

## Zoonotic Diseases are Potentially Very Dangerous to Humans



*By James LeDuc, director of the Galveston National Laboratory at the University of Texas Medical Branch*

Doctor James LeDuc, director of the Galveston National Laboratory at the University of Texas Medical Branch and founding member of the Global Virus Network (GVN) knows the threat that zoonotic infections pose. He has dedicated over 40 years to identifying and combating new and existing strains.

Zoonotic diseases represent around 60% of all human diseases and 75% of all emerging disease and are aptly named as they originate in vertebrate animals such as livestock, pigs, chickens, cattle, goats, sheep and camels. Yellow Fever, SARS, Rabies, HIV/AIDS and common strains of influenza all have zoonotic origins and have threatened humans for centuries.

In the late 1970s, Dr. LeDuc was assigned to a laboratory at the mouth of the Amazon River in Brazil. At the time, he was serving in the Army, which had a partnership with the Evandro Chagas Institute in Belem. During his time there, an outbreak occurred deep in the Amazon jungle among workers at a Ford rubber plantation. An unknown disease was spreading throughout the plantation, causing its victims to suffer hallucinations, hyper agitation, jaundice, hemorrhages, rash, black vomit, and severe arthritis. These symptoms were very perplexing because they seldom appear together.

“Some of the workers were employed to clean trails with machetes in the plantation for the rubber trees to grow. Their arthritis was so critical that they couldn’t even hold the machetes. One girl, around 15 or 16 years old, had a severely inflamed thumb on her right hand. It was twice the normal size. She was much, much too young have such inflamed joints. Others were extremely weak from the combination of symptoms, but we could not identify the disease by symptoms alone because they were too numerous, and they varied too much between patients,” LeDuc laments.

An investigation was quickly launched and blood samples were analyzed at the Institute. It was determined that many of the workers had Yellow Fever, explaining the fever, black vomit, and jaundice. The hallucinations, agitation and jaundice also resulted from the high toxicity levels of their circulation systems as their livers stopped functioning.

Further tests were needed to explain the other symptoms, though, and it was soon discovered that some of the workers had also contracted [Mayaro virus](#), explaining the rash and severe arthritis.

Dr. LeDuc's experience in the Amazon illustrates the importance of laboratory confirmation in establishing a correct diagnosis and underpins the necessity to develop vaccines and treatments for zoonotic infections in case they become urbanized. The outbreak of Yellow Fever occurred concurrently with Mayaro virus, and virological and serological studies made it possible to differentiate between the diseases. The GVN, with which Dr. LeDuc works, enables scientists to complete testing and diagnostic work that are incredibly valuable in identifying viral infections and administering proper treatments.



Both Yellow Fever and the Mayaro virus are transmitted by the *Aedes aegypti* mosquito. *Aedes aegypti* is a daytime feeder, making window screens and other protective barriers less important in combatting the diseases than if it was a nighttime feeder. Currently, there is no cure for either Yellow Fever or Mayaro. They can affect anyone and do not disproportionately affect the weak or the young. Treatment for Yellow Fever and Mayaro virus attempts to

reduce the symptoms for the comfort of the patient. Vaccines remain the single most important method for combating Yellow Fever; however, no vaccine exists for Mayaro.

[Yellow Fever](#) infects around 200,000 people per year and causes around 30,000 deaths worldwide each year. The rate of infection has increased over the past 20 years due to declining immunity in vulnerable populations, deforestation, urbanization, population movements and climate change. Less is understood about Mayaro virus, but it originates in monkeys and marmosets and has caused several epidemics in South America over the last 60 years.

Yellow Fever and Mayaro virus are typically contracted by humans in jungle settings and rarely appear in urban environments. Nevertheless, there is a significant risk that this could change and outbreaks could begin occurring in urban settings, creating a massive public health disaster. As populations increase, the potential for diseases to enter urban situations becomes more critical because if they do, the possibility that they will infect greater numbers of people also increases. Undoubtedly, the potential aspects of urbanization have been considered by the GVN at its Centers of Excellence. These institutions understand the contextual factors that impact virology and consider them as they work towards better treatments and vaccines.

“The international capacity to manufacture the Yellow Fever vaccine is low; many people could die before the vaccine could be made available in the necessary quantities. The French abandoned construction of the Panama Canal because it was killing young men who were working to build it. It is also noteworthy to consider the possibility of urbanization of Mayaro virus. It could, potentially, be transmitted in urban areas under the appropriate conditions,” states Dr. LeDuc.

Fortunately, the GVN creates partnerships with public and private agencies involved in surveillance and product development and distribution in order to deliver treatments and vaccines more swiftly. With continued support, the GVN can capitalize on its global network to address manufacturing deficits and prepare the world for future outbreaks.