

Dengue Fever: A Bad Case of Flu

While in the Amazon jungle of Peru during January of 2005, an infectious disease physician from the United States told me and my students that dengue fever is not in the Amazon jungle. I was surprised, even a bit astonished at this declaration. Later that week I witnessed first hand that dengue is indeed present in the Amazon jungle. I witnessed children who were in agonizing pain, having violent seizures, and were literally bleeding internally to death right in front of me.

Dengue fever is the number one mosquito transmitted virus in the world. It has become the most important mosquito-borne viral disease affecting humans. Over two billion people worldwide live in areas where they are at serious risk of becoming infected, with nearly 50 million individuals being infected by the virus each year. In Peru, dengue fever is endemic with new cases appearing all year long. The number of cases increase during the rainy season and decrease during the dry season proportionally to the mosquito population. The mosquito *Aedes aegypti*, the main vector for dengue fever, was even declared eradicated from Peru in 1958. A reinfestation of the *Aedes aegypti* mosquito is thought to have occurred in 1984 with the first case of dengue fever observed in March, 1990. An epidemic of classical dengue fever then occurred from March to July of 1990 in the Amazon Basin region which was caused by Dengue types 1 (DEN-1) and type 4 (DEN-4). Epidemiological surveillance by the Ministry of Health in Iquitos, Peru over the past three years has shown an increase of cases in dengue fever in the northern Amazonian jungles region of Peru. It is now estimated that 76,000 people probably experience dengue-like symptoms.

Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) are viral diseases transmitted by the bite of the *Aedes aegypti* mosquito. These mosquitoes transmit the virus by taking blood meals and are most active at daybreak and dusk. A bite by an infected mosquito transmits the virus quickly throughout the body of the human host. Dengue fever is divided into two categories. The first is a *jungle cycle* involving jungle mosquito vectors and wild monkeys as the reservoir. The second is an *urban cycle* involving urban mosquitoes with humans as the reservoir. If a person comes in contact with the infected mosquitoes in the jungle they may come down with jungle dengue fever. If the infected person then travels to an urban area they can be bitten by urban mosquitoes and transfer the virus to the mosquito. These infected mosquitoes then bite other humans and pass the disease. By decreasing or controlling the mosquito population in the jungle would lead to a decrease in the number of not only jungle dengue fever cases, but secondary urban dengue infections as well.

Dengue fever and dengue hemorrhagic fever are caused by four closely related virus serotypes. The serotypes include DEN-1, DEN-2, DEN-3, and DEN-4. If a person is infected with one of these serotypes and survives they will develop immunity to that particular serotype. However, immunity to one strain does not provide them with immunity to the other serotypes and they can still be infected by the other serotypes. The ability to be infected by more than one strain of dengue contributes to the reasons why there are so many cases of this disease and why multiple infections occur.

Dengue fever and dengue hemorrhagic fever are found primarily in tropical and subtropical areas between the latitudes of 30 Degrees North and 40 Degrees South. These diseases are endemic in Southeast Asia, the Pacific, West Africa, East Africa, the

Caribbean and the Americas. As the population of the *Aedes* mosquito's increases during the rainy season, the prevalence of dengue fever also increases. Mosquitoes rely on standing water for reproduction and since it rains every day from February to August in the Amazon, prime breeding grounds are produced. Dengue can be a very serious problem during these months where immense mosquito reproduction occurs.

Once a person has been bitten by a mosquito infected with dengue fever, the virus requires approximately 2-7 days of incubation before symptoms are present. Symptoms of dengue fever are manifested by a high fever, rash, severe headache, pain behind the eyes, and muscle and joint pain. The high fevers along with severe muscle and joint pain have together have been named "break-bone" fever. Nausea, vomiting, and loss of appetite are also common. These symptoms are present in "classical Dengue Fever," which lasts approximately 4-10 days with complete resolution of the disease and recovery. Classical dengue can be severe but is seldom fatal and primarily infects children. Most dengue infections follow these common symptoms and the individual survives, but some cases can progress to a more severe disease, dengue hemorrhagic fever.

In Dengue Hemorrhagic Fever (DHF), the patient's condition deteriorates rapidly between days 2-5. The patient develops a shock syndrome which includes restlessness, profuse sweating, and hypotension. The most prevalent symptom is spontaneous hemorrhages from the gums and gastrointestinal tract. These hemorrhages are caused by the development of thrombocytopenia (low platelets). They may also have low levels of protein and sodium in their blood and a mild increase in liver enzymes. These conditions lead to disseminated intravascular coagulation (DIC) and kidney failure. Ultimately the

person has acute bleeding from their gastrointestinal tract and under the skin and fluid develops in the lungs which may cause death. About 5 percent of patients that contract dengue hemorrhagic fever will die.

This viral disease is a major public health problem not only in Peru, but world wide. Once the disease enters the human-mosquitoes cycle, it can spread rapidly by the migration of infected individuals. Human migration in and out of different populations maintains the virus's survival. This allows for a potential epidemic outbreak in an exposed population. Over the last 50 years there have been major epidemic outbreaks throughout the world such as in Venezuela, Columbia, Brazil, Cuba and the Caribbean; with potential of this disease becoming pandemic.

My experience with patients with dengue has been overwhelming. I have seen a broad spectrum of patients from infants to adults. I've examined children who have hemorrhaged from their gums and nose. Many have had a rash covering their arms and legs and visible bleeding under their skin. They scream in pain and have violent seizures. They lay in bed with the sheets soaked in their own sweat. Some become even worse as their body fills with poisons because their kidneys begin shutting down. Obviously the naïve American Internal Medicine doctor was dead wrong; I was watching children acutely sick with dengue fever.

The majority of emergency room visits from children in Iquitos, Peru is either from malaria or dengue fever. Children with dengue fever can present with intense pain, seizures, and high fevers. Physicians order blood smears to rule out malaria, but there is no convenient serology test for dengue fever. The test to confirm the presence of the dengue virus has to be sent out to an external reference laboratory. Treatment is

symptomatic and includes analgesic, antipyretics (anti-fever medications), rest, and fluid replacement. There is currently no available vaccine for the dengue virus, but researchers predict that in 10 years there will be an effective vaccine.

In the terms of human misery and suffering, the patients with dengue are at the mercy of the disease. With no cure available, doctors can only treat symptoms and have to let the infection run its course until the body's immune system can overcome the virus. Analgesics and antipyretics are readily available, but most patients don't have the money for these basic medicines to treat their symptoms. Patients must battle intense pain and high fevers without relief until the virus gives up its grip or the disease progresses to DHF and possibly kills them.

What can be done to prevent people from contracting the disease? The primary prevention for dengue fever is to eliminate or at least reduce the mosquito population. The emergence of this debilitating disease has been dramatic in South America in the past 20 years due to changes in mosquito control programs. In an effort to prevent Yellow Fever, which is transmitted by the same mosquito, the Pan American Health Organization (now a unit of the World Health Organization) started a campaign that effectively eradicated the *Aedes* mosquito from Central and South America in the 1950s and 1960s. As a result, epidemic dengue occurred only sporadically in some Caribbean islands during this period. However, this program was stopped in the 1970s which allowed mosquitoes to reestablish themselves with a wider geographic distribution than before the eradication campaign began. A mosquito control program needs to be reinstated throughout the Americas. If not, dengue fever will continue to spread and could even progress to be the next pandemic disease affecting all of humanity.

Prevention for travelers in regions where dengue fever is present includes the use of mosquito nets, repellent, and avoidance of infested areas. Wearing light colors can help, but more importantly wear clothing that fully covers arms and legs. If we are proactive with education and begin to focus on eradication programs we can at least keep this disease under control. Will we ever completely get rid of dengue? No, dengue will never be eliminated. The virus has an immortal species as its vector. How do we kill a species that relies on water for survival? It rains nearly every day in the Amazon! As long as rain falls from the sky, there will be mosquitoes. The same rain that makes the Amazon jungle such a magnificent place also provides a myriad of habitats for mosquitoes to thrive in. If you come back from a visit in the jungle and you develop a high fever, severe muscle aches, and flu like symptoms, you may have “break-bone” fever. If your doctor tells you there is no Dengue in the jungles tell him/her to call me.