

On the trail of the origins of Covid-19

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Cave inhabited by bats. Sanatana/Shutterstock, CC BY

As the Covid-19 virus (coronavirus SARS-CoV-2) continues to spread and claim victims worldwide, its origins remain unknown. Each scientific community puts forward its own theory, with some suggesting the virus may have leaked out of a laboratory.

Another theory, based on recent studies of the Wuhan wet market in China, along with others carried out in Cambodia, Laos, Japan, China, and Thailand, posits that an ancestral virus in rhinolophus bats went on from infecting wild and/or domestic animals to humans. Indeed, in these different studies, several viruses with genetic sequences very similar to SARS-CoV-2 were isolated in these bats.

A missing link

Though it has been shown some bat species have hosted these coronaviruses naturally, the wild or domestic animal (or animals) that acted as a bridge between them and humans – the missing link – remains unidentified. Pangolins were first suspected, but now appear to have been collateral victims rather than one of these much-talked-about missing links. A coronavirus genome sequence detected in pangolins was indeed related to that of SARS-CoV-2, but the rest of the genome was too distant from it genetically to back the hypothesis.

Moreover, the pangolins hosts in which the viruses that were genetically close to SARS-CoV-2 were found had mostly been confiscated at live-animal markets, at the end of the supply chain. As a result, they had been in lengthy contact with other animal species. It is very likely they were infected along this supply chain rather than in their natural environment. Mink farms were also suspected of being an intermediate host in China.



It is unlikely pangolins were the virus's intermediate host. Arief Budi Kusuma/Shutterstock

Lastly, pangolins and rhinolophus bats do not share the same habitat, making it highly unlikely there was any contact between the two species in which the virus jumped from one to the other. On the other hand, civets and raccoon dogs could be an intermediate source of SARS-CoV-1). Rodents or primates could also carry pathogens with zoonotic potential, such as hantaviruses – which can cause haemorrhagic fever with renal syndrome – or filoviruses, which include the Ebola virus. The latter is passed on to humans through wild animals, in particular bats, antelopes, and primates such as chimpanzees and gorillas, then spreads among humans, mainly by direct contact with blood, secretions and other bodily fluids from infected people. The average case fatality rate is around 50%.

In 2013, initial cases of disease from the Ebola virus were detected in West Africa. The rise of these cases led to over 10,000 deaths, mainly in Guinea, Liberia, and Sierra Leone.

The risky habit of bushmeat-eating

Activities such as hunting, animal-handling or eating meat from wild animals therefore create the conditions for viruses to spread from animals to humans – a potentially devastating phenomenon called “spillover”.

The ZooCov project has sought to define and quantify this risk in Cambodia. For almost two years – and right from the start of the pandemic – it has adopted a “One Health” approach to explore whether – and how – pathogens such as coronaviruses can be passed on to humans from wild animals that are hunted and eaten.

Indeed, in South-East Asia, wild animals are regularly traded, and bushmeat is customarily eaten. This eating habit is often opportunistic. In some communities, it complements a low-protein diet. It can also be frequent and targeted. In Cambodia, 77% of 107 families interviewed in the ZooCov project said they had eaten bushmeat in the past month.

Use for medicinal purposes is also widespread. In Vietnam, an analysis of records of the Vietnamese authorities confiscating pangolins and related by-products between 2016 and 2020 reported 1,342 live pangolins (6,330 kg), 759 dead pangolins or pangolin carcasses (3,305 kg), and 43,902 kg of pangolin scales.

Yet this consumption also has a cultural and social dimension that is still not properly understood. Among the well-off – and often in big cities – people sometimes eat bushmeat out of a desire for social status, and a belief that eating it endows them with the physical or physiological attributes of the animal. They also sometimes eat bushmeat out of rejection of industrially produced meat, considered unhealthy. Animals are widely reared to meet this demand and the demand for fur production.

In the Stung Treng and Mondolkiri provinces of Cambodia, where protected forest areas remain, researchers surveyed more than 900 people living on the edge of these forests to determine the structure of the illegal bushmeat trade. Statistical analyses are underway to identify the people most at risk of contact with wildlife thus with such pathogens. We already know those exposed are mostly young middle-class men, and that some communities are more exposed than others. Sociological studies have also helped better grasp today's context: the legal framework, the profiles of players in the trade, their motives and deterrents in trade and consumption of wild animals, and how the context has changed with each different health crisis (bird flu, Ebola, SARS-CoV-1, etc.).

Which populations are most at risk?

These successive crises seem to have scarcely affected the habits of these communities. Beyond regularly eating bushmeat, one fourth of the families surveyed said they still hunted or ensnared wild animals, and 11% claimed to sell bushmeat or wild animals. Furthermore, in the same areas of study, over 2,000 samples taken from wild animals trafficked or eaten for subsistence – bats, rodents, turtles, monkeys, birds, wild pigs, etc. – were analysed. Some of these samples tested positive for coronaviruses and scientists at the Institut Pasteur du Cambodge (IPC) are currently sequencing their genome in a bid to learn more about their origin, evolution, and zoonotic potential. Finally, researchers collected blood samples from over 900 people from the same region to find out whether they had been in contact with a coronavirus or coronaviruses. These analyses are still underway, but what we do know is that these people had not been exposed to SARS-CoV-2 when the survey was conducted.

If the Covid crisis has taught us anything, it is the importance of detecting such emergencies early in order to nip the pathogens in the bud. While many questions remain about the way cases emerge, there are just as many questions about the monitoring systems that should be set up to track them. The results of the ZooCov project will be used to develop a system for detecting spillover of zoonotic viruses early, particularly by strengthening the system for monitoring wildlife health that is already in operation in Cambodia, which was set up by the Wildlife Conservation Society (WCS). Other large-scale projects in research and development will help us understand, detect, and prevent these phenomena of emerging cases.

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