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Animal markets, such as this one in China, could have seeded the COVID-19 pandemic, says a World Health Organization report.

WHO REPORT INTO COVID ORIGINS ZEROES IN ON ANIMAL MARKETS

Scientists say the conclusions make sense but note that supporters of the lab-leak theory are unlikely to be satisfied.

By Amy Maxmen

Markets that sold animals – some dead, some alive – in December 2019 have emerged as a probable source of the coronavirus pandemic in a major investigation organized by the World Health Organization (WHO).

That investigation winnowed out alternative hypotheses on when and where the pandemic arose, concluding that the virus probably didn't spread widely before December or escape from a laboratory. The investigation report, released on 30 March, also takes a deep look at the likely role of markets – including the

Huanan Seafood Market in Wuhan, to which many of the first known COVID-19 infections are linked.

“We could show the virus was circulating in the market as early as December 2019,” says the WHO’s Peter Ben Embarek, who co-led the investigation. He adds that this investigation is far from the last. “A lot of good leads were suggested in this report, and we anticipate that many, if not all of them, will be followed through because we owe it to the world to understand what happened, why and how to prevent it from happening again.”

Eddie Holmes, a virologist at the University of Sydney in Australia, says that the report

does a good job of laying out what’s known about the early days of the pandemic – and notes that it suggests next steps for study. “There was clearly a lot of transmission at the market,” he says. “To me, looking at live-animal markets and animal farming should be the focus going forward.”

Nevertheless, exactly what happened at the Huanan market remains unknown. Genomic analyses and inferences based on other diseases suggest that an intermediate animal – possibly one sold at markets – passed SARS-CoV-2 to humans after becoming infected with a predecessor coronavirus in bats.

After the report’s publication, WHO

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director-general Tedros Adhanom Ghebreyesus (who was not directly involved with the investigation) posted a statement saying that he looks forward to future studies of the virus's animal origins – but that he wasn't content with the examination of a possible laboratory leak. "I do not believe that this assessment was extensive enough," he wrote. "This requires further investigation, potentially with additional missions involving specialist experts."

Over 4 weeks from mid-January, 34 scientists from nations including China, Japan, the United States and the United Kingdom gathered in Wuhan and assessed data. The team has now published its findings in a 300-page report.

Much of it is devoted to cases occurring in December 2019 and January 2020. Of the 170-odd people who had symptoms in December, two-thirds reported having been exposed to live or dead animals shortly beforehand, and 10% had travelled outside Wuhan.

Chinese researchers sequenced SARS-CoV-2 from some of the people in this group, finding that eight of the earliest sequences were identical, and that infected people were linked to the Huanan market. This suggests an outbreak there, according to the report.

However, researchers also found that these genomes varied slightly from those in a few other early cases. Some linked to the market; others did not. This means that the coronavirus might have been spreading under the radar in communities, evolving along the way, and coincidentally occurring in people linked to the market, says the report.

Another possibility is that an outbreak occurred at a farm that provided animals to the Huanan market, suggests Holmes. Several infected animals – with slightly different variations of SARS-CoV-2 – might have then been sold at markets in Wuhan, sparking multiple infections in humans.

Plenty of animals were sold at the Huanan market. Records from December 2019 list poultry, badgers, rabbits, giant salamanders, two kinds of crocodile and more. Chinese officials said that the market didn't sell live mammals or illegal wildlife, the report adds. But it also references unverified media reports suggesting that such animals were sold, and refers to photographs that Holmes published after a trip there in 2014, of animals such as live raccoon dogs.

Chinese teams collected nearly 1,000 samples from the Huanan market in early 2020, swabbing doors, rubbish bins, toilets, stray cats and mice, and stalls that sold vegetables and animals. The majority of samples that tested positive were from stalls that sold seafood, livestock and poultry. The researchers also took samples from 188 animals across 18 species at the market, all of which tested negative.

But these animals don't represent everything sold in the Huanan market, notes WHO team member Peter Daszak, president

of the non-profit research organization EcoHealth Alliance in New York City. "A thousand samples is a great start, but there's more to do," he says. He points out that researchers traced farmed animals at the market back to three provinces in China where pangolins and bats carrying coronaviruses similar to SARS-CoV-2 had been found. Although the pangolin

"A thousand samples is a great start, but there's more to do."

and bat viruses proved too distant to be the direct progenitors of SARS-CoV-2, Daszak says that the animals might provide a clue that outbreaks among animals started in those places.

The WHO report also concludes that it's highly unlikely that the coronavirus escaped from a lab at the Wuhan Institute of Virology. Most scientists say that evidence overwhelmingly favours SARS-CoV-2 having spilled over from animals into humans, but a few have backed the idea that the virus was intentionally or accidentally leaked from a lab.

When the team visited the institute, its scientists told them that no one in the lab had antibodies against SARS-CoV-2, ruling out the possibility that someone there had

been infected in an experiment and spread it to others. The Wuhan researchers also said they hadn't kept any virus strains similar to SARS-CoV-2. And in their discussions with the team, they pointed out that similar viruses exist in animals in China, rather than in their lab.

Nevertheless, the findings might be contested. A group of scientists have written to the media saying that they wouldn't trust an investigation overseen by China's government.

But others say that the WHO's conclusions seem solid. "I'm sure people will say that the Chinese researchers are lying, but it strikes me as honest," argues Holmes. Matthew Kavanagh, a global-health researcher at Georgetown University in Washington DC, says that he's heard no evidence pointing to a lab. "But the sceptics are going to want a deeper investigation than the Chinese government allowed."

Some studies have suggested that COVID-19 was spreading among people before December 2019. To explore that possibility, the report authors looked at analyses of SARS-CoV-2 sequences collected from people in January 2020, and estimated that they evolved from a common ancestor between mid-November and early December of 2019. That estimate roughly corroborates the findings of a report published in *Science* last month (J. Pekar *et al. Science* <https://doi.org/f4cm;2021>).

OUTRAGE OVER VACCINE-TRIAL SCANDAL AT PERUVIAN UNIVERSITIES

Researchers gave shots to politicians and family members, violating trial regulations.

By Luke Taylor

A clinical trial of COVID-19 vaccines in Peru has sparked outrage and triggered a series of high-profile resignations at universities and in government. Politicians, researchers and some of their family members who were not enrolled as trial participants nevertheless received vaccines – breaching standard protocols. Investigations are ongoing as the country struggles to inoculate its general population with limited doses.

The scandal emerged on 10 February, when local media revealed that, in October 2020, then-president Martín Vizcarra had received two doses of a vaccine developed by the Chinese state-owned pharmaceutical group Sinopharm. At the time, a phase III clinical trial was under way to test the vaccine at two

universities in Peru; Vizcarra was not part of the trial.

Days later, it emerged that a group of around 470 other people – including 100 high-profile individuals such as Peru's minister of health and Vizcarra's wife and brother – also got a jab while the trial was in progress. The shots came from a batch of about 2,000 doses that Peruvian officials reportedly negotiated with Sinopharm to protect the medical staff running the trial.

It is not standard practice to vaccinate anyone other than trial participants while a trial is under way – including the medical staff running it, says Euzebiusz Jamrozik, a bio-ethicist at the Ethox Centre at the University of Oxford, UK.

The laws regulating clinical trials in Peru state that imported, experimental research products such as unapproved vaccines are to