Zika was a mild bug. A new discovery shows how it turned monstrous. 


In recent decades, there have been sporadic spikes of infection as the virus made its way from Africa to Southeast Asia. There was an outbreak in Micronesia in 2007, and in French Polynesia in 2013 and 2014.

But two years ago, when Zika finally reached South America, the speed at which it spread skyrocketed. Doctors also began noticing the increasing rates of the alarming microcephaly and suspected a connection to Zika. It took an international effort to connect the birth defects conclusively to Zika and begin to rein in the outbreaks.

Zika is primarily spread by mosquitoes, but it can be sexually transmitted.

To identify the small molecular change that gave Zika its sudden virulence and power to inflict birth defects, it took two dozen scientists — almost all based in China — working for more than a year to isolate the amino acid responsible.

The group took older strains of Zika from earlier outbreaks in Africa and Micronesia and compared it to the current strain in Brazil. Then, they slowly modified the older strains, making one change to a protein at a time and injecting it into pregnant female mice to see if the modified strains disrupted brain development. After trying seven different amino acids, they found the culprit.

It was a single amino acid called serine that, when replaced by another amino acid called asparagine, caused the devastating effect.

Because of the complexities involved in the research, the resulting paper carries the names of 23 co-authors, said Zhiheng Xu, a brain development expert at the Chinese Academy of Sciences, in a phone interview from Beijing. The interdisciplinary crew included experts in virology, neurologists, fetal development, mouse specialists and structural biologists as well as other fields.

Once the group isolated the protein change responsible, they checked against strains from previous eras to see when the amino acid mutation first appeared. The researchers believe the mutation occurred before a 2013 outbreak in French Polynesia and began to dominate as that strain spread to the Americas.

Part of what makes RNA viruses like Zika so successful is that their genetic material is unstable, giving them an uncanny ability to mutate quickly as they are transmitted over and over.
Scott Weaver, who heads the Institute for Human Infections and Immunity at the University of Texas Medical Branch in Galveston, called Thursday’s findings important, but pointed out the Chinese group only tested the changed amino acid strain on mice. “I believe that additional work in human cells, including cells from the placenta, as well as larger numbers of donors are needed to confirm the potentially very high significance of the study,” he said.

Before Thursday’s announcement, scientists had floated several theories for why Zika became so virulent in 2015. Some believed it had to do with the immune systems of Brazilians and South Americans, who had not been exposed to Zika before. Others thought Zika may have somehow interacted with the antibodies in the bodies of locals who had previously experienced other viruses like dengue.

Some of those other explanations may still have contributed to the outbreaks, said co-author Shi. “This isn’t the answer to everything, but it’s one of the most important pieces of the puzzle,” he said.

Zika can cause microcephaly even if moms have no symptoms, report says

What you need to know about Zika-virus