Zika: What the Hell is Going On?

By Josh Bloom — July 19, 2016

In the early days of HIV/AIDS, scientists were completely baffled by this terrifying new infection. But, within a year, bits of information came together, and it all started to make sense. The pathogen, its target in the body, the mechanism by which the virus destroyed the immune system, and the means of transmission were well on the way to becoming clear.

Things do not make as much sense with Zika. Not even close. And they make less sense now than they did only a week ago. Two strange stories have surfaced within that time. First, the CDC reported the first case of sexual transmission from woman to man. And, the first death from Zika in the continental US—an elderly man from Utah who died in late June—was also reported.

Stranger still, the man's caregiver was also infected. Not only was there no sexual contact involved, but the mosquitoes that spread the infection do not even exist in the area where the victim lived. The Utah Department of Health is baffled by what could end up being yet another means of transmission of the virus—just about the last thing we need.

What the hell is going on here?

Given the advances in molecular biology and monitoring over the past 35 years, one might expect that getting the answers about another "new" pathogen, Zika, would be quick and easy. But, not in this case. Zika keeps throwing curveballs at us, and every time we think we know what is going on, the virus sticks its tongue out at us.

The female to male transmission is especially puzzling, because in some ways, Zika is acting a bit like HIV.

It is very difficult for HIV-negative men to become infected, even if they have unprotected sex with HIV-positive women. The risk per sexual event is estimated to be between one in 1,000 and one in 2,000—less than one-tenth of one percent. Even when the infected woman has late-stage disease, and the number of viruses in her body are at their highest, the chances of transmission are less than one percent.

Zika is still characterized as a mosquito-borne infection, and that could be mostly true. But we at
the Council have been questioning this all along. As my colleague Julianna LeMieux recently wrote [5], the sexual transmission component of the infection may be far more important than is commonly believed. And, Hank Campbell recently reviewed earlier evidence that raised some doubts about the importance of mosquitoes as a vector.

Recent data [6] from the CDC are puzzling as well. As of July 13th, there have been 1,306 reported cases of Zika in the US. One case was the result of a lab accident. The other 1,305 were all travel-related or sexually transmitted. There have been zero cases of mosquito-transmitted Zika in the US. How can this be? The maps below are the projected ranges of *Aedes albopictus* and *Aedes aegypti*, the two mosquitoes that are known to carry the virus.

*Estimated range of Aedes albopictus and Aedes aegypti in the United States, 2016 (April 1,2016) Source: CDC*

These projections were made prior to mosquito season, so scientists have been waiting for the answer to the big question: What is going to happen once it is mosquito season? For example, now:  

*Mosquito season in the US. Source: Mosquitoreviews.com*

The entire country is now in the middle of mosquito season, yet there is not a single case of Zika from a mosquito? Why?
It certainly is not because we are too far away from the nearest hotspot—Puerto Rico (2).

The only plausible explanation that I can come up with (and it's pretty lame) is that we have fewer infected mosquitoes in the US, either because of better control methods, or because we do not have a reservoir of infected bugs that is large enough to start an epidemic. But, zero cases? I don't get it.

At this point, there are far more questions than answers. Here are a few others:

1. Zika belongs to the Flaviviridae family of viruses. Others in this family include hepatitis C and yellow fever. Flaviviruses are not known to form reservoirs like HIV does. They are cleared and do not return. When hepatitis C is cured, it does not come back. How long will it take for the virus to clear the body? When can a woman who has been infected safely become pregnant?
2. Are we facing a possible epidemic in the US? If so, why has it not started?
3. "Live" (3) Zika virus has been found in at least four body fluids. Are there others? Can it spread by air?
4. Will antiviral drugs (or failed drugs) that inhibited hepatitis C also inhibit Zika (I doubt it, but there are many thousands of compounds that inhibited HCV, but were unsuitable as drugs for any number of reasons.) If people aren't working on this already, I'll eat my shoes.

Hang in there folks. This is a mess, and is unlikely to be sorted out soon. There is SO much that isn't known.

The only thing we know for sure is that the butler didn't do it.
(Update: July 19. Health officials are investigating whether a Miami resident, who is now infected with the virus, caught it locally. If known risk factors are ruled out, this could be the first case of mosquito-acquired Zika in the continental US.)

(Update #2: July 21st. A Lancet Infectious Diseases paper [7] reports that Zika lasted 93 days in one man's semen. This is nuts.)

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Notes:

(1) It is important to keep in mind that this is just one case. It may turn out to be wrong.

(2) The virus was first identified in Uganda in 1947. If it can get from Uganda to South America and Puerto Rico, it can sure get here.

(3) Viruses are not alive, so they can also not be dead. The term "alive" is used to describe viruses that are viable and potentially infectious. Likewise, you cannot kill a virus, but you can inactivate or destroy it.

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