

A clue to stopping coronavirus: Knowing how viruses adapt from animals to humans

4 February 2020, by Frederick Cohan, Kathleen Sagarin and Kelly Mei



A horseshoe bat chasing a moth. Horseshoe bats were the source of SARS. Scientists consider bats to be a possible source of coronavirus. Credit: [DE AGOSTINI PICTURE LIBRARY / Contributor](#)

As the [novel coronavirus death toll mounts](#), it is natural to worry. How far will this virus travel through humanity, and could another such virus arise seemingly from nowhere?

As [microbial ecologists](#) who study the origins of new microbial species, we would like to give some perspective.

As a result of continuing deforestation, "bushmeat" hunting of wild animals and caring for our domestic animals, the novel coronavirus will certainly not be the last deadly [virus](#) from wild animals to infect [humans](#). Indeed, wild species of bats and primates abound in viruses closely [related to SARS](#) and [HIV](#), respectively. When humans interact with wild animal species, pathogens that are resident in those animals can spill over to humans, sometimes with deadly effects.

No new virus under the sun?

Most "emergent" viruses that are new to humans are [regular inhabitants of other species](#). In some cases, the animal hosts have reached a peaceful

coexistence with their viruses, as in the case of [bats](#). In other cases, the viruses are as deadly in their wild animal hosts as in us, as with [chimpanzees and their immunodeficiency viruses](#). Human activities have increased the rate of spillovers of wild animal viruses into our species, particularly from [bats](#).

Deforestation has brought bats closer to [human](#) habitations, [resulting in recurrent spread of Ebola from bats to humans](#) in sub-Saharan Africa. The trade in [wild animals](#) brought us SARS when [bats infected captive civets in a live-animal market](#) with the [virus](#). Most profoundly, [hunting chimpanzees in Cameroon brought humans HIV about a century ago](#), most likely by way of an [accident in handling an infected carcass](#).

Other recent, emergent viruses have come to us from bats by way of our domestic animals. Hendra and Nipah virus spilled over in 1994 from fruit bats, by way of [horses](#) and [pigs in 1999](#), respectively. In 2012 the MERS virus jumped to humans [from camels](#), which were [originally infected from bats](#) several hundred years ago. Caring for our horses' and camels' runny noses was responsible for bringing us Hendra and MERS.

Going further into the past, scientists have determined that agricultural and [domestic animals delivered to us our most deadly pathogens](#). For example, smallpox spilled over from [camels](#), and measles came to us from [cattle](#), both many centuries ago. These virus infections were not a flash in the pan but stayed with us and infected most people as children until the recent past. If not for vaccines, these viruses would still be a routine and deadly part of childhood.

While scientists do not yet know the [species](#) origin of the new coronavirus, it is unsurprising that it emerged in a market containing an [astonishing variety of live animals](#).

How far will the novel coronavirus spread?

Scientists quantify the ability of a virus to spread by [the statistic \$R_0\$](#) , which measures the average number of people each contagious person infects. When each individual carrying a virus infects more than one person ($R_0 > 1$), the virus can spread indefinitely. A happier outcome results when each infected person infects fewer than one person (R_0

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