of drones for vector control and developing best practices to communicate with affected communities.



CRITICAL QUESTIONS ABOUT ZIKA

RTI'S RESEARCH WILL PROVIDE ANSWERS TO CRITICAL QUESTIONS ABOUT ZIKA

- Can Zika be spread by aerosol transmission via coughing or sneezing?
- Can dried blood testing methods be used to identify Zika infections?
- How can we keep the blood supply safe for donors and recipients?
- What are the long-term effects of Zika infection?
- Can drones be used for vector control of *Aedes* mosquitoes?
- How much does *Aedes* mosquito control cost?
- What can we do to improve developmental outcomes and family adaptation for those affected by microcephaly in Brazil?
- How can we understand public perceptions and behaviors about Zika?
- How can we quickly implement a public health campaign to protect pregnant women against Zika?



IS TRANSMISSION A SNEEZE AWAY?

Zika is known to be transmitted when an *Aedes* mosquito bites an infected person and then bites another person, transferring the virus via its salivary glands. However, recent research has shown the presence of Zika in semen persisting longer than in blood. This discovery raises questions about other ways the infection can be spread. RTI is conducting research in North Carolina on the virus to determine whether Zika can survive in respiratory, oral, and salivary environments; whether the cells from the oral and respiratory tracts allow for propagation; and how long the virus can persist in saliva. Our early findings from this study suggest that Zika can be transmitted through infectious saliva to the oral and respiratory tracts.



PRINCIPAL INVESTIGATOR

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Key Research Activities

- Investigate whether Zika can infect and grow in mucosal cells in the oral and respiratory tracts
- Investigate how long Zika can persist in saliva
- Determine airborne characteristics and survivability of Zika

NEW ZIKA TESTING

Much is still unknown regarding the direct impact of Zika infection on human health. This is especially true for asymptomatic cases as well as cases where infections could potentially lead to long-term health issues that are not immediately apparent. A step toward better understanding the human health impact associated with a Zika infection is to first identify those who have been infected, even if they don't show known symptoms. Currently, Zika diagnostic tests are done only when symptoms are present and samples must be taken in a clinic and then refrigerated, which can be costly and cumbersome to administer. RTI is looking to develop a method to detect Zika virus from dried blood spot testing, which could provide an easy way to collect and store samples and therefore provide greater opportunity to understand the real prevalence and impact of Zika. Developing a successful method will provide anonymity for surveillance at the population level and in clinical research studies of infants. This method will provide a true population study of all exposed infants to determine the range of Zika health effects.

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Key Research Activities

- Investigate whether Zika RNA can be isolated from dried blood spots using commercially available viral RNA kits
- Investigate whether common molecular biology techniques can be used as a method for detection
- Determine whether blood types affect Zika detection
- Understand the limitations of the assay for Zika detection

PROTECTING THE BLOOD SUPPLY

RTI is the data coordinating center for a multi-country blood transfusion safety program sponsored by the National Heart, Lung, and Blood Institute of the National Institutes of Health, and recently received additional funding to study Zika virus infection in blood donors and recipients. RTI provides input into study design, supports data collection, and conducts statistical analyses to determine the incidence and natural history of Zika in blood donors in areas with active infection in the United States and Brazil. In addition, RTI is assessing the impact of emerging viruses that are transmitted by mosquitoes in patients treated with chronic transfusion therapy and determining disease prevalence before and after the epidemic season in Brazil.

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Key Research Activities

- Inform study design
- Support data collection
- Conduct statistical analyses

UNDERSTANDING LONG-TERM EFFECTS

Questions remain about the short- and long-term health impacts on people infected with Zika. A recent study of the epidemic in French Polynesia suggests that the onset of Guillain-Barré syndrome—an autoimmune disease that attacks the nerves and causes paralysis—is associated with Zika infection in adults. However, little is known about the short-term and potentially chronic neurological effects of the virus. RTI is conducting research in Nicaragua that will enroll a cohort of Zika-positive and Zika-negative children and adults to study the short- and long-term neurological signs and symptoms associated with Zika. We will also establish a biological specimen repository to test for factors that might increase the risk of adverse outcomes associated with Zika.

RTI is also the data coordinating center for the National Institutes of Health-funded Zika in Infants and Pregnancy (ZIP) study to assess the strength of the association between Zika infection during pregnancy and adverse maternal/fetal outcomes and the risk of mother-to-baby transmission. Across five countries, 10,000 women and their children will be enrolled over an 18-month period.

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Key Research Activities

- Evaluate neurological signs and symptoms associated with Zika infection among children and adults
- Enroll Zika-positive and Zika-negative patients into a cohort study
- Establish a biological specimen repository
- Prospective observational cohort study of pregnant women and their babies

DRONES VS. MOSQUITOES

Vector control, which attempts to limit or eradicate insects that transmit diseases, is a critical prevention strategy for Zika. In areas plagued by the virus in Guatemala, RTI is flying drones to understand how these tools can be used to combat the spread of Zika. We believe drones are a cost-effective tool to map mosquito breeding sites, particularly in cisterns, tires, pots, and stagnant pools. Better maps will allow responders to more effectively target insecticides at breeding sites. Our research aims to establish protocols for translating scientific specifications into flight and sensor requirements and to ensure that drones for vector control are safe, effective, and self-sustaining.



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Key Research Activities

- Develop processes for identifying *Aedes* mosquito breeding sites
- Create maps of breeding sites to determine risks to local communities
- Monitor public perceptions about drone-enabled interventions and create communication strategies to legitimize this approach and communicate risks

THE COSTS OF KILLING MOSQUITOES

Vector control, which reduces populations of the *Aedes* mosquitoes that transmit the Zika virus and limits their contact with humans, defends against the spread of Zika infections. To understand the costs associated with vector control, RTI conducted a survey of local vector control programs' existing interventions and sources of funding. We are developing in-depth costing and qualitative case studies of local vector control programs across the continental United States. In addition, we are conducting a systematic review of economic analyses of *Aedes* vector control efforts worldwide. It is anticipated that the results of these studies will help program managers and policy makers design and implement the most cost-effective mosquito control programs.

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Key Research Activities

- Assess the status of existing local vector control programs in the United States
- Understand the planning processes and funding sources of existing vector control programs in the United States
- Synthesize the knowledge base regarding the economics of *Aedes* vector control around the world



SUPPORTING AFFECTED FAMILIES

In November 2015, following reports of an increase in microcephaly birth defects, Brazil's Ministry of Health established a microcephaly registry. However, the registry does not provide a long-term assessment of developmental outcomes or essential guidance on intervention strategies. RTI is analyzing the feasibility of improving the registry by incorporating a longitudinal study of infants and families affected by microcephaly. Additionally, we are studying the role of early intervention programs designed to improve child development outcomes.

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Key Research Activities

- Identify pressing needs and establish partnerships
- Explore the need for and feasibility of a longitudinal microcephaly study in Brazil
- Pilot smartphones to report on infant development and receive supportive information
- Plan for the possible study of the efficacy of early intervention for affected children



UNDERSTANDING THE FEAR FACTOR

In 2016, RTI conducted two studies to help the Guatemalan government understand how best to inform citizens about Zika and the steps they can take to avoid infections. Through focus groups and interviews, we found that Guatemalans had widespread awareness of Zika and its symptoms and effects, and that most were aware of mosquito, but not sexual, transmission. People were aware that eliminating mosquito breeding grounds was key to stopping Zika, yet they noted challenges in doing so. Participants were eager for communication of credible information and guidance. Radio, local news, and community talks were recommended as the best ways to disseminate information. In a second study, we analyzed Zika news coverage, social media discourse, and online search behavior to understand how news coverage can drive information-seeking behaviors. We found that activity across all three channels was highest when the WHO declared Zika a public health emergency for pregnant women, which suggests a short window of opportunity to engage people and share information following a major health event.

RTI is also conducting a survey to understand the knowledge, attitudes, and behaviors surrounding Zika of Americans who are planning to travel in 2017. RTI will analyze news stories leading up to, and during the time of, the survey to determine what messages the public is receiving about Zika and travel.

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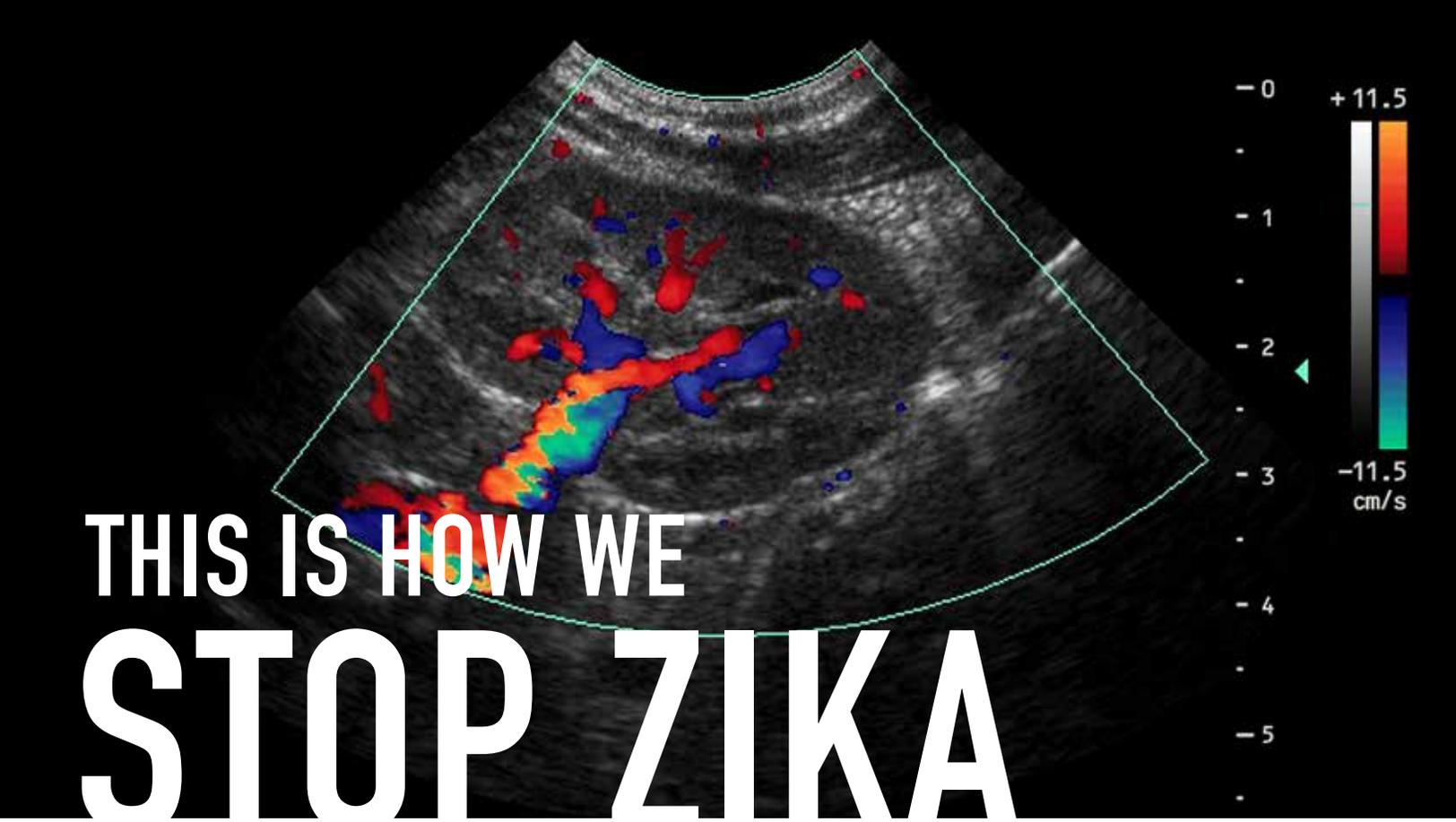
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Key Research Activities

- Monitor the public information environment to provide context for interpreting Zika communication campaign effects over time
- Conduct formative research to inform messaging for public education campaigns
- Conduct a survey to assess how Zika and news about Zika affect travelers' attitudes and behaviors



THIS IS HOW WE STOP ZIKA

In March 2016, the CDC Foundation funded RTI to develop, implement, and evaluate a Zika awareness campaign for pregnant women in Puerto Rico, the U.S. Virgin Islands, and American Samoa with an emphasis on meeting the immediate communication needs of pregnant women in Puerto Rico. The 3-month campaign, called *Detén el Zika* (or This Is How We Stop Zika), included traditional and print advertising, social media, and a website to promote awareness, knowledge, dialogue, and prevention behaviors to protect against Zika infection and transmission from mother to baby during pregnancy, which could result in babies having birth defects and disabilities.



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Key Research Activities

- Conduct fast turn-around formative research to obtain feedback on campaign concepts and materials
- Create a concept brief to guide the development of campaign objectives, messaging, and products
- Implement an integrated multimedia campaign to include paid, owned, earned, and shared media
- Evaluate the potential exposure to, and engagement with, the campaign

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