



The BMJ

Cite this as: *BMJ* 2023;382:p1556
<http://dx.doi.org/10.1136/bmj.p1556>
 Published: 10 July 2023

COVID UNKNOWNNS

Did covid-19 come from a lab leak in China?

Three and a half years since the pandemic began, the origins of covid-19 are back in the news. **Mun-Keat Looi** asks what the latest evidence means for the laboratory leak theory of covid

Mun-Keat Looi

Why is the laboratory leak theory in the news again?

As a mystery with no definitive answer, the story of the origin of covid-19 has almost never left media reports or the public consciousness in the three years since the pandemic began.

Most recently, the US government declassified documents¹ relating to its investigation into the origins of covid-19,² while the *Sunday Times* reported documents and an interview with a former US government source.³ The *Wall Street Journal* also reported that three researchers who had been conducting coronavirus research at a controversial Wuhan laboratory in China (see [box 1](#)) were allegedly sick with signs of a respiratory illness at the end of 2019. And a BBC podcast about covid's possible beginnings⁴ featured rare public comments from the former head of China's infectious disease agency.

Box 1: What is the laboratory leak theory of covid-19?

This is the theory that instead of coming from a naturally occurring spillover from the animal kingdom, as most human diseases do, covid-19 may have been the result of a leak during laboratory experiments—either deliberately as an act of bioterrorism or accidentally because of bad laboratory safety practice. (Laboratory leaks do happen,⁶ although the vast majority are not of deadly pathogens.)⁷

Key to the credence given to the theory is the fact that the city where the first SARS-CoV-2 cases were detected is home to the Wuhan Institute of Virology (WIV), which conducts research into zoonotic diseases, including coronaviruses found in bats that are similar to SARS-CoV-2. Researchers at WIV had received funding from the US National Institute of Allergy and Infectious Diseases to do controversial “gain of function” experiments, altering viruses to see what mutations might make them deadlier.⁸ In a vacuum of answers to the mystery of how the world came to be disrupted by covid-19—or who to blame—this association is considered by many to be too much of a coincidence. These theories were posited at the beginning of the pandemic and gained momentum when then US president Donald Trump drew attention to the laboratory connection.⁹

What did the US intelligence report say?

On 23 June 2023, the director of national intelligence in the US published findings from intelligence services about the links between covid-19 and a laboratory in the city of Wuhan. Many had hoped that the report would provide evidence that might sway, or even settle, the debate about the laboratory leak

theory. But the report found no evidence to prove definitively that a laboratory leak did or did not occur. “Both a natural and laboratory associated origin remain plausible,” the report states.

The report also dismissed the possibility raised by the *Wall Street Journal* that the researchers who were unwell in late 2019 had contracted covid-19. It concluded that, although several researchers were “mildly ill” in autumn 2019, “they experienced a range of symptoms consistent with colds or allergies with accompanying symptoms typically not associated with covid-19, and some of them were confirmed to have been sick with other illnesses unrelated to covid-19.” Two of the three researchers named told *Science*⁵ that the accusations were “ridiculous,” with one denying being unwell and another pointing out that they work mainly on bioinformatics and not with live viruses.

Does any of this prove that the laboratory leak theory is correct?

No. As stated above, the US intelligence community has concluded that both the main theories—animal spillover at a wet market and laboratory leak—remain plausible, with a sense of resignation about ever finding a definitive answer.

A separate report also published in June, from the US Government Accountability Office,¹⁰ confirmed that National Institutes of Health (NIH) funding had gone to WIV and that the EcoHealth Alliance—the US research body partnering with it—“did not properly notify NIH in a timely manner of research at WIV, which, according to NIH, exceeded the safety threshold outlined in the 2016 award conditions.” Again, it cannot say whether a laboratory leak of any virus did or did not occur. (A conflict of interest with the EcoHealth Alliance and WIV also led the *Lancet* to shut down its inquiry into the origins of covid-19.)¹¹

The *Sunday Times* investigation centres on the testimony of one US official—kept anonymous for confidentiality reasons—and refers to documents “seen by” the newspaper. These follow the lines of various US federal department's investigations into the matter.

Many US federal departments have conducted their own separate investigations and have come to unclear and conflicting conclusions. The Energy Department and the Federal Bureau of Investigation both lean towards a laboratory leak as being most reasonable—FBI director Christopher Wray made headlines in March by saying he personally thinks a

laboratory origin is more likely. Five other US intelligence agencies, however, concluded that natural transmission is more likely. The Central Intelligence Agency has abstained from making even a low confidence judgement, given the lack of evidence.

US officials accept that there is good evidence that local and national authorities in China disposed of virus samples and used up others in research, some of which might have aided the investigation. The same US officials “cautioned against overstating the importance of the destroyed samples,” however, according to the *New York Times*.¹²

That the Chinese government was a major impediment to international attempts to understand covid-19 in its early months is clear. As the *New York Times* put it, “Chinese officials, according to American intelligence assessments, are either convinced the virus was caused by natural transmission or do not want to investigate further out of fear that it could hurt their international reputation if, for example, evidence emerged that would illustrate sloppy practices or unsafe experiments at one of their labs.”

The World Health Organization has repeatedly called for China to release more data and cooperate with its ongoing investigation.

What about the Chinese CDC official’s comments?

In the podcast *Fever: the Hunt for Covid’s Origins*, George Gao, president of China’s International Institute of Vaccine Innovation, said, “You can always suspect anything. That’s science. Don’t rule out anything.”⁴

This made headlines as it is rare for any Chinese official, let alone the country’s top virologist, who was head of the Chinese Centres for Disease Control during the acute phase of the pandemic, to publicly answer a question about covid-19’s origins or the laboratory leak theory.

Gao did confirm that the Chinese government had conducted some form of investigation, though it did not involve the Chinese Centres for Disease Control. “The government organised something,” he says, also confirming that the WIV laboratory that has been caught up in the laboratory leak theory “was double checked by experts in the field.”

He also said that he had not seen the report of the investigation but “heard” that the laboratory was cleared. “I think their conclusion is that they are following all the protocols. They haven’t found any wrongdoing.”

James Wood, head of department of veterinary medicine, University of Cambridge, said: “Professor Gao is an internationally respected scientist. He said science deals in probabilities and not in certainties. In reality, it may never be possible to know with confidence how the covid-19 virus entered the human population.”

What is the scientific consensus as it stands?

Many virologists, epidemiologists, and other infectious disease experts still say that all available evidence points to SARS-CoV-2 spilling over to humans from an animal host, most likely at a wet market in Wuhan.

Michael Worobey, professor of ecology and evolutionary biology at the University of Arizona, told the *Economist* that this is the most plausible explanation for three reasons. Geographically, the pattern of the earliest cases centre on the wet market. Zoonotically, animals that could be infected with SARS-CoV-2 were present at the wet market, as confirmed by peer reviewed research published in *Nature* using swab data collected from the market before the outbreak.¹³

In addition, genetic evidence following the successive mutations that occur in a virus’s genome as it replicates from generation to generation point to two spillover events from animals to humans tied to the wet market.¹⁴ Writing on Twitter, Francois Balloux, chair in computational biology systems biology at UCL, said that three independent scientific approaches (direct, serology, and phylogenetics) are “highly consistent” in pointing to “a host jump of SARS-CoV-2 from animals to humans around November 2019.

“The evidence also fits a scenario of an initial emergence in China, followed by rapid transmission to Europe, with northern Italy having acted as the epicentre of the spread to the rest of the world,” he said.

- Office of the Director of National Intelligence. Potential links between the Wuhan Institute of Virology and the origin of the covid-19 pandemic. June 2023. www.dni.gov/files/ODNI/documents/assessments/Report-on-Potential-Links-Between-the-Wuhan-Institute-of-Virology-and-the-Origins-of-COVID-19-20230623.pdf.
- Gordon MR. US funded scientist among three Chinese researchers who fell ill amid early covid-19 outbreak. *Wall Street Journal*. 20 June 2023. www.wsj.com/articles/u-s-funded-scientist-among-three-chinese-researchers-who-fell-ill-amid-early-covid-19-outbreak-3f919567?mod=hp_lead_pos11.
- Calvert J, Arbutnot G. What really went on inside the Wuhan lab weeks before covid. *Sunday Times*. 2023. www.thetimes.co.uk/article/inside-wuhan-lab-covid-pandemic-china-america-qhjwvwm0.
- Sudworth J, Maybin S. Covid: top Chinese scientist says don’t rule out lab leak. *BBC News*. 30 May 2023. www.bbc.com/news/world-asia-65708746.
- Cohen J. “Ridiculous,” says Chinese scientist accused of being pandemic’s patient zero. *Science*. 2023. www.science.org/content/article/ridiculous-says-chinese-scientist-accused-being-pandemic-s-patient-zero.
- Piper K. How deadly pathogens have escaped the lab—over and over again. *Vox*. 20 March 2019. www.vox.com/future-perfect/2019/3/20/18260669/deadly-pathogens-escape-lab-smallpox-bird-flu.
- Furmanski M. Threatened pandemics and laboratory escapes: self-fulfilling prophecies. 2014. <https://thebulletin.org/2014/03/threatened-pandemics-and-laboratory-escapes-self-fulfilling-prophecies>.
- Thacker PD. The covid-19 lab leak hypothesis: did the media fall victim to a misinformation campaign? *BMJ* 2021;374:. doi: 10.1136/bmj.n1656 pmid: 34244293
- Mazzetti M, Barnes JE, Goldman A. Trump officials are said to press spies to link virus and Wuhan labs. *New York Times*. 30 April 2020. www.nytimes.com/2020/04/30/us/politics/trump-administration-intelligence-coronavirus-china.html.
- United States Government Accountability Office. NIH could take additional actions to manage risks involving foreign subrecipients. June 2023. https://intelligence.house.gov/uploaded-files/6.14.23_gao_report_to_hpsci.pdf.
- Thacker PD. Covid-19: *Lancet* investigation into origin of pandemic shuts down over bias risk. *BMJ* 2021;375:. doi: 10.1136/bmj.n2414 pmid: 34598923
- Barnes JE. US intelligence agencies may never find covid’s origins, officials say. *New York Times*. 21 June 2023. www.nytimes.com/2023/06/21/us/politics/covid-pandemic-lab-leak-intelligence.html.
- Liu WJ, Liu P, Lei W, et al. Surveillance of SARS-CoV-2 at the Huanan Seafood Market. *Nature*. 2023. doi: 10.1038/s41586-023-06043-2. pmid: 37019149
- Markov PV, Ghafari M, Beer M, et al. The evolution of SARS-CoV-2. *Nat Rev Microbiol* 2023;21:-79. doi: 10.1038/s41579-023-00878-2 pmid: 37020110