

Relevant studies and articles regarding the origin of SARS-CoV-2 virus

Continuous and commented list (chronological order)

[Crits-Christoph, A., Gangavarapu, K., Pekar, J.E., Moshiri, N., Singh, R., Levy, J.I., ... & Débarre, F. \(2023\) Genetic evidence of susceptible wildlife in SARS-CoV-2 positive samples at the Huanan Wholesale Seafood Market, Wuhan: Analysis and interpretation of data released by the Chinese Center for Disease Control. Zenodo, preprint, 20 March 2023. \[1\]](#)

Unearthed data from online genomic database GISAID adding to the body of evidence identifying the Huanan market as the spillover location of the virus and the epicenter of the pandemic. The findings were discussed in journals like SCIENCE (16 March [2], 17 March [3], 21 March [4]) or NATURE (21 March [5], 29 March [6]), [7] and by the WHO [8].

[Gordon, M.R., Strobel, W.P. \(2023\) Lab Leak Most Likely Origin of Covid-19 Pandemic. Energy Department Now Says. Wall Street Journal \(26 February 2023\). \[9\]](#)

The U.S. Department of Energy now concludes that the pandemic probably arose from a laboratory leak.

[Bruttel, V., Washburne, A., & VanDongen, A. \(2022\) Endonuclease fingerprint indicates a synthetic origin of SARS-CoV-2. bioRxiv, 2022-10 \(20 October 2022\). \[10\]](#)

Preprint claiming a "high likelihood" that SARS-CoV-2 was engineered in a lab as "restriction site fingerprint and the pattern of mutations generating them are extremely unlikely in wild coronaviruses".

[Pekar, J. E., Magee, A., Parker, E., Moshiri, N., Izhikevich, K., Havens, J. L., ... & Wertheim, J. O. \(2022\) The molecular epidemiology of multiple zoonotic origins of SARS-CoV-2. Science, 377\(6609\): 960-966 \(26 July 2022\). \[11\]](#)

Science paper claiming that the pandemic likely resulted from multiple zoonotic events originating at the wildlife market in Wuhan.

[Worobey, M., Levy, J. I., Malpica Serrano, L., Crits-Christoph, A., Pekar, J. E., Goldstein, S. A., ... & Andersen, K. G. \(2022\). The Huanan Seafood Wholesale Market in Wuhan was the early epicenter of the COVID-19 pandemic. Science, 377\(6609\): 951-959 \(26 July 2022\). \[12\]](#)

Science paper claiming that the Wuhan wildlife market was the epicenter of the COVID-19 pandemic.

[Harrison, N. L., & Sachs, J. D. \(2022\) A call for an independent inquiry into the origin of the SARS-CoV-2 virus. Proceedings of the National Academy of Sciences, 119\(21\): e2202769119. \[13\]](#)

Opinion piece in PNAS asking for transparency regarding the collaboration between Chinese institutions/laboratories and US agencies. There's also an article in THE INTERCEPT [14] on this paper.

[Eban, K. \(2022\) "This Shouldn't Happen": Inside the Virus-Hunting Nonprofit at the Center of the Lab-Leak Controversy. Vanity Fair \(31 March 2022\). \[15\]](#)

Investigation regarding the role of EcoHealth Alliance in risky coronavirus research.

[Maxmen, A. \(2022\) Scientists struggle to probe COVID's origins amid sparse data from China. Nature \(17 March 2022\). \[16\]](#)

Latest news on the search for the virus origin, the WHO and the role of China.

[Lerner, S., Hvistendahl, M. \(2022\) Peter Daszak answers critics and defends coronavirus research. The Intercept \(11 March 2022\). \[17\]](#)

Interview with controversial scientists Peter Daszak on his ties to coronavirus research and the Wuhan Institute of Virology.

[Maxmen, A. \(2022\). Wuhan market was epicentre of pandemic's start, studies suggest. Nature. 603\(7899\): 15-16 \(27 February 2022\).](#) [18]

Nature article on new studies pointing to the Wuhan market as starting point of the virus outbreak.

[Temmam, S., Vongphayloth, K., Salazar, E.B., Munier, S., Bonomi, M., Regnault, B., ... & Eloit, M. \(2022\) Bat coronaviruses related to SARS-CoV-2 and infectious for human cells. Nature. 1-10 \(16 February 2022\).](#) [19]

Nature study showing that coronaviruses very closely related to SARS CoV-2 can be found in bats in Laos. However, none of the viruses harbored the furin cleavage site.

[Technofog \(2022\) New documents reveal early beliefs that SARS-CoV-2 was engineered. The Reactionary \(11 January 2022\).](#) [20]

Emails from prominent scientists like Anthony Fauci showing that a huge effort was made to shut down discussions for political reasons.

[Thacker, P.D. \(2022\) Why Do People Not "Trust the Science"? Because Like All People, Scientists Are Not Always Trustworthy. The Disinformation Chronicle \(11 January 2022\).](#) [21]

Case study showing that one of the earliest publications slamming the lab leak theory was secretly edited by a leading researcher at the Wuhan Institute of Virology, amongst others.

[Suryanarayanan, S. \(2021\) Wuhan's lower biosafety level labs posed greater risk for coronavirus lab leak, experts said. U.S. Right to Know \(27 December 2021\).](#) [22]

Emails obtained by the NGO U.S. Right to Know showing that biosafety experts had considerable doubts regarding the safety measures at the Wuhan Institute of Virology (WIV).

[Schmidt, C. \(2021\) Scientists Square Off Over Covid, Wuhan, and Peter Daszak. Undark Magazine \(24 November 2021\).](#) [23]

Article on western scientists and their conflicts of interest regarding independent assessment of the origins of the virus.

[Ruiz-Medina, B.E., Varela-Ramirez, A., Kirken, R.A., Robles-Escajeda, E. \(2021\) The SARS-CoV-2 origin dilemma: Zoonotic transfer or laboratory leak? BioEssays. 44: e2100189 \(21 November 2021\).](#) [24]

Publication weighing the arguments for zoonotic transfer/lab leak. The authors conclude that there is "stronger evidence supporting a zoonotic transfer. However, lack of transparency has given way to maintain the laboratory leak hypothesis alive. Because of the implications, the two scenarios should remain on the table, and additional vigorous investigations are needed to reach a conclusion about the origin of SARS-CoV-2."

[Helden, J. van, Butler, C.D., Achaz, G., Canard, B., Casane, D., Claverie, J.-M., Colombo, F., Courtier, V., Ebright, R.H., Graner, F., Leitenberg, M., Morand, S., Petrovsky, N., Segreto, R., Decroly, E., Halloy, J. \(2021\) An appeal for an objective, open, and transparent scientific debate about the origin of SARS-CoV-2. The Lancet 398: 1402-1404 \(17 September, 2021\).](#) [25]

Joint letter in The LANCET asking for a science-based approach regarding the origin of the virus: „.... research-related hypotheses are not misinformation and conjecture. More importantly, science embraces alternative hypotheses, contradictory arguments, verification, refutability, and controversy. Departing from this principle, risks establishing dogmas, abandoning the essence of science, and, even worse, paving the way for conspiracy theories.“

[Knapton, S. \(2021\) Revealed: How scientists who dismissed Wuhan lab theory are linked to Chinese researchers. The Telegraph \(10 September 2021\).](#) [26]

Analysis showing that almost all scientists who in a letter to The Lancet publicly dismissed the possibility that SARS-CoV-2 could have come from a lab in Wuhan, had links to its Chinese researchers, their colleagues or funders.

[Maxmen, A. \(2021\) US COVID origins report: researchers pleased with scientific approach. Nature 597: 159-160 \(27 August 2021\).](#) [27]

Nature article summarising the outcomes of a US intelligence analysis of the virus origins. The report was ordered by President Biden. "Intelligence agencies were divided on whether the pandemic most likely began because of a laboratory accident, or because of human contact with an infected animal. The only strong conclusion is that the coronavirus was not developed as a biological weapon; most agencies thought, with low confidence, that it was unlikely to have been genetically engineered."

[Holmes, E.C., Goldstein, S.A., Rasmussen, A.L., Robertson, D.L., Crits-Christoph, A., Wertheim, J.O., ... & Rambaut, A. \(2021\) The origins of SARS-CoV-2: A critical review \(19 August 2021\). Cell, 184\(19\): 4848-4856. \[28\]](#)

Review of the scientific evidence regarding the origin of SARS-CoV-2, favouring the theory of a zoonotic event as the cause of the pandemic, but also stating that "the possibility of a laboratory accident cannot be entirely dismissed".

[Domingo, J. L. \(2021\) What we know and what we need to know about the origin of SARS-CoV-2. Environmental Research, 200: 111785 \(28 July 2021\). \[29\]](#)

Good overview weighing the evidence for the possible origins of the virus. The publication concludes that the scientific literature does not "allow yet drawing definitive and conclusive conclusions about the origin of SARS-CoV-2."

[Birrell, I. \(2021\) Did scientists stifle the lab-leak theory? UnHerd \(22 July, 2021\). \[30\]](#)

Well-informed newspaper article about the role of scientists in stifling the debate on the origin of the virus.

[Bloom, J.D., Chan, Y.A., Baric, R.S., Bjorkman, P.J., Cobey, S., Deverman, B.E., Fisman, D.N., Gupta, R., Iwasaki, A., Lipsitch, M., Medzhitov, R., Neher, R.A., Nielsen, R., Patterson, N., Stearns, T., van Nimwegen, E., Worobey, M., Relman, D.A. \(2021\) Investigate the origins of COVID-19. Science 372: 694-694 \(14 July 2021\). \[31\]](#)

Joint letter composed by prominent scientists calling for a science-based discourse regarding the origin of the virus. Published in Science journal.

[Maxmen, A., Mallapaty, S. \(2021\) The COVID lab-leak hypothesis: what scientists do and don't know. Nature 594: 313-315 \(8 June 2021\). \[32\]](#)

Article in Nature journal discussing the various questions connected to the lab leak theory: Is it suspicious that no animal has been identified as transmitting the virus to humans? Does the virus have features that suggest it was created in a lab? Did researchers collect SARS-CoV-2 from a mine?, amongst others.

[Piplani, S., Singh, P. K., Winkler, D. A., & Petrovsky, N. \(2021\) In silico comparison of SARS-CoV-2 spike protein-ACE2 binding affinities across species and implications for virus origin. Scientific reports, 11\(1\): 1-13 \(24 June 2021\). \[33\]](#)

Publication in Scientific Reports describing how surprisingly well-adapted to humans the SARS-CoV-2 spike protein is. "It remains to be addressed whether SARS-CoV-2 is completely natural and was transmitted to humans by an intermediate animal vector or whether it might have arisen from a recombination event that occurred in a laboratory handling coronavirus, inadvertently or intentionally, with the new virus being accidentally released into the local human population."

[Matthews, D. \(2021\) Elite journals under scrutiny over role in Wuhan lab leak debate. Times Higher Education \(7 June 2021\). \[34\]](#)

Times article disclosing massive conflicts of interests of a key scientist who dismissed the possibility of a lab leak.

[Deigin, Y., Segreto, R. \(2021\) SARS-CoV-2's claimed natural origin is undermined by issues with genome sequences of its relative strains. BioEssays 43: 2100015 \(27 May 2021\). \[35\]](#)

Investigation of specific genetic features of SARS-CoV-2 virus, challenging the natural origin.

[Zimmer, C., Gorman, J., Mueller, B. \(2021\) Scientists Don't Want to Ignore the 'Lab Leak' Theory. Despite No New Evidence. The New York Times \(27 May 2021\). \[36\]](#)

Balanced New York Times article, quoting different scientists and showing that in the early days of the pandemic, it was very difficult for scientists to discuss the lab leak theory seriously because of

the Trump administration's conspiracy myths regarding the virus outbreak.

[Donald G. McNeil Jr. \(2021\) How I Learned to Stop Worrying And Love the Lab-Leak Theory. \(17 May 2021\).](#) [37]

Article by Pulitzer Prize winning journalist, Donald G. McNeil Jr., with lots of information regarding the corona virus research at the Wuhan Institute of Virology.

[WHO \(2021\) WHO calls for further studies, data on origin of SARS-CoV-2 virus, reiterates that all hypotheses remain open \(30 March 2021\).](#) [38]

First WHO report claiming: "As far as WHO is concerned, all hypotheses remain on the table."

[Segreto, R., Deigin, Y., McCairn, K., Sousa, A., Sirotkin, D., Sirotkin, K., Couey, J.J., Jones, A., Zhang, D. \(2021\) Should we discount the laboratory origin of COVID-19? Environ Chem Lett 19, 2743-2757 \(25 March 2021\).](#) [39]

Publication on specific genomic features of SARS-CoV-2 concluding that while "a natural origin is still possible and the search for a potential host in nature should continue, the amount of peculiar genetic features identified in SARS-CoV-2's genome does not rule out a possible gain-of-function origin..."

[Young, A. \(2021\) Could an accident have caused COVID-19? Why the Wuhan lab-leak theory shouldn't be dismissed. USA Today \(22 March 2021\).](#) [40]

Article summarising the history of accidents and breaches in high-security labs handling dangerous pathogens.

[Schmidt, Christian, 2021. Lab Leak: A Scientific Debate Mired in Politics — and Unresolved. Undark Magazine \(17 March 2021\).](#) [41]

Detailed article describing the politization of the scientific debate surrounding the origin of the virus.

[Mallapaty, S., Maxmen, A., Callaway, E. \(2021\) 'Major stones unturned': COVID origin search must continue after WHO report, say scientists. Nature 590: 371-372 \(10 February 2021\).](#) [42]

Nature article quoting different scientists questioning the outcomes of the first WHO report on the virus origins.

[Sallard, E., Halloy, J., Casane, D., Decroly, E., van Helden, J. \(2021\) Tracing the origins of SARS-COV-2 in coronavirus phylogenies: a review. Environ Chem Lett 19: 769-785 \(4 February 2021\).](#) [43]

Publication stating that the "data currently available are not sufficient to firmly assert whether SARS-CoV2 results from a zoonotic emergence or from an accidental escape of a laboratory strain. This question needs to be solved because it has important consequences on the risk/benefit balance of our interactions with ecosystems, on intensive breeding of wild and domestic animals, on some laboratory practices and on scientific policy and biosafety regulations."

[Segreto, R., Deigin, Y. \(2021\) The genetic structure of SARS-CoV-2 does not rule out a laboratory origin. BioEssays 43: 2000240 \(17 November 2020\).](#) [44]

One of the first genomic analyses questioning the natural origin of specific elements of SARS-CoV-2 virus.

[Sirotkin, K., Sirotkin, D. \(2020\) Might SARS-CoV-2 have arisen via serial passage through an animal host or cell culture? BioEssays 42, 2000091 \(12 August 2020\).](#) [45]

Genomic analysis and discussion of the possibility of SARS-CoV-2 being a product of gain-of-function research.

[Cyranoski, D. \(2020\) The biggest mystery: what it will take to trace the coronavirus source. Nature \(5 June 2020\).](#) [46]

Early Nature article discussing, but mostly dismissing, the theory of a lab leak.

[Andersen, K.G., Rambaut, A., Lipkin, W.I., Holmes, E.C., Garry, R.F. \(2020\) The proximal origin of SARS-CoV-2. Nature medicine, 26\(4\): 450-452 \(17 March 2020\).](#) [47]

Early publication on genomic features of the virus. "However, since we observed all notable SARS-CoV-2 features, including the optimized RBD and polybasic cleavage site, in related coronaviruses in

nature, we do not believe that any type of laboratory-based scenario is plausible."

[Sallard, E., Halloy, J., Casane, D., Decroly, E., van Helden, J. \(2021\) Tracing the origins of SARS-COV-2 in coronavirus phylogenies: a review. Environmental Chemistry Letters, 1-17 \(4 February 2021\).](#) [48]

Paper weighing up the possible origins of the virus. The authors conclude that "on the basis of currently available data it is not possible to determine whether the emergence of SARS-CoV-2 is the result of a zoonosis from a wild viral strain or an accidental escape of experimental strains."

[Calisher, C., Carroll, D., Colwell, R., Corley, R. B., Daszak, P., Drosten, C., ... & Turner, M. \(2020\) Statement in support of the scientists, public health professionals, and medical professionals of China combatting COVID-19. The Lancet, 395\(10226\): e42-e43 \(19 February, 2020\).](#) [49]

Influential letter written by scientists (many of them with ties to the Wuhan Institute of Virology) branding the lab leak discussion a conspiracy theory, and thus adding to the toxicity of any future debate. "We stand together to strongly condemn conspiracy theories suggesting that COVID-19 does not have a natural origin."

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Links

[1] <https://zenodo.org/record/7754299#.ZBj4TvbMI2x> [2] <https://www.science.org/content/article/covid-19-origins-missing-sequences> [3] <https://www.science.org/content/article/it-s-inexcusable-who-blasts-china-not-disclosing-potential-data-covid-19-s-origin> [4] <https://www.science.org/content/article/covid-origin-report-controversy> [5] <https://www.nature.com/articles/d41586-023-00827-2> [6] https://www.nature.com/articles/d41586-023-00901-9?WT.ec_id=NATURE-202303&utm_source=sap-outbound-id=FFF9DE43E313E5357BB5A0546228BAE66DC61D89 [7] <https://doi.org/10.1038/d41586-023-00827-2> [8] <https://www.who.int/news/item/18-03-2023-sago-statement-on-newly-released-sars-cov-2-metagenomics-data-from-china-cdc-on-gisaid> [9] https://www.wsj.com/articles/covid-origin-china-lab-leak-807b7b0a?mod=trending_now_news_1 [10] <https://www.biorxiv.org/content/10.1101/2022.10.18.512756v1> [11] <https://www.science.org/doi/10.1126/science.abp8337> [12] <https://www.science.org/doi/10.1126/science.abp8715> [13] <https://www.pnas.org/doi/10.1073/pnas.2202769119> [14] https://theintercept.com/2022/05/19/covid-lab-leak-evidence-jeffrey-sachs/?utm_medium=email&utm_source=The%20Intercept%20Newsletter [15] <https://www.vanityfair.com/news/2022/03/the-virus-hunting-nonprofit-at-the-center-of-the-lab-leak-controversy> [16] <https://www.nature.com/articles/d41586-022-00732-0> [17] https://theintercept.com/2022/03/11/covid-nih-ecohealth-peter-daszak-interview/?utm_medium=email&utm_source=The%20Intercept%20Newsletter [18] <https://www.nature.com/articles/d41586-022-00584-8> [19] <https://www.nature.com/articles/s41586-022-04532-4> [20] <https://technofog.substack.com/p/new-documents-reveal-early-beliefs> [21] <https://disinformationchronicle.substack.com/p/why-do-people-not-trust-the-science> [22] <https://usrtk.org/biohazards/wuhans-lower-biosafety-level-labs-posed-greater-risk-for-coronavirus-lab-leak/> [23] <https://undark.org/2021/11/24/scientists-square-off-over-covid-wuhan-and-peter-daszak/> [24] <https://doi.org/10.1002/bies.20210018> [25] [https://doi.org/10.1016/S0140-6736\(21\)02019-5](https://doi.org/10.1016/S0140-6736(21)02019-5) [26] <https://www.telegraph.co.uk/news/2021/09/10/revealed-scientists-dismissed-wuhan-lab-theory-linked-chinese/> [27] <https://doi.org/10.1038/d41586-021-02366-0> [28] <https://www.sciencedirect.com/science/article/pii/S0092867421009910> [29] <https://www.sciencedirect.com/science/article/pii/S0013935121010793> [30] <https://unherd.com/2021/07/how-scientists-stifled-the-lab-leak-theory/> [31] <https://doi.org/10.1126/science.abj0016> [32] <https://doi.org/10.1038/d41586-021-01529-3> [33] <https://www.nature.com/articles/s41598-021-92388-5> [34] <https://www.timeshighereducation.com/news/elite-journals-under-scrutiny-over-role-wuhan-lab-leak-debate> [35]

<https://doi.org/10.1002/bies.202100015> [36] <https://www.nytimes.com/2021/05/27/health/wuhan-coronavirus-lab-leak.html> [37] <https://donalddgmcneiljr1954.medium.com/how-i-learned-to-stop-worrying-and-love-the-lab-leak-theory-f4f88446b04d> [38] <http://https://www.who.int/news/item/30-03-2021-who-calls-for-further-studies-data-on-origin-of-sars-cov-2-virus-reiterates-that-all-hypotheses-remain-open> [39] <https://doi.org/10.1007/s10311-021-01211-0> [40] <https://eu.usatoday.com/in-depth/opinion/2021/03/22/why-covid-lab-leak-theory-wuhan-shouldnt-dismissed-column/4765985001/> [41] <https://undark.org/2021/03/17/lab-leak-science-lost-in-politics/> [42] <https://doi.org/10.1038/d41586-021-00375-7> [43] <https://doi.org/10.1007/s10311-020-01151-1> [44] <https://doi.org/10.1002/bies.202000240> [45] <https://doi.org/10.1002/bies.202000091> [46] <https://doi.org/10.1038/d41586-020-01541-z> [47] <https://www.nature.com/articles/S41591-020-0820-9> [48] <https://link.springer.com/article/10.1007/s10311-020-01151-1> [49] [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30418-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30418-9/fulltext)