

## Deadly Viruses Have Been Part of Us for Millions of Years

by Jennifer Couzin-Frankel on July 29, 2010 4:18 PM | [Permanent Link](#) | [5 Comments](#)

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Over the past few months, researchers have [found](#) that the viruses responsible for Ebola, Marburg hemorrhagic fever, and other deadly diseases have been hanging out in the genomes of certain mammals for tens of millions of years. It turns out that this was just the tip of the iceberg. Scientists have now discovered that these viruses have integrated themselves into the DNA of a wide range of animals, including humans, zebrafish, and other vertebrates. Although the researchers don't know whether the embedded viral sequences have a function, they suspect they are helpful to the animals—otherwise, they wouldn't have endured through millions of years of evolution.

The viruses in question belong to two families: Filoviruses, which include Ebola and Marburg, and Bornaviruses, which causes neurological diseases in certain animals, such as horses. All are RNA viruses, which means they can't easily convert their genetic material into DNA, a necessary step for integrating into an animal's genome. Yet they've done just that, and the new study suggests that they've been even more successful than scientists imagined.

Anna Skalka, a virologist at Fox Chase Cancer Center in Philadelphia, Pennsylvania, was on sabbatical at Princeton University when she heard about work showing that RNA viruses had integrated into insects and plants. Along with two colleagues, Vladimir Belyi and Arnold Levine, both at the Institute for Advanced Study in Princeton, New Jersey, she decided to see whether the same was true in vertebrates. Unlike the previous studies that focused on certain

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**Hosting Ebola.** The microbat (*left*) and the tarsier have genetic sequences from Ebola embedded in their DNA.

Credit: (right, *Myotis lucifugus*) Gary Corbett/Alamy; (right, *Tarsius syrichta*) Jasper Greek Golongco



of the species, including a squirrel, a small bat, a zebrafish, and a human had RNA viral sequences embedded in their DNA. But equally intriguing was how few different families of RNA viruses turned up. Daily News  
 Filoviruses. "It's a mystery as to why this should be," Skalka says. The integrations happened as long as 40 million years ago, the team [reports](#) today in *PLOS Pathogens*.

"It would be interesting to know what's special about these two families of viruses," says Jonathan Stoye, a virologist at the National Institute for Medical Research in London. He wonders exactly how the RNA viruses are infecting cells without harming them, allowing them to become a part of an animal's DNA. That said, it's still too early to know whether Bornaviruses and Filoviruses are really overrepresented, says Derek Taylor, an evolutionary biologist at the University at Buffalo in New York. That's because studies like this can't help but miss genetic sequences from viruses that have changed significantly over time, and the viruses may now look very different from how they did when they inserted themselves into a genome. "There may be some ancient ghosts in there," Skalka agrees, "but the surviving viruses have evolved so far that we can't recognize them anymore."

Skalka speculates that the sequences her team and others have found might protect the host from infection. Interestingly, horses are especially vulnerable to Bornaviruses, and no *Bornavirus* sequences showed up in these animals. In addition, bats had Ebola-like sequences, which the scientists speculate could help them transmit the disease without succumbing to it.

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**wayne williamson**

i would like to know how they came up with the 40 million year ago integration...if its because of common ancestors its pretty weak...there is nothing to say the incorporation of genes didn't occur independently later on....

Jim Arcieri and Wicho's 13...get over it...so funny...

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**Justin Van Kleeck**

This is interesting in light of the theory that the earliest eukaryotic cells may have been prokaryotic cells invaded by viruses. This discovery seems relevant, at least in the sense of the ancient relationship (perhaps even a symbiosis?) between "hosts" and "viruses."

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**Wicho's 13**

Not only I believe this is true, but i think we humans are a virus to this planet. The same way they are viruses to our bodies.

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**Jim Arcieri**

Since DNA and RNA are codes, there must be a code creator. Perhaps if you started with the idea of design, you'd find the reason for what seems to be so strange. Snakes harbor poison without harm to themselves because they have a system designed for it. I wonder if the same system is in the original design of the genes. That still doesn't answer why - but evolution is completely unnecessary to the explanation.

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**Bob Wallace**

Sorry Jim, you're talking religion here and not providing a testable hypothesis.

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