

How science demolishes the right-wing fiction of a Wuhan “lab leak” as the source of coronavirus

Part one of a three-part series

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This is part one of a three-part series. Part two can be viewed [here](#), and part three can be viewed [here](#).

“How on earth can I offer up evidence for something where there is no evidence? I don’t know how the world has come to this, constantly pouring filth on an innocent scientist,” said Dr. Shi Zhengli to the *New York Times* last week on the media speculation that the virus which caused the COVID-19 pandemic escaped from her lab.

Dr. Shi is the director of the Center for Emerging Infectious Diseases at the Wuhan Institute of Virology (WIV), located in Jianxia District in Wuhan City, which is at the epicenter of the “lab-leak” claims. She has devoted her efforts to analyzing the SARS family of viruses that triggered a 2002 pandemic in order to protect humanity against a future pandemic. Her work on coronaviruses (CoVs) has been critical to understanding the pandemic potential of these pathogens.

Indeed, her decade-long research into bat-related viruses and her work to build up the world’s largest database on them were vital in quickly identifying the novel coronavirus causing the unusual pneumonias in Wuhan in December 2019. As the *South China Morning Post* noted in February 2020, “Her work gave a head start to the scientific research community’s understanding of the origin of the new virus.” Yet she was thrown into the maelstrom of conspiracy theories that have emphatically asserted that the virus originated at the Wuhan lab.

More than one year into the pandemic, these baseless theories are propounded throughout the corporate press as part of a coordinated international campaign to deflect the burden of blame for the pandemic from the ruling elites’ disastrous response against the contagion and thrust it on to the heads of the Chinese government and Chinese scientists.

On May 29, 2021, the *World Socialist Web Site* wrote, “There is no factual or scientific foundation for the claim that the virus originated in a Chinese laboratory. To date, the only evidence presented by the White House, the US intelligence agencies, and the media to support the claim is that employees at the Wuhan Institute of Virology became ill in late 2019 with symptoms that a State Department report acknowledged are ‘consistent with ... common seasonal illnesses.’”

The question posed above by Dr. Shi places the issue in its appropriate context. The burden of proof has been reversed, so that the accused must demonstrate their innocence. Not only that, but as with the “weapons of mass destruction” hoax advanced by the Bush-Cheney administration before the US invasion of Iraq in 2003, the accused is called on to prove a negative—in 2003, the non-existence of weapons in Iraq, in 2021, the non-existence of a program in Wuhan to engineer a deadly virus.

The WWSW has already documented the origins of the “lab leak” account as a fabrication of the American ultra-right, promoted by

President Donald Trump, his close counselor Steve Bannon, and right-wing anti-Beijing multi-millionaire “dissidents.” The purpose has been to shift public opinion and pave the way for American aggression against China, up to and including all-out war. This has entailed a full-scale assault on science and scientists, who largely reject and refute the “lab leak” claims.

A survey conducted by *Morning Consult* this month suggests that almost half of Americans now believe that the virus that causes COVID-19 was leaked from the Wuhan lab, indicating that the incessant clamor by the media and politicians of both parties has had its desired effect on public opinion.

The purpose of this series is to provide an account of what experts in the field of virology are actually saying about the issue, and what the science actually shows about the claims that the Wuhan lab is the source of coronavirus. This entails extensive citation of scientific reports and communications among scientists, for which the writer asks in advance the reader’s patience and best efforts to follow the intricate details.

The most comprehensive investigation of this issue was presented by the World Health Organization in their phase one report, in February 2021, on the origin of the virus, which was led by 17 international experts. In no uncertain terms they stated that a lab leak was “extremely unlikely.”

Professor Dominic Dwyer, a microbiologist from New South Wales, Australia, and one of the team members, identified a critical weakness in the conspiracy theory, telling the *Sydney Morning Herald*: “The laboratory leak, for that to be the origin ... meant they must have had the virus to begin with, and we don’t have evidence of that ...”

As a matter of fact, back in January 2020, after having their first glimpse at the genetic sequence of the SARS-CoV-2 virus and noting unusual features in its make-up, renowned evolutionary virologist Dr. Kristian Andersen, from Scripps Research Institute in La Jolla, California, and his colleagues considered the possibility that the virus could have been engineered.

However, after an extensive review and analysis, the team concluded that the virus had emerged from nature. Their discussion in these early investigations provided the background for Dr. Anthony Fauci’s emails that were recently made public and taken out of context for political purposes. More on this later.

To substantiate their claim that the Chinese engineered the SARS-CoV-2 virus and either accidentally or deliberately released the pathogen, the *New York Times*, *Washington Post*, and *Wall Street Journal* have turned to the writings of Nicholas Wade instead. His scientific-sounding but highly distorted assessment of the facts regarding the origin of SARS-CoV-2, published in the *Bulletin of the Atomic Scientists* on May 5, has

been used to provide this dangerous political hoax a modicum of credibility.

The WWS has previously detailed Wade's background as a science journalist, not a scientist, and his advocacy of extremely right-wing views, including a 2014 book that argued for genetic differences in intelligence between the races, which was widely condemned by scientists, though hailed in neo-Nazi circles.

We will address the main issues raised by Wade in the course of his lengthy piece, although it should be pointed out that he begins his treatise by admitting that there is no direct evidence to support the theory of a laboratory leak. That alone should have been sufficient grounds for the editors to reject his article for publication, except for the political agenda that it served.

The "Proximal Origin" report

Wade attacks Dr. Andersen and his colleagues for their initial work, titled, "The Proximal Origin of SARS-CoV-2," published in the reputable *Nature Medicine*, where they explained why the evidence pointed to the emergence of the virus from nature. He does little more than claim their conclusions were "strained" and "contrived," without actually rebutting the scientific basis of their arguments.

He dismisses the study as "a letter, in other words an opinion piece, not a scientific article," although it would be more correct to describe the work as an interim report. The 2,300-word, highly technical analysis is published under the heading "Correspondence," but with five scientists as co-authors and 30 footnoted references. (A well respected journal of modern physics is titled *Physical Review Letters*, conveying how the term "letters" is used to describe scientific assessments).

The Andersen document explores three alternative theories of the origin of SARS-CoV-2, including natural selection in an animal host, followed by transfer to humans; transfer from animals to humans followed by natural selection in humans; and creation in a laboratory through the process known as "selection during passage," i.e., repeated passage of the virus through cells in the laboratory while it is manipulated to acquire new characteristics.

The authors conclude that further study was required to determine which of the two natural selection processes was more likely, while the laboratory origin was extremely unlikely, particularly because the virus had characteristics requiring development under the pressure of an immune system—in other words, it had to have grown up and mutated within a living organism. For a lab to have simulated the natural environment to the extent required to generate the mutations that created SARS-CoV-2, one scientist later observed, it would have to use so many animals that the Wuhan Institute of Virology could open its own zoo.

Throughout the lengthy article, Wade makes scientific assertions that expose his complete lack of understanding of the analysis conducted and its implications. He banks on his readers' lack of familiarity with the scientific details to cover for his avoidance of the real issues, while he casts aspersions on the motives of scientists who uphold the natural origins of SARS-CoV-2. And he apparently never reached out to speak to Dr. Shi Zhengli about the nature of her work and her studies.

Wade pretends to consider two alternative theories, which he presents as initially equally probable: that the coronavirus has a natural origin, and that it was developed in the Wuhan lab. Actually, however, he stacks the deck, claiming that the only evidence of natural origin was in the statements issued by groups of scientists at the onset of the pandemic, while all the empirical evidence developed since then cuts the other way, in favor of a lab leak.

In particular, Wade and other advocates of the "lab leak" theory cite the existence of what is called the furin cleavage site, a point on the spike protein of SARS-CoV-2 where the protein can more easily divide to better invade human cells. They claim (falsely) that there is no such site in other coronaviruses found in nature, so it must have been introduced through genetic engineering.

It is worthwhile to review how Dr. Shi and Dr. Andersen defend their work, by referencing their actual explanations for the emergence of the SARS-CoV-2, something which Wade never does. We will also consider how other scientists in the field of virology regard the work of Shi and Andersen, and what they make of the claims of the "lab-leak" theory.

Dr. Shi Zhengli

On February 3, 2020, Dr. Shi Zhengli and colleagues published the first extensive review on the novel CoV in the journal *Nature*, reporting on their initial investigation into and describing the full genomic sequence of the novel CoV, initially labelled 2019-nCoV, later to be dubbed SARS-CoV-2.

Their paper described receiving samples derived from the lung tissue of seven critically ill patients admitted to the ICU at Wuhan Jin Yin-Tan Hospital, six of whom worked at the Hunan Seafood market. According to Shi, the samples were received on December 31, 2019, and by January 2, 2020, her team had identified the responsible pathogen, a novel coronavirus. She added that an "exhaustive" search of coronaviruses in her lab's databank did not demonstrate any matching sequences.

Notably, several labs, including the Chinese Center for Disease Control and Prevention, all independently verified the genetic sequence of the novel CoV in the first week of January 2020. One of these investigators, famed virologist Dr. Zhang Yongzen, and his team at Shanghai Public Health Clinic, grew frustrated by delays from the Chinese authorities, and published the sequence on January 11, 2020, on the website virological.org, giving the rest of the world a first look at the genetic blueprint of SARS-CoV-2.

In the findings of Shi's team, five of the seven samples were positive for coronavirus infection on first sampling, using the Polymerase Chain Reaction (PCR) test which has now come into use worldwide. One sample was analyzed for its genomic sequences, and 87.1 percent of the sequences matched those from previously studied SARS-related coronaviruses.

They also confirmed that the novel coronavirus and the original SARS-CoV detected in 2002 shared almost 80 percent of their nucleotide sequences, as well as 94.4 percent of the amino acid sequences that make the necessary proteins for its life cycle, suggesting the two belonged to the same species.

Additionally, Dr. Shi and colleagues found that a bat coronavirus known as RaTG13 showed a similarity to the SARS-CoV-2 coronavirus. Remnants of the genetic material for the RaTG13, but not the live virus, had been found in a cave inhabited by the *Rhinolophus affinis* bat in Tongguan town in Mojiang county of Yunnan Province in 2013. (This source accounts for the acronym of the virus: **R**hinolophus **a**ffinis **T**ong-Guan 2013 became RaTG13, just as **C**ORONA **V**IRUS **D**ISEASE 2019 became COVID-19.)

They proceeded to sequence the full length of the RaTG13, finding that the overall genome sequence matched SARS-CoV-2 by 96.2 percent. However, the bat coronavirus does not have the furin cleavage site that the SARS-CoV-2 virus possesses, which has been a point of contention in promoters of the lab-leak theory. Shi and her team concluded that "RaTG13 is the closest relative of 2019-nCoV, and they form a distinct

lineage from other SARS-related CoVs.”

Recognizing the critical need to develop diagnostic tests to identify infected patients, they designed the first unique PCR-based detection method for the novel coronavirus, using sequences from the receptor-binding domain (RBD) of the spike protein. They also warned of the possibility of airborne transmission of the disease.

This study’s other essential contributions included documenting the disappearance of the infection after the patients recovered, followed by a robust antibody response to the coronavirus in their immune system. They also isolated the virus using human cell lines from one of the initial patients. Infectivity studies were conducted that demonstrated that the novel coronavirus, like the original SARS-CoV-1 of 2002, used the ACE2 receptors of host cells (the acronym stands for angiotensin-converting enzyme II) to enter them.

In a lengthy interview conducted by staff writer Jon Cohen for Science Magazine on July 31, 2020, Dr. Shi offered insights into her initial work on the SARS-CoV-2 virus and concerns raised at the time of a possible lab leak and clandestine gain-of-function experiments (gain-of-function experiments, another hobby horse of the “lab leak” proponents, are efforts to determine different ways that a virus can strengthen its infectiveness, in order to anticipate the future development of dangerous pathogens).

Dr. Shi acknowledged much that has been independently corroborated, including that not all patients could be traced back to the Hunan Seafood market. Though remnants of the SARS-COV-2 virus were detected on surfaces at the market, no live virus was found in cold foods or animals there.

She wrote, “According to the findings of our team and our international peers, SARS-CoV-2 is very likely to have originated from bats. It may have evolved in one or more intermediate hosts, become adapted to humans, and eventually spread among humans. However, it remains unclear which animals were the intermediate hosts and how it spilled over to humans.” The intermediate host still remains to be determined.

The following question was posed by Cohen:

Many scientists who have analyzed the sequence of SARS-CoV-2 have concluded that it does not have the signatures of a lab-engineered virus. But even some of these researchers say it remains possible that SARS-CoV-2 existed in your lab and accidentally infected a lab worker. They note that several labs had accidental infections with the virus that causes SARS. So how can you rule out this possibility?

Dr. Shi explained:

... the research and experiments in our institute are in strict accordance with the international and national management requirements of biosafety laboratories and experimental activities, which are conducted in the required biosafety laboratories. Both the facilities and management of P3 and P4 laboratories are very strict. For example, personal protective equipment must be worn by the research staff. The air in the laboratory can only be discharged after highly efficient filtration. Wastewater and solid waste must be sterilized under high temperatures and high pressure. The entire process of the experimental activities is video-monitored by biosafety management personnel. Every year, the lab’s facilities and equipment must be tested by a third-party institution authorized by the government. Only after passing the test can the lab continue to run. The high-level biosafety laboratories at our institute have been operated safely and stably.

To date, no pathogen leaks or personnel infection accidents have occurred.

In response to the question whether bat viruses were grown at the Wuhan lab, she answered, “We have only isolated three strains of live SARS-related coronaviruses (SARSr-CoV) from bats, which shared 95-96% genome sequence similarity with SARS-CoV and less than 80% similarity with SARS-CoV-2. These results were published in *Nature* in 2013, the *Journal of Virology* in 2016, and *PLoS Pathogens* in 2017, respectively.”

To place this into its proper context, humans and pigs overlap at the genetic level by 84 percent. The bat viruses stored at the Wuhan lab were less similar, genetically speaking, to SARS-CoV-2, than a pig is to a human being. Yet in the writings of Nicholas Wade and other right-wing propagandists, the transformation of the bat viruses stored at the lab into the virus which causes COVID-19 is portrayed as well within the capacities of the Chinese scientists.

Moreover, the work on bat viruses at WIV was being documented and made public through professional journals that are peer-reviewed and followed carefully by experts in the field throughout the world. It was extremely time-consuming and required an unprecedented team approach where multiple groups at multiple labs in many countries were sharing information about the progress of their collective work.

Dr. Shi explained that the work being done was related to SARS-like viruses, indicating their concerns were with the emergence of SARS-CoV-1 or viruses similar to it. Their work was intended to understand how the original SARS emerged in 2002 and to address the threat it posed as a pandemic pathogen. SARS-CoV-2 has diverged considerably from these SARS-related viruses.

She also mentioned that all students and staff working at the Wuhan lab submitted blood samples at the onset of the outbreak, and no infections were detected. They also tested all 2,007 CoV samples they held in their viral-sample banks. None matched the SARS-COV-2, with the RaTG13 gene sequence being the closest.

Concluding, Dr. Shi said, “Over the past 20 years, coronaviruses have been disrupting and impacting human lives and economies. Here, I would like to make an appeal to the international community to strengthen international cooperation on research into the origins of emerging viruses. I hope scientists around the world can stand together and work together. The purpose of the search for the origin of a virus is to prevent the recurrence of similar outbreaks which will harm human society. In this way, we can respond more effectively when an outbreak happens.”

To be continued



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