SOUTHWEST CHILDREN'S CENTER

Zika and Beyond

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This year, perhaps more than others, mosquitos as vectors of disease have reached a level of interest unprecedented in the United States. We've lived a charmed existence in the country by not being subject to malaria like much of the tropical and subtropical world around us. Nevertheless, storm clouds loom on the horizon surrounding the possible establishment of an ongoing (endemic) presence of tropical viral illnesses brought to us largely by travelers from abroad. The trifecta of Dengue, Chikungunya and most recently the more threatening Zika are kindred infections in that they are tropical viruses and require the mosquito vectors *Aedes aegypti and Aedes albopictus* to transmit infection. These two species are urban mosquitos and coexist with ease among us in an urban setting. The symptoms of the three viruses are similar, with enough overlap to make diagnosis of a specific tropical vector-borne illness difficult. Couple that with the reality that all three illnesses can have subtle, or with Zika, absent symptoms in the majority of cases and you can see how difficult it may be to diagnose cases and understand the scope of the evolving problem in the United States. Chikungunya will come to us from the India subcontinent with a possible stopover in the Caribbean first, as endemicity seems to be now established there. Chikungunya is often manifested as arthritis and arthralgia that can be severe and for some minority of patients may last for years after the infection. Dengue is already here for those of us in Texas as the illness is endemic in Mexico and has crossed the Rio Grande to some extent for years. The illness is subtle with rash, red eyes, generally mild fever and will usually resolve without incident. A small minority will progress to severe Dengue symptoms with capillary leak, hemorrhagic disease, shock and be life threatening. Dengue, in some quarters referred to "bone break fever", overlaps symptoms with Chikungunya enough that laboratory testing could be necessary to separate the two. Zika, though it seems to be a new pestilence, has identified origins in the Zika forest of Uganda in 1947 with human disease confirmed in Nigeria in 1954. Zika infection is so mild that eighty percent of human infection produces subclinical symptoms (symptoms are so mild; they go unnoticed by even the patient). The problem with this tropical viral illness is that infected in the first trimester, a developing fetus can suffer irreparable brain injury and end up with a very small and ineffective brain (microcephaly). This devastating association is new to us in 2015 and our knowledge is

evolving. It would appear from early estimates that microcephaly would be the outcome in perhaps one percent of affected first trimesters. Even though the number is small, given the lifelong devastation that would result from each instance of microcephaly, the problem is one of staggering concern. Though Dengue and Chikungunya can produce significant human suffering, the specter of microcephaly from a poorly timed Zika infection grants the Zika virus a stature not matched by Dengue or Chikungunya. The explosion onto the scene and relevancy in the United States in 2015 or so owes its newfound notoriety to several issues. Global warming and expansion of mosquito habitat as a result, is part of the puzzle as the necessary vectors will be present in a larger part of the globe. Another key element in expansion of these tropical diseases is the increasing world travel. As with Ebola virus and measles at Disneyland, modestly ill travelers cannot effectively be screened from travel. They will enter the United States from time to time as global infectious disease circumstances change with the virus in their blood streams. As ill travelers arrive in the United States, these viruses in their blood streams could be available to the two specific mosquito vectors (already present in the United States) needed for transmission. The third component in the establishment of new territory for all three diseases is poverty. In poverty, living conditions are more stark. Screened enclosures for sleep that would limit mosquito contact as humans sleep are less available in poverty. Nocturnal "blood meals", virus transmission and the establishment of endemism are more likely in poverty. It may be this last issue that makes the United States experience with all three diseases, but especially Zika different than much of the rest of the world. We can hope that the relative lack of poverty will be enough to keep these viruses from establishing a permanent presence in this country.

In the meantime, we need to learn more about Zika and the first trimester. Can we develop effective therapy for a pregnancy identified as affected by Zika? Global surveillance will be ongoing so travel to affected destinations can be avoided by pregnant or at risk of being pregnant women. Vaccination efforts have begun and as the case many times before, control through vaccination offers the tool with the greatest possibility of controlling yet another significant health care concern.

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Control of virus transmission by limiting vector contact is a multilayered option that starts with choosing clothing (probably lightweight clothing as mosquitoes tend to be warm weather concerns) that covers arms, legs and torsos fully. The next layer of protection would be to choose permethrin containing clothing or to wash/rinse existing clothing in a permethrin containing product. Even after several washes, permethrin remains within the clothing and can serve as an effective barrier to mosquito contact. The Centers for Disease Control website provides authoritative information and is an excellent resource for becoming well informed on this subject. The final layer of protection would be the application of specific products to clothing or skin that provide a final layer of mosquito avoidance. Though DEET is the best known of the repellent chemicals and is contained in the largest number of available products, it is not the only option. Products containing picaridin, IR3535, oil of lemon eucalyptus and para-methane-diol are other chemicals the Centers for Disease Control lists as options that are safe and effective for use. There are some special considerations with use of these products with young children and once again, rather than reinvent the "wheel", the Centers for Disease Control website is a source of reliable information.

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