

News in focus



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Researchers say that a next step in the COVID-19 origins hunt should be to study wildlife, such as foxes and raccoon dogs, on farms in China.

SCIENTISTS STRUGGLE TO PROBE COVID'S ORIGINS AMID SPARSE DATA FROM CHINA

Origin investigations typically take years, but some researchers say China is delaying the process for political reasons as international tensions rise.

By Amy Maxmen

Scientists are anxious to obtain more data on the earliest days of the COVID-19 pandemic, following three tantalizing reports posted online last month¹⁻³. Although not yet published in peer-reviewed journals, the preprints provide further evidence supporting the hypothesis that the coronavirus SARS-CoV-2 spread from animals to people who raised, butchered or bought them. But the reports don't reveal exactly what happened.

The World Health Organization (WHO) Scientific Advisory Group for the Origins of Novel Pathogens (SAGO) will soon put out a report specifying studies that are urgently needed, says Maria Van Kerkhove, an epidemiologist at the WHO. A principal requirement in light of the latest preprints is to collect and analyse samples from farmers and wildlife at farms that supplied the Huanan Seafood Wholesale Market in Wuhan – to which many early COVID-19 cases were traced and where coronavirus samples from January 2020 were concentrated – as well as from market

vendors. The WHO made these suggestions a year ago, but the studies either haven't been conducted or haven't been published. The scientific community has grown frustrated with the wait as the world seeks answers to help prevent future pandemics.

Researchers in the United States, the United Kingdom and Australia who have worked closely with colleagues in China have told *Nature* that they're disappointed by the slow release of information from China about COVID-19's origins. "We are all trying to find out what the bloody hell happened, but we

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are hamstrung by the data available,” says Edward Holmes, a virologist at the University of Sydney in Australia and a co-author of two of the latest preprints^{2,3}.

Some Chinese scientists say that they, too, would like to see more origin studies, but that the topic is politically sensitive. In March 2020, a directive from the Chinese government – highlighted by the Associated Press (see go.nature.com/3jreovj) – instructed researchers at universities, companies and medical institutions to have all studies on COVID-19 vetted by government research units and then published under the direction of public-opinion teams. Those who don't follow procedures, the document warned, “shall be held accountable”.

Investigations of an outbreak's origins usually take many years to reach a conclusion, if one is ever reached. But the scientific community fears that political barriers are holding this one up – and they're unsure of the best way to expedite matters. Van Kerkhove says that SAGO will continue to outline the most pertinent studies needed, and to offer help with analyses. Until these happen, she warns, gaps in knowledge will allow damaging and scientifically unsupported theories to flourish. “If we don't get the information we need,” Van Kerkhove says, “then there's a space to fill, and people will fill that space with assumptions.”

A focus on farms

Chinese authorities closed the Huanan market on 1 January 2020, after physicians in China reported that many of the people they were treating for a mysterious form of pneumonia had worked there or visited it soon before falling ill. Researchers in China leapt to investigate. On 22 January 2020, the Chinese Center for Disease Control and Prevention (CDC) reported that 33 of 585 swabs taken from the market tested positive for SARS-CoV-2, and that these samples were concentrated in two aisles of stalls where wild animals were sold. “It is highly suspected that the current epidemic is related to the trade of wild animals,” the report said.

Investigators also collected samples from stray cats, mice and slabs of frozen and refrigerated seafood and meat, all of which tested negative for the virus. They continued to collect specimens for a couple of months, but none seems to have been from wildlife sold at the Huanan market, or from farms that reared wildlife to be sold there for food, medicine or fur.

When an international team of researchers assembled by the WHO and the Chinese government set out to study the pandemic's origins in China in late January 2021, they asked about wildlife farms supplying Wuhan's markets. Chinese researchers handed the team a list of farms that included several in southern China. This is a region where a close relative of SARS-CoV-2 has been found in bats⁴, notes Peter Daszak, one of the researchers on the team and president of EcoHealth Alliance, a



KYODO NEWS VIA GETTY

A WHO-assembled team visited Wuhan's Huanan Seafood Wholesale Market in 2021.

scientific organization in New York City that has collaborated on coronavirus research with the Wuhan Institute of Virology. But the team didn't visit the farms, and Daszak was told that they hadn't been studied because they had been closed after a ban on the consumption of wild animals in February 2020.

What's more, he says, when the team drafted a report on its investigation, some Chinese researchers and officials with China's foreign ministry wanted to change parts of it that discussed the sale of wild animals at the Huanan market.

“We are all trying to find out what the bloody hell happened, but we are hamstrung by the data.”

The final WHO report, posted in March 2021, was ambiguous over details on animals at the market – a departure from the clarity of the January 2020 notice from the Chinese CDC. The report said that “no illegal trade in wildlife has been found”, and “no verified reports of live mammals being sold around 2019 were found”. But it also referenced photographs of raccoon dogs and other live animals for sale at the Huanan market in 2014, which Holmes had submitted to the WHO team.

A few months after the report's release, conservation biologists in China published a paper⁵ documenting more than 47,000 animals – including 31 protected species – that had been sold at the Huanan market and others

in Wuhan as recently as November 2019. The report noted that almost all of the animals were sold alive in cages, that butchering was usually done at the market, and that many of the traded species are known to host a range of infectious diseases. “I'm very disappointed that the [WHO] group didn't have access to that kind of information,” Van Kerkhove says.

Seeking more details, the WHO report called for studies of wildlife farms. And it recommended that blood donations collected from people between September and December 2019, and stored at the Wuhan Blood Centre, be analysed for antibodies against SARS-CoV-2. At a press briefing in August 2021, Zeng Yixin, vice-minister of the National Health Commission in Beijing, pledged to complete the studies outlined in the WHO report. At the same time, he fiercely rejected requests by the WHO director-general to further investigate the hypothesis that SARS-CoV-2 was released from the Wuhan Institute of Virology.

More than a year since the WHO's recommendations, studies from wildlife farms, the Wuhan Blood Centre and Wuhan laboratories have yet to materialize. Chinese researchers involved in the WHO investigation, as well as others at the Chinese CDC, did not respond to queries from *Nature* about the status of the studies.

Ray Yip, an epidemiologist and former director of the Beijing branch of the US Centers for Disease Control and Prevention, says that China's approach to COVID-19 origin investigations shifted as anti-Chinese rhetoric mounted over the course of the pandemic. This largely started with former US president Donald Trump's insistence on using anti-Asian

terms for the coronavirus. “I think there was a shift in China’s attitude when they began to feel they were being humiliated or blamed for this pandemic, even though every new disease has to start somewhere,” Yip says.

Then came the unsubstantiated allegations that COVID-19 was made in a Chinese lab. Former US secretary of state Mike Pompeo said on Fox News that “a pile of evidence a hundred feet high” supported that claim. But no strong evidence for an accidental or intentional leak of SARS-CoV-2 has been put forward, and an investigation by US intelligence agencies, conducted last year, found that SARS-CoV-2 was unlikely to have been genetically engineered. In retaliation, Yip says, China’s foreign ministry has promoted a baseless rumour that the virus came from a US military laboratory.

This sort of defensiveness isn’t limited to the lab-leak hypotheses, Huang says. He speculates that because tensions between China and the United States have grown, the Chinese government wants to avoid publicizing any data that might cause world leaders to blame China for the pandemic. And he suggests that China’s government might be sensitive about the wildlife trade, which has been of significant cultural and economic value. Although the country banned the trade and consumption of terrestrial wildlife in 2020, he and other researchers say that enforcement is difficult and demand remains high.

Requests for data

Youngmee Jee, an infectious-diseases researcher and chief executive of the Pasteur Institute in South Korea, disagrees with those who say China is withholding data on COVID-19’s origins. She says that origin investigations usually take many years, and points out that Chinese researchers have already conducted a number of relevant studies. For example, a report published⁶ in *Cell* in February surveyed game animals across China for viral infections, and found 21 viruses that could be dangerous to humans – although none was SARS-CoV-2.

In an e-mail to *Nature*, Shuo Su, a virologist at Nanjing Agricultural University in China, and a co-author of the *Cell* report, stresses that the study is not connected to COVID-19’s origins. Another of the report’s co-authors, Mang Shi, an evolutionary biologist at Sun Yat-sen University in Shenzhen, reiterates Su’s point. He recommends that future origin investigations survey bats and other mammals in Laos – where researchers identified the closest-known relative to SARS-CoV-2 in bats – as well as in the neighbouring province of Yunnan in southern China. “We should keep looking at animals in that area of southeast Asia,” he says. “The exact country isn’t important.”

Seeking to encourage the release of data, virologists outside China have sent e-mails to George Gao, the head of the Chinese CDC, and his colleagues, trying to convince them of

the importance of sharing genetic sequences that could answer questions about the human or animal hosts of coronaviruses found at the Huanan market in early 2020.

As for the WHO, Van Kerkhove says that she is in contact with Gao, and that SAGO will continue to voice its recommendations for further studies, and to offer Chinese researchers help with data collection and analysis.

Whatever the strategy, Huang fears that the COVID-19 origins probe is at an impasse.

“Without cooperation from China,” he says, “there isn’t much that anyone can do.”

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2. Worobey, M. et al. Preprint at Zenodo <https://doi.org/10.5281/zenodo.6299600> (2022).
3. Pekar, J. E. et al. Preprint at Zenodo <https://doi.org/10.5281/zenodo.6291628> (2022).
4. Zhou, P. et al. *Nature* **579**, 270–273 (2020).
5. Xiao, X., Newman, C., Buesching, C. D., Macdonald, D. W. & Zhou, Z.-M. *Sci. Rep.* **11**, 11898 (2021).
6. He, W.-T. et al. *Cell* <https://doi.org/10.1016/j.cell.2022.02.014> (2022).

WHERE IS RUSSIA’S CYBERWAR? ANALYSTS DECIPHER ITS STRATEGY

Specialists expected severe cyberattacks when Russia invaded Ukraine – which so far haven’t materialized.

By Elizabeth Gibney

When Russia invaded Ukraine last month, many security analysts were expecting a level of cyberwar never seen before, because of Russia’s history of such aggression.

There has been low-level activity. Cyberattacks were under way in Ukraine even before Russian forces invaded on 24 February. Hours prior, a type of malware called a wiper circulated on Ukrainian government computing

systems, corrupting data. Earlier that week, a massive distributed denial of service (DDoS) attack, widely attributed to Russia, had flooded Ukrainian bank websites with traffic, making them inaccessible.

Such assaults were unsurprising; Ukraine has faced a barrage of cyberattacks since conflict flared with Russia in 2014. But despite the slew of low-level cyberattacks, important infrastructures including telephone, Internet, power and health-care systems remain intact.

Nature spoke to researchers about the role



The city of Mariupol has experienced some of the most intense bombing in the war so far.