

Disease Potential in Michigan for Current and Potential Invasive Mosquito Species

Macy Doster

Mosquitoes have the potential to cause great problems for residents of Michigan today and in the future. The potential of disease in Michigan is dependent on several different factors including the vectors carrying the disease, the environment in which the invasive mosquito species breed and live, the restrictions of mosquito species migration, and the safety precautions that are taken when transporting potential mosquito habitat to Michigan.

It is difficult to determine the distribution of diseases spread by mosquitoes because researchers must look at the victims with the disease rather than the actual mosquitoes that spread the disease, which are called vectors. An invasive mosquito species is a mosquito that is not native to the land in which it is currently established.

Aedes albopictus (Asian Tiger mosquito) is a mosquito species that is a vector for the Yellow Fever virus, Dengue Fever, and the Chikungunya virus. *Ae. albopictus* is native to tropical and subtropical regions, but have been successfully adapting to cooler regions. The species was accidentally brought to the United States by tires that were imported from Asia. This happened because the adult female laid her eggs in the dry habitat of the tire and then were sent overseas. The tires, most likely, were outside and it rained, filling the tires with large enough amounts of water to allow the eggs to hatch into larvae.

The *Ae. albopictus* mosquito is an artificial container breeder, which includes spare tires, buckets, flower pots and uncovered, abandoned pools. In Michigan, as well as any other state, container breeders live in a habitat that can be created easily and is not determined by geographical features. The farthest north that *Ae. albopictus* has traveled is Chicago, therefore it is definitely a possibility for the species to establish

themselves in Michigan. Because the habitat is readily found, the species is currently limited by temperature and climate conditions, however, it is still very likely for the species to show up in Michigan in the near future.

The Yellow Fever mosquito, *Aedes aegypti*, is a species that is native to Africa. It was brought over to the United States on ships used for colonization in the "New World" in the 1500s. This species is a primary vector for Yellow Fever and Dengue Fever, which increases the disease potential in the areas that are invaded by the *Ae. aegypti*. One can find this species in urbanized areas, with close proximity to people. It is also "extremely common in areas lacking piped water systems" because they too are a container breeding species (Zettel 1). The species is found in 23 states and has traveled as far north as New York. The potential for disease is fairly large due to the adapting they have done as well as the migration patterns of spreading to mild temperature regions in the summer months. Michigan has a fairly warm summer that could definitely suit the *Ae. aegypti* species well.

K.B. Gibney, a researcher who is part of the Division of Vector-Borne Diseases at the Centers for Disease Control and Prevention (CDC), has done a study on a fifteen year review of Chikungunya (CHIK) cases in the United States. Gibney and his team "identified all the positive CHIK test results from 1995 through 2009" (Gibney 2). They found that "109 laboratory-confirmed CHIK cases" were discovered in the United States from 1995 through 2009. The peak of positive cases being between 2006 and 2009. Most of the cases occurred between the months of July and September, which is when vectors carrying chikungunya virus (CHIKV), such as *Aedes aegypti* and *Aedes albopictus*, are the most active. These two vectors are well established in the United

States and if CHIKV were to present itself in Michigan, it would be a seasonal introduction rather than established populations due to the cold winter. The potential for CHIK in Michigan is moderate since the two vectors are present here and are especially active, just as people are, in the summer. The cases that were discussed above were all transmitted while the victims were travelling out of the country, which decreases the potential of transmission in Michigan to decrease. Local transmission of Chikungunya is unlikely because the vectors are not well suited for Michigan's climate.

Another invasive mosquito species in Michigan that can potentially carry diseases are the *Culex pipiens*, which are vectors for the West Nile Virus (WNV) and St. Louis Encephalitis. This species is a container breeder, but can also be found in "catch basins in urban areas" (Crans 1) . This species, unlike the ones discussed previously, can obtain the disease from biting an infected bird and can then bite and infect a human. Although it is hard to tell where this species originated, it seems to be native to the Northern United States and into parts of Canada. It may be native to Michigan, which would make it a non-invasive species.

Malaria is another mosquito-borne disease, but it has not been found to be transmitted in the United States, let alone Michigan. However, there is still potential for the disease to show its presence in Michigan because the vectors, *Culex species* are still in Michigan. According to the Centers for Disease Control and Prevention, one way for the disease to come to Michigan is through people who have travelled to a country with Malaria, be bitten by an infected mosquito, and then travel back to Michigan and be bitten by another mosquito. Malaria has been very contained and used to be under high security by the CDC.

Hypothetically, it is possible for WNV, Yellow Fever, Dengue Fever, and St. Louis Encephalitis to come to Michigan because the associated vectors with each disease are present in our state. However, the conditions and several steps that must be taken for a disease to spread all the way from Africa and the other locations in which these diseases are currently present leave the potential for disease in Michigan relatively low. Under the following conditions a mosquito-borne disease can successfully spread throughout Michigan. A person comes back from a country with a mosquito bite from an infected mosquito. That person must then get bitten by a mosquito in Michigan, that mosquito will now be infected. To spread the disease any further, the mosquito must survive long enough to bite another human or bird. It is not for certain that if a disease does happen to present itself in Michigan, it will spread and cause a great epidemic. Although this may be true, our state's people and government need to take the necessary precautions in order to prevent disease transmission.

The disease potential in Michigan for current and potential invasive mosquitoes species is fairly low, but considering all the disease vectors that are present in Michigan, the spread of disease is primarily dependent on how the governments of each county in Michigan approach mosquitoes. Even if the mosquito hasn't shown signs of carrying diseases in a while, it should still be a primary concern to each county to reduce the risk of mosquito-borne diseases by using a variety of methods to decrease the amount of mosquito bites.

In Michigan, the potential for disease is caused by a combination of several factors such as, the mosquito disease vectors, the environment of these vectors, the restrictions that limit a particular mosquito species from establishing themselves, and

the precautions that are taken to prevent the spread of a mosquito-borne disease.

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