

About the Genomic Origin and Direct Source of the Pandemic Virus

*Dany Shoham**

The debate over the genomic origin and direct source of the pandemic virus has intensified due to recent analyses concerning activities that had taken place in Wuhan prior to the initial outbreak and thereafter. Revisiting various aspects which are related to this development appears to be imperative, as certain early indications seem to converge with those analyses, while other recent analyses are contradictory.

A REMARKABLE MOVE UNDERTAKEN BY MAJOR JOSEPH MURPHY – BACKGROUND AND REPERCUSSIONS

The remarkable study undertaken in 2021 by Major Joseph Murphy during his service at the United States (US) Defense Advanced Research Projects Agency (DARPA)—whereby he objectively analysed activities planned (and performed) by Wuhan Institute of Virology (WIV) in conjunction with various collateral information—caused him to conclude that the initial virus generating the pandemic was created at WIV, and accidentally leaked therefrom in 2019.¹ This important development has led to the present commentary.

¹ Dr Dany Shoham is from Begin-Sadat Center for Strategic Studies, Bar Ilan University, Israel.



A 2015 article on China's biological weapons (BW) programme noted:

The chances that an outstanding state like China would ignore new avenues of BW designing and deployment are a priori slim, if any. China, in all likelihood, is and will persist as a paramount BW possessor.

In 2010, the Monitor Group, a prominent international management consulting partnership, predicted that China would, within a decade, become the world leader in discovery and innovation in life sciences. Some research is seen as less controversial in China than elsewhere, such as research regarding the genetic causes of intelligence, which is just one example...Fundamentally, it is assumed that China would not miss, skip, or give up any highly advanced technology, especially when it is military oriented. This postulation refers to BW, among other disciplines. And it seems that once targeted, the upgrading of BW by Chinese military scientists will persist for long.

[China's BW arsenal presumably] comprises a first generation of BWA [biological warfare agents] (for example, plague and brucellosis germs) in an operational state; a second generation of BWA (for example, Hantan and Japanese Encephalitis viruses) in an operational state; plus a third generation of BWA (for example, SARS, Ebola and Influenza viruses) still under development, in part or entirely.

Notably, some of the mentioned [Chinese] facilities have frequent and systematic interactions with American scientists, often aiming to absorb—ostensibly academically—advanced know-how from the concerned scientists. Those interactions appear to represent an inherent line within China's scientific international interfaces. It is directed primarily by COSTIND [Commission for Science, Technology and Industry for National Defense] and by the PLA Military Intelligence Department.

Uniquely, across China...officially...the Wuhan Institute of Virology is...equipped with [a maximal level biohazard facility (BSL-4)], furnished by a French supplier. The Institute investigates highly virulent viruses, such as SARS, influenza H5N1, Japanese encephalitis, and dengue. Besides this, the germ causing anthrax is studied in the institute, too (which is beyond the discipline of virology).²

The study on anthrax was done with the State Key Laboratory of Pathogen and Biosecurity of the Academy of Military Medical Sciences.

An additional important perspective can be attained by looking into the list of Chinese facilities or bodies that were represented in the international ‘Trends in Science and Technology Relevant to the Biological and Toxin Weapons Convention’,³ in China, in 2010. Convened in cooperation with the Chinese Academy of Sciences (CAS), and reflecting, if inferentially, involvement—administrative, conceptual or practical—in the Chinese BW programme, the Chinese facilities or bodies represented thereby included the following:

1. Division of International Organization, Bureau of International Cooperation, CAS (represented by Qi Dong).
2. Organisation for International Dialogue and Conflict Management (represented by Lei Pei).
3. Department of Science and Education, National Institute for Communicable Disease Control and Prevention (represented by Zhenjun Li).
4. Plant Protection and Plant Quarantine Division, Department of Crop Production, Ministry of Agriculture (represented by Enlin Zhu).
5. Institute of Biophysics, CAS (represented by Lei Zhang).
6. WIV, CAS (represented by Zhiming Yuan)
7. Beijing Institute of Biological Science, CAS (represented by Ming Li).
8. Institute of Microbiology, CAS (represented by Li Huang).
9. Chinese Academy of Military Medical Sciences (represented by Gang Dong, Shu Liu, Jinglin Wang, Lei Wang, Li Wang, Xiushan Zhang, Lianhui Zhu).

Except for one military facility, all the facilities and bodies are civilian, including the four institutes affiliated with the CAS.

Nominally just civilian, to be more precise.

Under the Chinese Academy of Military Medical Sciences is the Institute of Microbiology and Epidemiology, Beijing, about which it has been stated in the 2015 article mentioned earlier:

The institute is a major facility in China, where aerobiological R&D take place, and pertain to applicable BW-related aspects within a variety of areas...Also, the institute dealt in 2009 with simultaneous detection of five biothreat agents...The so-called ‘five representative biothreat agents’ included the bacteria *B. anthracis* (spores) and *Y. pestis*, the virus SARS-CoV, staphylococcal enterotoxin B and ricin toxin.⁴

Thus, together with two germs and two toxins, SARS-CoV or severe acute respiratory syndrome-associated coronavirus is the only virus mentioned within this significant context.

Also, in 2015, a Chinese governmental document, 'The Unnatural Origin of SARS and New Species of Man-made Viruses as Genetic Bioweapons', described SARS coronaviruses as a 'new era of genetic weapons' that can be 'artificially manipulated into an emerging human disease virus, then weaponised and unleashed in a way never seen before'.⁵ Among the many listed authors of the document were People's Liberation Army (PLA) scientists and weapons experts, most of whom worked at China's Air Force Medical University and one who had collaborated on many scientific papers with researchers at the WIV. Claiming that terrorists using gene editing had created SARS-CoV-1 as a bioweapon, the document explored issues surrounding the development of bioweapons capabilities.

Further, in 2015, aiming to 'examine the emergence potential (that is, the potential to infect humans) of circulating bat CoVs', Professor Shi Zhengli used, in WIV (together with University of North Carolina), a novel chimeric virus by taking the backbone of the SARS-CoV-1 virus and replacing its spike protein with one from a bat virus (known as SHC014-CoV). This manufactured virus was able to infect the cells of the human airway, at least when tested against a lab culture of such cells.⁶ Simultaneously, in 2015, French intelligence officials warned that China was cutting back on agreed collaboration (mainly in terms of French supervision) at the WIV, and that the lab could one day be transformed into a 'biological arsenal'.⁷

For several years, a nearly silent (and yet highly productive, particularly during 2017)⁸ Chinese 'incubation period' took place. It was interrupted, in 2018, by US Embassy officials who visited WIV several times and sent two formal warnings to Washington about inadequate safety at the lab, while conducting risky studies on coronaviruses from bats. Nonetheless, this incubation period was supported by the significant merging of Wuhan Institute of Biological Products (WIBP) with WIV in Wuhan's Zhengdian site; but then, the WIV again occupied the headlines in 2019, not in its favour (though with no connection to SARS-CoV-2). A battery of lethal strains of Ebola and henipavirus were improperly dispatched to WIV by a distinguished Chinese virologist, Dr Xiangguo Qiu, who headed the Vaccine Development and Antiviral Therapies section in the Special Pathogen Program of the Public Health Agency of Canada.

Commenting on this affair in a newspaper interview, the author of this commentary stated: ‘I would say this Canadian “contribution” might likely be counterproductive. I think the Chinese activities...are highly suspicious, in terms of exploring (at least) those viruses as BW agents.’⁹ Further elaborating on Chinese facilities with which Dr Qiu had links, another article mentioned:

[Among those facilities] There are four facilities that have been regarded to possess parts of the Chinese biological weapons alignment, namely:

- Institute of Military Veterinary, Academy of Military Medical Sciences, Changchun
- Center for Disease Control and Prevention, Chengdu Military Region
- Wuhan Institute of Virology, Chinese Academy of Sciences, Hubei
- Institute of Microbiology, Chinese Academy of Sciences, Beijing.¹⁰

On the last day of December 2019, the Chinese authorities informed the world for the first time that a virus (SARS-CoV-2) had caused an outbreak in Wuhan. A few weeks later, in an article in *The Washington Times*, it was stated while talking about the roots of the virus that:

Certain laboratories in the institute (WIV) have probably been engaged, in terms of research and development, in Chinese [biological weapons], at least collaterally, yet not as a principal facility of the Chinese BW alignment. Work on biological weapons is conducted as part of dual civilian–military research and is ‘definitely covert’... It is not known whether the institute’s coronaviruses are specifically included in China’s biological weapons program but it is possible... The [bordering] Wuhan Institute of Biological Products is a civilian facility but is linked to the Chinese defense establishment. China’s vaccine against SARS is probably produced there. This means the SARS virus is held and propagated there, but it is not a new coronavirus unless the wild type has been modified...In principle, outward virus infiltration might take place either as leakage or as an indoor unnoticed infection of a person that normally went out of the concerned facility. This could have been the case with WIV, but so far there isn’t evidence or indication for such incident.¹¹

Nonetheless, things have changed since January 2020; indications and circumstantial evidence gathered.

A remarkably meticulous review about WIBP at large concluded that ‘any investigation of the possible origins of SARS-CoV-2 should consider the WIBP and the WIV on their common Zhengdian location as one integrated unit’,¹² particularly:

A Hazardous Waste Disposal Service-Tender Notice published by WIBP in December 2018 mentioned 28 tons of small experimental animal carcasses and 25 tons of substandards vaccines accumulated over a year.

Construction work occurred in 2019 next to the operating BSL-4, BSL-3 and BSL-2, animal houses and vaccine labs of the WIV and WIBP. Construction work included a large research center and overhaul of wastewater treatment.

In August 2019, the WIBP completed the animal room rabbit 1, 2 workshop roof waterproof linoleum demolition and installed a new one, involving local roof skeleton removal of new works, roof red tile finishing flips and other maintenance to improve the workshop roof leakage problem.¹³

It might be of merit to take a notice of the latter sentence, in particular.

During the recent decade, certain vaccine and drug developments involving the WIBP’s National Engineering Technology Research Center of Combination Vaccines (and the Division of HIV/AIDS and Sex-transmitted Virus Vaccines of the National Institutes for Food and Drug Control, Beijing) included:

1. Lassa virus vaccine: within the context of ‘the ability [of the virus] to cause lethal disease in humans, limited treatment options, and potential as a bioweapon’.¹⁴
2. A drug against smallpox virus: within the context of ‘increasing concern over the potential use of smallpox virus as a biological weapon’.¹⁵
3. Recombinant vaccinia vaccine virulence and immunogenicity: within the context of ‘expressing the HIV-1 envelope gene’.¹⁶
4. SARS-CoV-2 convalescent patient sera: within the context of ‘developing a pseudovirus-based neutralization assay evaluating neutralizing antibodies against SARS-CoV-2 in biosafety level 2 facilities’.¹⁷

The article, ‘Establishment and Validation of a Pseudovirus Neutralization Assay for SARS-CoV-2’, by Nie et al., was submitted

for publication on 24 February 2020,¹⁸ that is, just 55 days after the initial pandemic notification by China. Incidentally or not, on 24 February 2020, a patent for a vaccine against SARS-CoV-2 was filed by principal investigator Yusen Zhou, a PLA scientist who worked on it with WIV and WIBP. Zhou died three months later under undisclosed circumstances.¹⁹ On 25 February 2020, Sinopharm's Chief Executive Officer, Yu Qingming, disclosed in an interview how China had approved 'conditional sales' of his firm's vaccine (developed foremost in WIBP), with senior managers given the jab in March of that year.²⁰ Also, in February 2020, Major General Professor Wei Chen, a prominent Chinese biological warfare expert affiliated with the military's Beijing Institute of Biotechnology, was appointed head of the WIV wing dealing with coronaviruses. In Wuhan, she collaborated with the WIBP and Wuhan-based academic institutions. Her objectives were to oversee their activities and to develop/complete vaccines, anti-sera and other countermeasures to guard against the spreading SARS-CoV-2 virus.²¹

As for the WIV's planned (and performed) activities during 2018–19 (within 'Project DEFUSE: Defusing the Threat of Bat-borne Coronaviruses', administered by EcoHealth Alliance), which were analysed by Major Joseph Murphy, they included the following tasks at the WIV (and occasionally at other facilities outside China, in parallel to WIV):

Design Luciferase immunoprecipitation system (LIPS) assays to high- and low-jump risk SARSr-CoV QS₀ we have characterized... Determine specificity of LIPS assays by *recombinant protein or attenuated virus inoculation into rabbits*...Validate LIPS assays using positive serum samples, spike protein based LIPS and viral neutralization...Test previously-collected human sera from Yunnan Province to assess SARSr-CoV QS spillover.

Testing of targeted immune boosting in wild-caught captive *Rhinolophus* spp [bats].

Experimental testing of targeted immune boosting using humanized mice and experimental bat colonies...

Identify specific sites (entry, exit points), identify FEA automatic aerosolization points, fine-tune deployment plan...Conduct bat viral surveillance of one test-site cave and two control caves at our cave complex to assess baseline data before deployment proof-of-concept experiment...

Run deployment experiment of most effective immune boosting molecules and delivery techniques via FEA aerosolization

mechanism at one test and two control bat cave sites in Yunnan, China.

...test bat fecal, oral, and blood samples for SARSr-CoVs by PCR...collect viral load data from fresh fecal pellets. SARSr-CoV spike proteins will be sequenced, viral recombination events identified, and isolates used to identify strains that can replicate in human cells.

Experimental work using bats and transgenic mice will be conducted at the BSL-3 in WIV, Duke-NUS, UNC, or NWHC.

...biohazardous waste will be contained in biohazard bags and sharps containers and incinerated at WIV or Yunnan CDC facilities.

This will be supplemented by characterization of isolated viruses...*approximately 15–20 bat SARSr-CoV spike proteins/year...* and >180 bat SARSr-CoV strains sequenced in our prior work and not yet examined for spillover potential.

...conduct *in vitro* pseudovirus binding assays, using established techniques, and live virus binding assays (at WIV, to prevent delays and unnecessary dissemination of viral culture) for isolated strains. Initial model predictions based on these data inputs will be used to guide strain selection for further characterization.²²

Subsequent to analysing Project DEFUSE activities of WIV—which are fairly detailed and partially suspicious—plus additional information, at DARPA, Major Murphy concluded that an initial lab escape of the virus sparking the pandemic took place, accidentally, in August 2019, when a precursor virus was being modified—incompletely yet, hence still virulent—into an attenuated live vaccine, tentatively. Thus, it appears that the coinciding of such a virus—intended to eventually be inoculated into rabbits, possibly in an aerosolic form—and the August 2019 leakage in the animal room rabbit 1, 2 workshop roof (mentioned earlier) is highly supportive of Murphy’s conclusion.

Still, while the report by Murphy connects Project DEFUSE to the lab leak hypothesis, the related data published by EcoHealth involves viruses genetically distant, relatively, from the one that primarily caused COVID-19.²³ However, it would be naive to think that EcoHealth is or was aware of all strains, either natural or genetically modified, of SARS-related viruses held, explored and tested in WIV (presumably in a dual-purpose course, often); particularly, considering the removal by WIV of a critical database regarding viruses collected by WIV from the institute records in September 2019 (plus a series of additional aberrant deeds), shortly after the alleged August 2019 leak.

All in all, the scenario posed by Murphy is clearly consistent with the aforementioned January 2020 observation concerning possible virus leak from WIBP, that is: 'China's vaccine against SARS is probably produced there [in WIBP]. This means the SARS virus is held and propagated there, but it is not a new coronavirus, unless the wild type has been modified.'²⁴

Other recent analyses ostensibly point to raccoon dogs and red foxes placed in Wuhan wet market as natural generators of the incipient contagion,²⁵ yet their findings seem to be, for now, fractional; in 2020, pangolins and wild bats were pointed at as natural generators, whereas now raccoon dogs and red foxes are supposed to be the generators.

And while a concrete, primarily natural animal host of the pandemic virus has yet not been established (in about two and a half years), a modified virus could readily form in laboratory animals, such as monkeys, for example; a possible scenario, then, is the one posed by British military and intelligence expert Col. (Retd) Richard Kemp:

The high probability, I was told, is that the virus came from an animal that had been involved in testing in WIV and had ended up in the wet market. It was believed then and now the carcass was infected with coronavirus and that an unscrupulous member of staff sold it for personal profit without considering it may be infected. That is how it got out. I have known the source for many years and come to trust this person as serious and not given to false claims. In intelligence terms it means we have to take it very seriously as it means it is known to be true but cannot be backed up by absolute evidence.²⁶

Rabbits, monkeys, experimental bats, humanised mice? Were infected carcasses of such lab animals conveyed inappropriately from WIV to Wuhan wet market and used to feed raccoon dogs and red foxes placed therein; or otherwise brought about the incipient contagion?

THE BIOLOGICAL WEAPONS (BW) DIMENSION

It should be emphasised that all of the mentioned performed activities of WIV within the described Project DEFUSE with EcoHealth might be entirely civilian, in principle. However, the issue of how the interfaces taking place during the last decade among the WIV, WIBP, the PLA and the Chinese defence establishment, within the context of SARS-related coronaviruses research and development, ought to be observed remains open for the time being.

A senior Russian scientist, Professor Peter Chumakov (a member of the Russian Academy of Sciences), said that Chinese scientists at WIV had taken extremely dangerous steps during their studies of tentative vaccines, including inserts in the genome, that gave the treated virus unordinary ability to infect human cells. He underscored the possibility that ‘behind the scientists stood curators who directed actions in another direction that they needed’.²⁷

The PLA paid much attention to SARS-related viruses not only in terms of public health but also in general terms of biological warfare, as indicated here. However, PLA linkages to WIV might be considered more meaningful within the context of this commentary. Thus, Colonel Dr Lawrence Sellin (Retd) pointed, in detail, at PLA activities and connections suspected of enabling and bringing about the emergence of SARS-CoV-2 in Chinese labs, with special reference to Wuhan.²⁸ Sellin especially noted that:

early in 2019, a fully or nearly fully formed SARS-CoV-2 was sent from the PLA Eastern Theater Command in Nanjing, its headquarters, to WIV, specifically for testing on monkeys. The leader of these tests was Chao Shan, who has a background in working with monkeys and transmitting viruses.²⁹

Notably, WIV has long been routinely supplied with rhesus monkeys from the Macaque Breeding Base in Suizhou City. Alongside, cell culture derived from African green monkey has been used as well in WIV and could significantly enhance bat coronaviruses adaptation to humans (thus leading to SARS-CoV-2), as suggested recently,³⁰ and supported by Kaina.³¹ Moreover, according to Sellin, there have been indeed multiple links between WIV and the PLA’s biowarfare programme.³²

Further, in his 2021 book, *Infinite Errors: The Secret Story of a Pandemic that Should Have Been Avoided*, Fabrizio Gatti states that there are at least two Chinese Communist Party military scientists on the Academic Committee of WIV, namely: Wang Hongyang of the Second Military Medical University, who served as the deputy director of the committee from 2019 to 2020; and the other is Wang Fusheng from the Military Infectious Diseases Hospital 302.³³ Both facilities are regarded as affiliated with the PLA’s BW programme alignment, at large.³⁴

The US Department of State Fact Sheet has noted the connections between the WIV and the PLA:

Despite the WIV presenting itself as a civilian institution, the US has determined that the WIV has collaborated on publications and secret projects with China's military. The WIV has engaged in classified research, including laboratory animal experiments, on behalf of the Chinese military since at least 2017.³⁵

Strangely, the US Director of National Intelligence Office ignored this information.³⁶

All in all, some cardinal points are yet to be illuminated and clarified. In its essence, it is still a wide-ranging challenge of integrating science and intelligence, with weighty implications.

NOTES

1. VERITAS document of Major Josheph Murphy's letter to the US Department of Defense Inspector General, 13 August 2021, available at https://assets.ctfassets.net/syq3snmxclc9/2mVob3c1aDd8CNvVnyei6n/95af7dbfd2958d4c2b8494048b4889b5/JAG_Docs_pt1_Og_WATERMARK_OVER_Redacted.pdf
2. D. Shoham, 'China's Biological Warfare Programme: An Integrative Study with Special Reference to Biological Capabilities', *Journal of Defence Studies*, Vol. 9, No. 2, April 2015, available at https://www.idsa.in/jds/9_2_2015_ChinasBiologicalWarfareProgramme.
3. 'Trends in Science and Technology Relevant to the Biological and Toxin Weapons Convention: Summary of an International Workshop', National Research Council, 2011, available at <http://www.nap.edu/catalog/13113/trends-in-science-and-technology-relevant-to-the-biological-and-toxin-weapons-convention>.
4. Jing Wang, Yu Yang, Lei Zhou, Jinglin Wang, Yongqiang Jiang, Kongxin Hu et al., 'Simultaneous Detection of Five Biothreat Agents in Powder Samples by a Multiplexed Suspension Array', *Immunopharmacology and Immunotoxicology*, Vol. 31, No. 3, 2009, pp. 417–27.
5. 'Five Years before Pandemic, Chinese Scientists Discussed Weaponising Coronaviruses: Report', *The Week*, 9 May 2021, available at <https://www.theweek.in/news/world/2021/05/09/five-years-before-pandemic-chinese-scientists-discussed-weaponising-coronaviruses-report.html>
6. V.D. Menachery, B.L Yount, K. Debbink, S. Agnihothram, L.E. Gralinski, J.A. Plante et al., 'A SARS-like Cluster of Circulating Bat Coronaviruses Shows Potential for Human Emergence', *Nature Medicine*, Vol. 21, 2015, pp. 1508–513.
7. Imogen Braddick, 'France Warned Wuhan Lab could be Turned into a "Biological Arsenal" by Chinese Military Four Years before Covid

- “Leak”, *The Sun*, 29 July 2021, available at <https://www.thesun.co.uk/news/15729081/france-warned-wuhan-lab-biological-arsenal-chinese-military/>
8. D. Shoham, ‘Too Many Coincidences: The Likelihood that a Lab Leak in Wuhan led to the COVID-19 Outbreak’, BESA Center Perspectives Paper No. 2,112, 3 August 2021, available at <https://besacenter.org/too-many-coincidences-the-likelihood-that-a-lab-leak-in-wuhan-led-to-the-covid-19-outbreak/>
 9. Tom Blackwell, ‘Bio-warfare Experts Question Why Canada was Sending Lethal Viruses to China’, *National Post*, 8 August 2019, available at <https://nationalpost.com/health/bio-warfare-experts-question-why-canada-was-sending-lethal-viruses-to-china>.
 10. D. Shoham, ‘China’s Biological Warfare Programme and the Curious Case of Dr. Xiangguo Qiu’, *CBW Magazine*, Vol. 12, No. 4, 2019, available at <https://idsa.in/cbwmagazine/chinas-biological-warfareprogramme>
 11. Bill Gertz, ‘Coronavirus Link to China Biowarfare Program Possible, Analyst Says’, *The Washington Times*, 26 January 2020, available at <https://www.washingtontimes.com/news/2020/jan/26/coronavirus-link-to-china-biowarfare-program-possible/>.
 12. Rodolphe de Maistre, Gilles Demaneuf and Billy Bostickson, ‘Wuhan Institute of Biological Products Co’, Projects: Pandemics DRASTIC, March 2021, available at https://www.researchgate.net/publication/350485858_Wuhan_Institute_of_Biological_Products_Co.
 13. Ibid.
 14. Q. Li, Q. Liu, W. Huang, J. Wu, J. Nie, M. Wang et al., ‘An LASV GPC Pseudotyped Virus Based Reporter System Enables Evaluation of Vaccines in Mice under Non-BSL-4 Conditions’, *Vaccine*, Vol. 35, No. 38, September 2017, pp. 5172–178.
 15. J. Wu, Q. Liu, H. Xie, R. Chen, W. Huang, C. Liang et al., ‘Screening and Evaluation of Potential Inhibitors against Vaccinia Virus from 767 Approved Drugs’, *Journal of Medical Virology*, Vol. 91, No. 11, November 2019, pp. 2016–24.
 16. R. Zhu, W. Huang, W. Wang, Q. Liu, J. Nie, S. Meng et al., ‘Comparison on Virulence and Immunogenicity of Two Recombinant Vaccinia Vaccines, Tian Tan and Guang9 Strains, Expressing the HIV-1 Envelope Gene’, *PLoS One*, Vol. 7, No. 11, 2012, p. e48343.
 17. J. Nie, Q. Li, J. Wu, C. Zhao, H. Hao, H. Liu et al., ‘Establishment and Validation of a Pseudovirus Neutralization Assay for SARS-CoV-2’, *Emerging Microbes and Infections*, Vol. 9, No. 1, 2020, available at <https://www.tandfonline.com/doi/full/10.1080/22221751.2020.1743767/>.

18. Ibid.
19. Andrew Court, 'Chinese Military Scientist Filed a Patent for a COVID-19 Vaccine BEFORE the Virus was Declared a Global Pandemic and Worked Closely with "Bat Woman" at Wuhan Institute', *Mail Online*, 7 June 2021, available at <https://www.dailymail.co.uk/news/article-9658235/Chinese-scientist-filed-patent-COVID-vaccine-virus-declared-global-pandemic.html>.
20. Ian Birrell, "A Lab Leak isn't 100% Certain but it Seems to be the Only Logical Source of Covid": Washington Expert Who led Inquiry into the Cause of the Virus Reveals Three Wuhan Lab Scientists Fell Ill in November 2019', *Mail Online*, 28 March 2021, available at <https://www.dailymail.co.uk/news/article-9410163/US-State-Department-expert-David-Asher-says-lab-leak-logical-explanation-Covid-source.html>.
21. D. Shoham, 'Where did COVID-19 Really Come from?', BESA Center Perspectives Paper No. 1,664, 28 July 2020.
22. 'Project DEFUSE: Defusing the Threat of Bat-borne Coronaviruses', VERITAS document of the research proposal, March 2018, available at https://assets.ctfassets.net/syq3snmxcl9/4NFC6M83ewzKLf6DvAyg/b4/0cf477f75646e718afb332b7ac6c3cd1/defuse-proposal_watermark_Redacted.pdf; emphasis in original.
23. Christa Case Bryant, 'Did Fauci Mislead Congress? NIH Letter Deepens Concerns', *The Christian Science Monitor*, 22 October 2021, available at <https://www.csmonitor.com/USA/Politics/2021/1022/Did-Fauci-mislead-Congress-NIH-letter-deepens-concerns>.
24. Bill Gertz, 'Coronavirus Link to China Biowarfare Program Possible, Analyst Says', n. 11.
25. Carl Zimmer and Benjamin Mueller, 'New Research Points to Wuhan Market as Pandemic Origin', *New York Times*, 27 February, 2022, available at <https://www.nytimes.com/interactive/2022/02/26/science/covid-virus-wuhan-origins.html>
26. Chris Hughes, 'UK colonel told it's "highly probable" coronavirus came from secretive Chinese lab', *Mirror*, 4 June 2020, available at <https://www.mirror.co.uk/news/world-news/sinister-links-trace-coronavirus-back-22140342>
27. Will Stewart, 'Wuhan Scientists "Did Absolutely Crazy Things" to Alter Coronavirus, Expert Claims', *Mirror*, 24 April 2020, available at <https://www.mirror.co.uk/science/wuhan-scientists-did-absolutely-crazy-21920746>.
28. Lawrence Sellin, 'The Chinese Military, its Links to U.S. Funding and the Laboratory Origin of COVID-19', Citizens Commission on National Security, 14 February 2021, available at <https://ccnationalsecurity.org/>

- the-chinese-military-its-links-to-u-s-funding-and-the-laboratory-origin-of-covid-19/; and ‘WION Speaks with Retired US Army Officer Colonel Lawrence Sellin’, 14 August 2021, available at https://www.youtube.com/watch?v=lu-O2QoTeTQ&ab_channel=LawrenceSellin.
29. Savio Rodrigues and Sonakshi Datta, ‘Unraveling the Corona Virus Origin Mystery with Dr. Lawrence Sellin’, *Goa Chronicle*, 24 May 2021, available at <https://goachronicle.com/unraveling-the-corona-virus-origin-mystery-with-dr-lawrence-sellin/>.
 30. Connor Boyd and Luke Andrews, ‘The “Early Covid Mutations” from a Chinese Lab that are Fueling Leak Theory’, *Mail Online*, 10 February 2022, available at <https://www.dailymail.co.uk/news/article-10497629/The-early-Covid-mutations-Chinese-lab-fuelling-leak-theory.html>.
 31. B. Kaina, ‘On the Origin of SARS-CoV-2: Did Cell Culture Experiments Lead to Increased Virulence of the Progenitor Virus for Humans?’, *In Vivo*, Vol. 35, No. 3, 2021, pp. 1313–326, available at <https://iv.iiarjournals.org/content/35/3/1313.long>.
 32. ‘Lawrence Sellin: National Institutes of Health (NIH) Spent \$Billions Supporting Research in China Including its Biowarfare Program’, *Survival Magazine*, 5 February 2022, available at <https://survivalmagazine.org/news/lawrence-sellin-national-institutes-of-health-nih-spent-billions-supporting-research-in-china-including-its-biowarfare-program/>; and Lawrence Sellin, ‘The Laboratory Origin of COVID-19 and the Ongoing Cover-up of its Origin, the Structure of China’s Biowarfare Program and China’s Massive Infiltration of U.S. Virus Laboratories’, *Lawrence Sellin Newsletter*, 16 February 2022, available at https://lawrencesellin.substack.com/p/the-laboratory-origin-of-covid-19?utm_source=url.
 33. Philip Willan and Didi Tang, ‘Wuhan Lab used Chinese Military as Key Advisers’, *The Times*, 21 June 2021, available at <https://www.thetimes.co.uk/article/china-nominates-lab-leak-wuhan-institute-of-virology-for-top-science-award-37pg72gx5>.
 34. Shoham, ‘China’s Biological Warfare Programme’, n. 2.
 35. ‘Fact Sheet: Activity at the Wuhan Institute of Virology’, US Department of State, 15 January 2021, available at <https://2017-2021.state.gov/factsheet-activity-at-the-wuhan-institute-ofvirology/index.html>
 36. Dany Shoham and Yossi Kuperwasser, ‘The U.S. Intelligence Community and the Roots of the Pandemic Virus’, *Journal on Chemical and Biological Weapons*, July–December 2021, pp. 4–15, available at <https://www.idsa.in/system/files/page/2015/cbw-winter-july-december-2021-final-version-5-16.pdf>