THE Science BREAKER
SCIENCE MEETS SOCIETY

February 13, 2018

Health & Physiology

Finding Zika's Achilles heel

by **Beata Kusmider**[1] | PhD student

[1]: Department of Molecular Biology, Section of Biology, Faculty of Science, University of Geneva, Switzerland.

This Break was edited by Carlos Rivera-Rivera, *Managing Editor* - TheScienceBreaker

Zika virus has been put in the spotlight after the large 2015 outbreak in Brazil. Infections have been seen in many other countries across the world, but so far there is no special treatment or vaccine available. Most of the people infected with Zika virus do not show severe symptoms or may even have none at all. However, in some infected adults, Zika virus can contribute to the development of a serious disease, the Guillain-Barré syndrome. This syndrome causes progressive muscle weakening that can lead to paralysis. The most common way that Zika spreads to humans is through bites of several mosquito species found in tropical and subtropical areas. It may also be transmitted from a pregnant woman to her child. Some of the babies infected this way are born with severe defects including an improperly formed brain (1, 2, 3).

When a person gets infected with Zika or any other pathogen, his or her defense barrier, the immune system, produces proteins called antibodies. Their purpose is to recognize and neutralize the attacking agents. Any antibody recognizes one specific part of a pathogen, called its antigen. Within all antibodies targeting the same pathogen there exist individual varieties that can recognize different antigens and that neutralize the pathogen with different efficiency. Building on that, the authors of this study set out on a mission to find effective Zika antibodies produced by the immune systems of people previously infected with the virus.

The researchers drew blood from eight patients living in different geographical locations. This is important, because Zika and other viruses may exist in many varieties. They usually come from one common ancestor, but after they spread to a new outbreak area, they can mutate and change freely to form new varieties. The authors confirmed that each patient's serum could bind to and neutralize Zika. Since multiple different antibodies are present in one person's blood, the unique subtypes had to be then separated. Antibodies are produced by a subgroup of white blood cells called B-cells. Those cells were purified from patients' blood and cultured in laboratory conditions with a single cell being used to seed one culture. The scientists established a protocol that allowed them to produce and purify large quantities of each of the antibodies in the laboratory. Among the isolated antibodies, the researchers found one that could recognize and attack multiple varieties of Zika virus coming from the Americas, Africa and Asia and chose it to study its properties in more detail.

Since the consequences of infection can be severe for adults and infants, the researchers investigated the neutralizing efficiency of the antibody in both. When the antibody was administered to already infected adult mice the amount of viruses in their organisms decreased and the mice did not develop harmful symptoms of the viral infection. Additionally, such therapy applied to pregnant females reduced Zika transmission to any fetus growing. The antibody was also tested as a protective measure, being delivered to mice before the infection could occur. As before, the mice that underwent the treatment and were exposed to the virus afterwards, shown a reduced viral load in adults and diminished mother to child transmission compared to untreated individuals.

In addition, the researchers were able to determine which part of the virus is recognized by this particular antibody. This gives valuable information for the prospective vaccine design. Vaccines use inactivated pathogens or their fragments to stimulate antibody production in our bodies before the infection occurs. Once the pathogen appears in our organisms there are enough antibodies to mount effective defense. Knowing exactly which antigen stimulates the best response in this study, future researchers could use engineered versions of that antigen to develop vaccines against Zika.

This study is another step in our battle against Zika virus. Its authors suggest that we could develop therapies based on similar molecules and use them as an emergency treatment for high-risk patients such as pregnant women. Additionally, as in the myth of Achilles, Zika virus seems to have an especially vulnerable spot which was uncovered by the researchers in this study. This brings us closer to the development of an efficient Zika vaccine that could protect imperiled populations.