Why doesn't Ebola cause disease in bats, as it does in people?

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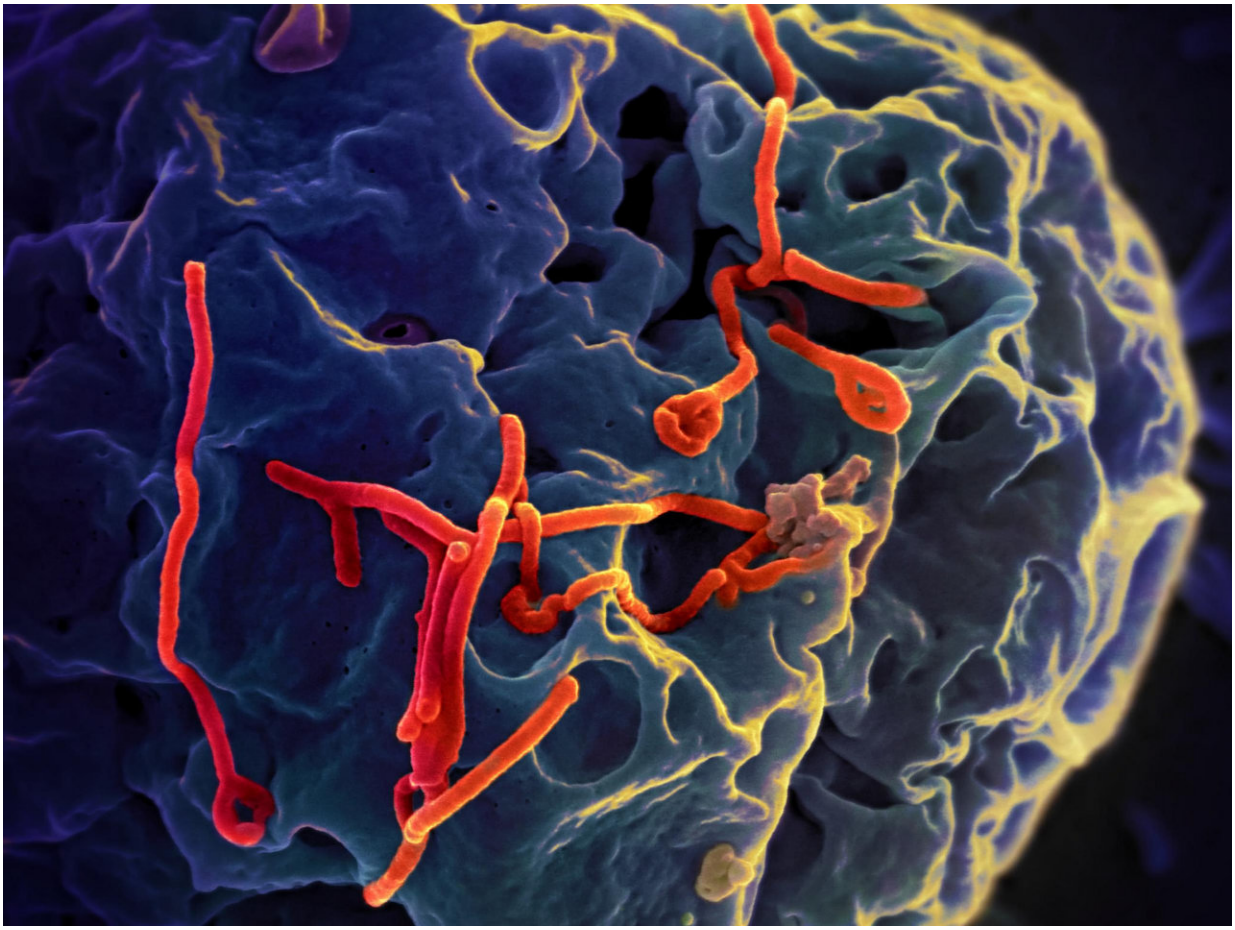

Ebola virus particles (red) on a larger cell. Credit: NIAID

A new study by researchers from The University of Texas Medical

Branch at Galveston uncovered new information on why the Ebola virus can live within bats without causing them harm, while the same virus wreaks deadly havoc to people. This study is now available in *Cell Reports*.

The Ebola virus causes a devastating, often fatal, infectious disease in people. Within the past decade, Ebola has caused two large and difficult to control outbreaks, one of which recently ended in the Democratic Republic of the Congo.

When a virus brings serious disease to people, it means that humans are not good hosts for the virus. Viruses depend on a living host for their survival and have natural reservoirs—a hosting animal species in which a virus naturally lives and reproduces without causing disease. Bats are likely a natural reservoir for the Ebola virus, but little is known about how the virus evolves in bats.

Like most other RNA viruses, Ebola's molecules are structured in a way that makes them more prone to genomic errors and mutations than other types of viruses. Because of this, Ebola and similar viruses have a remarkable ability to adapt to and replicate in new environments.

In the study, the research team, led by Alex Bukreyev, a UTMB virologist in the departments of pathology and microbiology and immunology, working with the team of Raul Andino, University of California, San Francisco, investigated how the Ebola virus adapts to both bat and human cells. They assessed changes in mutation rates and the structure of Ebola virus populations repeatedly in both bat and human cell lines using an ultra-deep genetic sequencing.

"We identified a number of meaningful differences in how the Ebola virus evolves when placed in a human cell line relative to a bat cell line," Bukreyev said. "For instance, the RNA editing enzyme called ADAR

within bat cells play a greater role in the replication and evolution of the Ebola virus than do such enzymes in human cells. We found that the envelope protein of Ebola virus undergoes a drastic increase in certain mutations within bat cells, but this was not found in human cells. This study identifies a novel mechanism by which Ebola virus is likely to evolve in bats."

The study suggests that the Ebola virus and bats can live together harmoniously because of the bat cell's ability to induce changes in the virus that make it less capable of harm. Bukreyev said that the study's findings validate the ultra-deep genetic sequencing used in this study as a predictive tool that can identify viral mutations associated with more adaptive evolution. This technology can be very useful in studying, and perhaps shaping, the evolution of emerging viruses, like SARS-CoV-2, the virus responsible for COVID-19.

More information: Zachary J. Whitfield et al, Species-Specific Evolution of Ebola Virus during Replication in Human and Bat Cells, *Cell Reports* (2020). DOI: 10.1016/j.celrep.2020.108028

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