Maybe both sides are right: If SARS-CoV-2 was leaked from a Wuhan lab, it doesn't mean the virus was necessarily engineered

The "lab leak" hypothesis about the origin of Covid-19 has been getting a lot of attention lately, and deservedly so. This is the idea that the SARS-CoV-2 virus accidentally escaped from a laboratory in Wuhan, China, that conducts research on coronaviruses. Just a few weeks ago, a group of highly respected virologists and epidemiologists published a letter in the journal Science calling for a more thorough investigation, stating that the lab leak hypothesis was not taken seriously enough in earlier investigations.

The coincidence of having a major virus research facility, the Wuhan Institute of Virology (WIV), just a short distance from the live animal food market that was originally believed to be the source of the outbreak is too great to ignore. Even more curious is that WIV was actively doing research on coronaviruses in bats, including the bats that carry a strain of SARS-CoV-2 that is the closest known relative to the Covid-19 virus itself.

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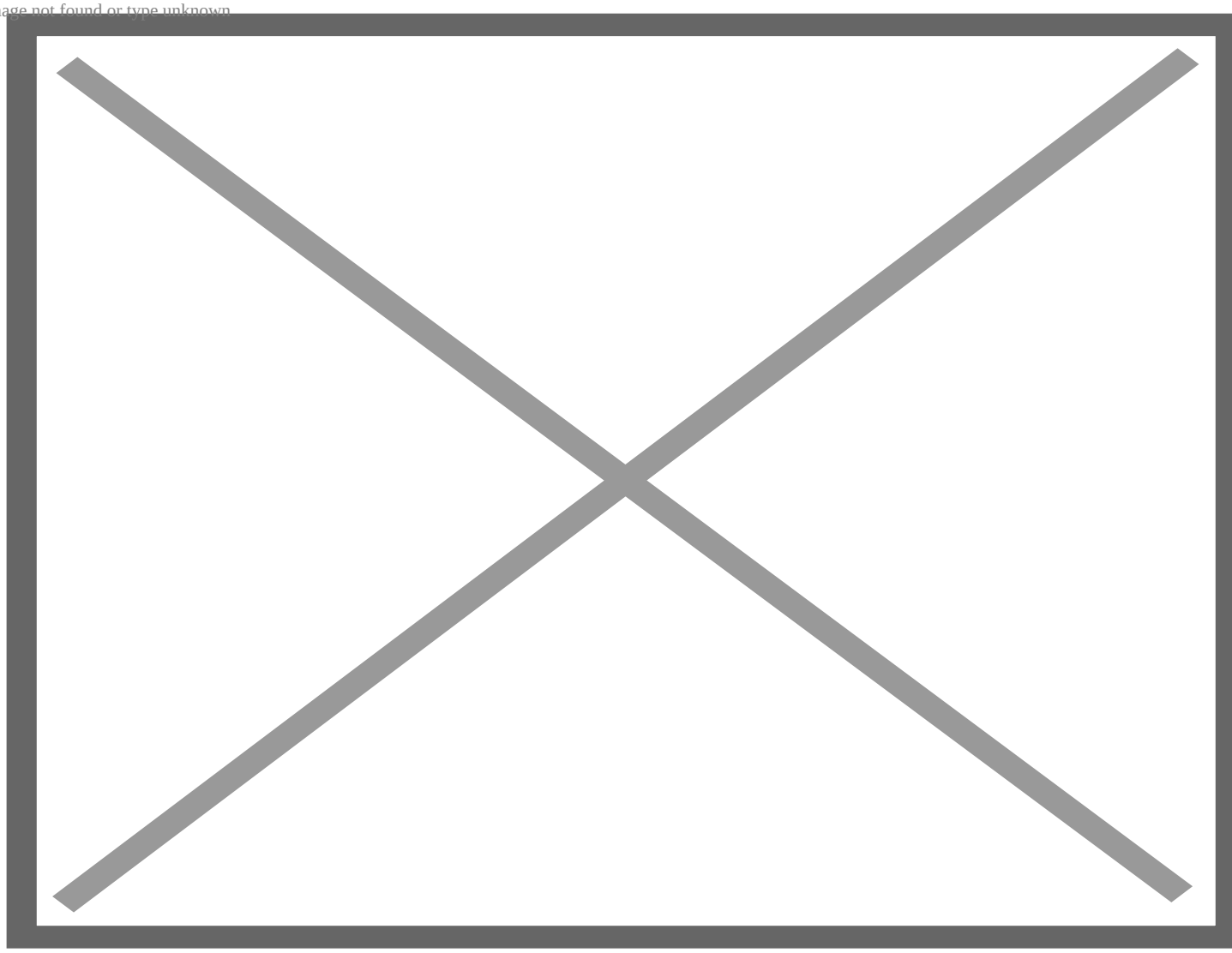

Wuhan Institute of Virology entrance. Credit: Ureem2805/Wikimedia

From the beginning of the outbreak, attention was focused on WIV, and various conspiracy theorists suggested, without any evidence, that the Covid-19 virus was either intentionally engineered, intentionally released, or both. Let me just say right off the bat that I don't believe either of those claims.

However, I do think the lab leak hypothesis is credible, and it's also possible that "gain of function" research (more about this below) might be responsible.

In arguing against (unsupported) claims that the Chinese released the virus on purpose, a group of virologists published a paper very early in the pandemic, in March 2020, which looked at the genome sequence of the virus and concluded that "SARS-CoV-2 is not a laboratory construct or a purposefully manipulated virus." Other studies since then have come to similar conclusions: the virus is very similar to naturally-occurring coronaviruses, and it is possible that it simply evolved naturally in the wild, probably in

bats.

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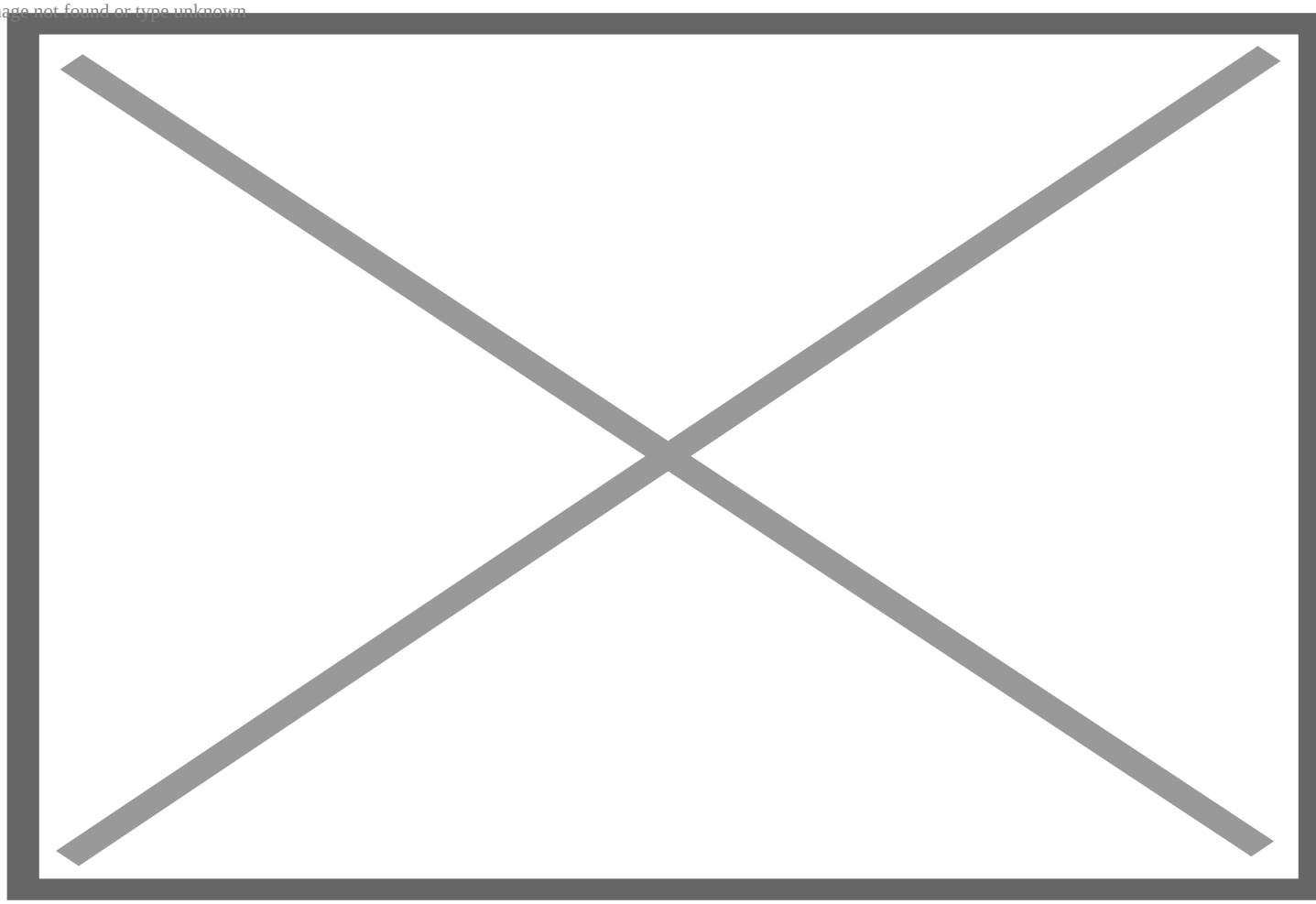

Credit: Shutterstock

Even so, the lab leak hypothesis remains highly credible, regardless of whether or not the virus was genetically engineered. Here's why. First, we know that lab accidents can happen and viruses can escape, even if these accidents are rare. We also know that the Wuhan Institute of Virology had thousands of viruses, including coronaviruses, in its facility. And despite claims that viruses couldn't possibly have escaped accidentally, a 2017 *Nature* article describing the then-new Wuhan Institute reported, perhaps prophetically, that "worries surround the [Wuhan Institute of Virology], too. The SARS virus has escaped from high-level containment facilities in Beijing multiple times."

The secrecy of the Chinese government, which has not yet allowed independent, outside scientists full access to WIV to investigate, hasn't helped matters. We need to know if any viruses in WIV are similar to the Covid-19 virus, and at this point we can't trust the Chinese government's assurances on this question. Of course, even if they allow outsiders to investigate now, we cannot know that they have preserved all the viruses that were present in the lab in the winter of 2019-2020.

Now let’s talk about gain-of-function research. Gain of function, or GoF, refers to research that tries to make viruses or bacteria more harmful, by making them more infectious. This seems crazy, right? And yet it’s been going on for years, despite the efforts of many scientists to stop it. In the past, GoF research focused on the influenza virus, and in particular on a small number of scientists (highly irresponsible ones, in my view) who were trying to give avian influenza–bird flu–the ability to jump from birds into humans. I wrote about this in 2013, and in 2017, and again in 2019, each time calling on the US government to stop funding this extremely dangerous work. The NIH did put a “pause” on gain-of-function research for a few years, but the work resumed in 2019.

Now, let me explain why GoF research does not require artificially engineering a virus. Viruses mutate very rapidly all by themselves, and RNA viruses like influenza and SARS-CoV-2 mutate even more rapidly than DNA viruses. So a GoF experiment doesn’t need to engineer a virus to make it more infectious: instead, scientists can simply grow a few trillion viral particles, which is easy, and design experiments to select the ones that are more infectious. For example, some GoF research on bird flu simply sprays an aerosol mixture of viruses into a ferret’s nose (influenza research often uses ferrets, since you can’t ethically do this with people), and waits to see if the ferret comes down with the flu. If it does (and this has been done, successfully), the strain that succeeds now has a new function, because it can infect mammals. The viruses that are artificially selected (as opposed to natural selection) in these experiments will appear completely natural; no genetic engineering required.

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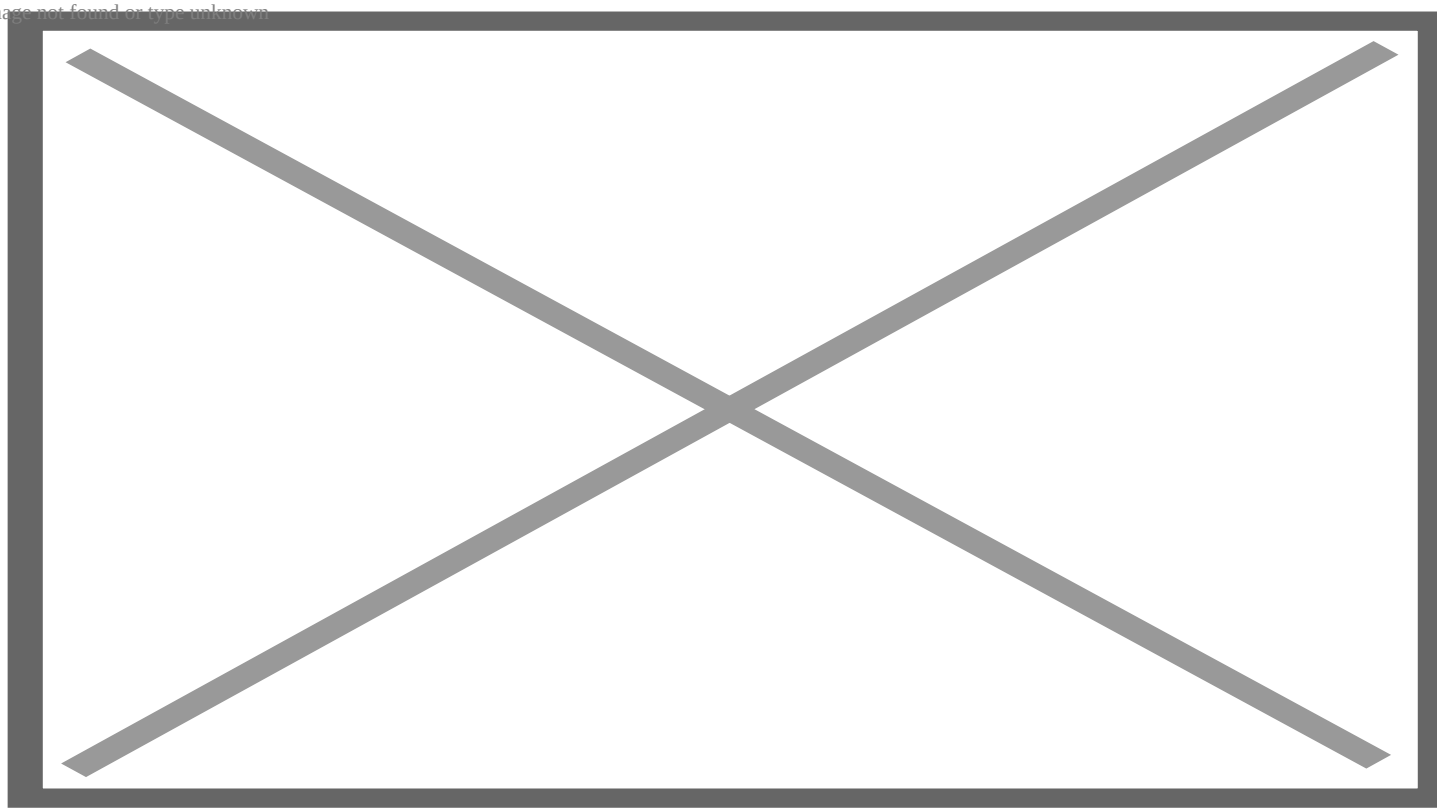

Credit: S. Herfst/Science

We know that WIV was conducting gain-of-function experiments, and we know that its work included coronaviruses. Was the Wuhan Institute of Virology running GoF experiments on SARS-CoV-2 viruses from bats? Possibly. And if it was, these experiments could easily have produced a strain that infected humans. If a lab employee was accidentally infected with such a strain, that could have started the pandemic. And even if SARS-CoV-2 wasn't the subject of GoF experiments, a naturally-occurring strain being studied at WIV could still have infected one of their scientists and thereby leaked out into the population.

I'm not saying that any of these events is likely. I am, however, agreeing with the scientists who, in their recent letter to *Science*, called for a deeper investigation into the cause of the Covid-19 pandemic.

Finally, let me echo a sentiment they expressed in their letter, which is best said by simply quoting them: "in this time of unfortunate anti-Asian sentiment in some countries, we note that at the beginning of the pandemic, it was Chinese doctors, scientists, journalists, and citizens who shared with the world crucial information about the spread of the virus—often at great personal cost." Rather than seeking to cast blame, we need to uncover the origin of the Covid-19 pandemic, and any behaviors that led to it, as a means to help all societies prevent future pandemics.

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