

# Researchers identify novel virus that could cause respiratory disease in ball pythons

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A ball python (on branch) is shown. Credit: Christina Wozniak

Researchers have identified a novel virus that could be the source of a severe, sometimes fatal respiratory disease that has been observed in captive ball pythons since the 1990s. The work is published this week in *mBio*, the online open-access journal of the American Society for Microbiology.

Investigators observed the virus, which they named ball python nidovirus, in eight snakes with pneumonia; virus levels were highest in the animals' lungs and other respiratory tract tissues. The team also sequenced the genome of the virus, finding it to be the largest of any RNA virus yet described.

Ball pythons have become one of the most popular types of reptiles sold and kept as pets, the authors said, because of their relatively modest size, docile behavior and ease of care. Respiratory disease has been noted in these animals since the 1990s but until now a potential cause has not been identified, said senior study author Joseph L. DeRisi, PhD, chair of the Department of Biochemistry and Biophysics at the University of California, San Francisco, in part because of the limitations of available technology.

"This is really exciting because up to this point there have been no known viruses of this type in reptiles," DeRisi said. "Some of the most feared diseases we know of, like Ebola virus, HIV, Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), did not arise from people but have been transferred originally from animals. Our work suggests there may be very large reservoirs of genetic diversity of viral families that can cause human disease in under studied organisms, like reptiles. We would do well to look broadly across all species."

DeRisi and colleagues at seven other institutions across the country studied tissue samples from ball pythons with symptoms of respiratory disease from seven collections in Florida, Oklahoma, Pennsylvania, Texas and Wisconsin. Autopsies on the animals found lesions in the animals' upper and lower respiratory tracts, and additional lesions in other areas of the body. Using an electron microscope, investigators observed virus-like particles in the cells lining the lungs of two snakes.

To identify a cause of disease, the scientists used a technique called shotgun metagenomics to sequence RNA of eight of the snakes, finding a novel nidovirus in all of them, but not in a search of tissues from 57 other snakes not affected by pneumonia, collected for other studies. Additional work found that the virus was most prevalent in the sick animals' respiratory tract tissue, and that the nidovirus is most similar to a subset of the nidoviruses called toroviruses, which infect mammals and ray-finned fish.

"The identification of a novel nidovirus in reptiles contributes to our understanding of the biology and evolution of related viruses, and its association with [lung disease](#) in pythons is a promising step toward elucidating an etiology for this long-standing veterinary disease," DeRisi said. "Our report will enable diagnostics that will assist in determining the role of this virus in the causation of disease, which would allow control of the disease in zoos and private collections."

Yet to be determined, said study coauthor Mark Stenglein, PhD, is how the virus is spread, whether ball pythons are the primary natural host for the virus, and how widespread the virus is in the wild. In a previous study published in *mBio* in August 2012, DeRisi, Stenglein and colleagues discovered the first reptile arenavirus. The team is continuing work identifying reptilian viruses. "I think it's the tip of the iceberg," DeRisi said. Indeed, within the same month, two additional groups reported identification of a nearly identical [virus](#), in a total of five additional pythons, all with lung disease.

Provided by American Society for Microbiology

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