

Finding the Human Face of Dengue



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Dr. Barry Beaty, is a University Distinguished Professor of Virology and has done extensive research in Mexico to better understand [Dengue Fever](#) and Dengue hemorrhagic fever and shock syndrome and how to prevent Dengue Virus infections. He is the former Director of the Rocky Mountain Regional Center of Excellence for Biodefense and Emerging Diseases and the Infectious Disease Supercluster at Colorado State University. He is in the Department of Microbiology, Immunology & Pathology of the College of Veterinary Medicine & Biomedical Sciences and a GVN Center Director. The College is a Center of Excellence of the Global Virus Network, which provides unique opportunities for colleagues around the world to collaborate in efforts to prevent and control mosquito borne and other viral diseases.

On one trip to Mexico to conduct mosquito surveillance in the mid 1990's he encountered first-hand the human face of why one area of his research is so important.

“While looking for *Aedes aegypti* breeding sites, I rounded a corner of a house, which had no doors or window, and I saw three of the most beautiful little children that you could imagine sitting on an old mattress. They all smiled and waved. As usual, large numbers of *Aedes aegypti*, the mosquito which transmits Dengue virus, were detected, which were feeding on the children and others in the house. All I could think was that we simply must do better to protect these children and the poorest of the poor from epidemic Dengue Fever and Dengue Hemorrhagic Fever and Shock Syndrome, which was emerging in countries throughout the Americas.” .

The World Health Organization (WHO) estimates that about 2.5 billion people or 40% of the world's population resides in areas— primarily the populous nations of the tropics— where dengue transmission is possible.¹ The WHO estimates that between 50 and 100 million infections, with 22,000 deaths, mostly among children, occur annually. Prior to 1970, Dengue was only present in a small number of countries, but is now endemic in throughout much of the tropical world. Unfortunately, Beaty says the situation is likely to worsen with increased urbanization, the resurgence of *Aedes aegypti* following the demise of vector control programs, the trafficking and simultaneous circulation of the four serotypes of dengue virus in much of the tropical world, and the lack of vaccines to prevent Dengue virus infection.

Indeed, in the Americas alone, 1.6 million cases of dengue were reported in 2010, and roughly 1 million were reported in 2011ⁱⁱ. These statistics are startling, but as bad as they are, are a recent study in *Nature* reveals that the actual burden of Dengue is actually three-fold greater than the WHO estimates.ⁱⁱⁱ – Scientists of the Global Virus Network are collaborating on research through grants, articles, meetings and more on ways to control the spread of Dengue Fever and Dengue Hemorrhagic Fever and Shock Syndrome.

Beaty asserts that the emergence of epidemic dengue and dengue hemorrhagic fever and shock syndrome (a life-threatening form of the disease) in the Americas has been a public health disaster

Dengue fever outbreaks occur primarily in tropical urban areas of the world where the omnipresent *Aedes Aegypti* mosquito lives. Preventing the spread of Dengue relies in part upon Ministries of Health spraying of insecticides in and around homes where human cases have been detected and controlling the breeding sites for juvenile mosquitoes by larviciding and source reduction. Community-based mosquito control programs educate people about Dengue and empower them to help prevent infections by controlling the mosquito that transmits it. *Aedes aegypti* breeds principally in man-made breeding sites, such as discarded tires, bottles, cans, etc., which are universal in the new throwaway society, making control of juvenile stages of the mosquito very difficult. In addition, adults are little affected by space spraying because they are frequently located inside the homes. Although beneficial, such control efforts have done little to stem the rising tide of the Dengue Pandemic around the world.

“Housing in Mexico was of cement construction but as with many of the homes, there were no windows or doors, just openings in the walls, making these homes an ideal place for mosquitoes to live and for virus transmission to occur. Many insect vectors of globally important diseases, such as dengue, malaria, filariasis, Chagas, live in close association with humans in their homes and transmit the respective pathogens to humans there. This is an alien concept to those of us from more developed countries or regions where the home is a refuge and screens and air conditioning shield us and provide a safe place that protects us from these purveyors of disease.”

In response, Beaty and collaborators have conducted “Casa Segura” studies, in which they adapt long lasting insecticide- treated fabrics used in bed nets to control the malaria mosquito, *Anopheles gambiae*, into curtains that can be hung in windows and doorways to protect the home. The Casa Segura approach is not a magic bullet, and new vaccines are critical, but it is one piece of the integrated approach that experts agree is necessary to curb the alarming increase in Dengue in the tropical world. Even with a vaccine, mosquito control is likely to remain a necessary component of effective Dengue control programs.

Currently, there is no medical cure or vaccine for Dengue Virus infections. “Not only must we develop new vaccines, diagnostics, and therapeutics, but we must develop new ways to protect these children from Dengue and the other devastating diseases transmitted by insects in their own homes,” Dr. Beaty asserts.

Thus, the familiar adage, “It takes a village to raise a child” is becoming increasingly true as virologists like Beaty research Dengue Fever and develop new solutions to address it.

“I can close my eyes and still see them today, many years later,” Beaty says of the children he met in Mexico.

ⁱ “Impact of Dengue,” Global Alert and Response, World Health Organization. 2013. Available at: <http://www.who.int/csr/disease/dengue/impact/en/>

ⁱⁱⁱ “Dengue in the Americas- update EW 31,” Pan American Health Organization. Available at: http://new.paho.org/hq/index.php?option=com_content&view=article&id=5800&Itemid=259&lang=en

iii. “The global distribution and burden of dengue” Bhatt, S., et al., 2013. Nature 496, 504-507.