



On the origins of SARS-CoV-2

Stakeholders in public health must lobby policy makers to make decisions based on evidence, not political expediency, particularly when the studies that hang in the balance are critical to understanding the origins of epidemics.

In March, Andersen et al. laid out the case for the natural emergence of SARS-CoV-2 based on a detailed genomic analysis in “The proximal origin of SARS-CoV-2” in *Nature Medicine* (26, 450–452; 2020). This was partly in response to growing speculation that SARS-CoV-2 emerged from a laboratory, based on the fact that the COVID-19 pandemic began in the same city as the Wuhan Institute of Virology, a state-of-the-art virology lab that conducts research on bat coronaviruses. Despite much noise to the contrary, there is no credible evidence that SARS-CoV-2 was ever known to virologists before it emerged in December 2019, and all indications suggest that, like SARS-CoV and MERS-CoV, this virus probably evolved in a bat host until an unknown spillover event into humans occurred.

Unfortunately, this did little to quell often contradictory and sometimes outright ridiculous conspiracy theories that spread faster than the virus itself: SARS-CoV-2 was the result of a laboratory accident or was intentionally engineered, and this was concealed to hide either spectacular incompetence or a complex international conspiracy involving Bill Gates, the Chinese Communist Party and 5G wireless network infrastructure with an end goal of ushering in a new world order. The proof presented to corroborate these theories relied heavily on cherry-picked evidence ranging from withdrawn preprints to secret diplomatic cables about vague lab safety information to grossly overinterpreted satellite and mobile phone data, all of which prove exactly nothing about SARS-CoV-2 origins.

A favorite version of the laboratory-origin stories relies on the fact that SARS-CoV-2 was engineered for gain-of-function studies that were also previously performed with bat SARS-like coronaviruses to understand cross-species transmission risk (*Nat. Med.* 21, 1508–1513; 2015). The irony is that those gain-of-function studies provided valuable information about the biology of SARS-CoV-2. Gain-of-function research is also subject to intense scrutiny and governmental oversight, precisely because of the high risk involved in conducting it safely; thus, it is extremely unlikely that gain-of-function research on hard-to-obtain

coronaviruses (such as bat SARS-like coronaviruses) could occur under the radar. Moreover, there is an extensive history of pathogen emergence by natural means: most novel viral pathogens that have caused epidemics or pandemics in the human population have emerged naturally from a wildlife reservoir. Therefore, the overwhelming conclusion is that this virus, too, found its way into a human host through a series of unhappy accidental encounters with animals.

The laboratory origin stories have taken on a new life as political propaganda, with wide-ranging, deeply harmful implications. In February, US senator Tom Cotton appeared on Fox News to share his fervent belief that the virus was a biological weapon. US Secretary of State Mike Pompeo also heavily implied that SARS-CoV-2 has anthropogenic origins. US president Donald Trump himself has given the theory further credence. In addition, the Rule of Law Society, an institution with no clear scientific mandate that was directed by former Trump White House chief strategist Stephen Bannon until his recent indictment for fraud, has sponsored two preprints claiming that SARS-CoV-2 was deliberately engineered as a bioweapon and alleging an international cover-up by the global scientific community. The lead author of those preprints, Yan Li-Meng, has personally attacked scientists engaged in combating this misinformation with evidence, including me. As a result, I’ve been threatened with violence and sexual assault, an occupational hazard of misinformation debunking that I’ve unfortunately come to expect. Although this is deeply unpleasant, I am more concerned about the long-term effects of this type of misinformation for scientists around the world and our ability to conduct impactful scientific research on emerging viruses with pandemic potential.

In April 2020, we witnessed firsthand how misinformation about the virus’ origins can destroy research when President Trump ordered the National Institutes of Health to strip the EcoHealth Alliance of a grant that involved close collaboration with researchers at the Wuhan Institute of Virology. The NIH justified the cancellation

by saying the research, which investigated bat SARS-like coronaviruses circulating in China and zoonotic spillover, did not align with NIH priorities, which strains credibility. This work produced some of the strongest corroborating evidence that SARS-CoV-2 is a naturally emergent pathogen, as serological surveys demonstrated that people living in close proximity to colonies of bats had antibodies to bat SARS-like coronaviruses. The NIH has since set impossible conditions for restoring the grant, ensuring that this research will never resume. This set a chilling precedent by imposing a tremendous and unnecessary setback on the efforts to understand SARS-CoV-2, eroding trust in scientists and disrupting productive international collaborations that are essential both in this pandemic and to global health security over the longer term.

Public health is an enterprise that requires the engagement of the global public health community. As such, countering the corruption of science with politics will require a community effort. The stakeholders in public health—scientists, clinicians and, most importantly, the public—must push back against political interference in essential, objective scientific investigations. We must demand that funding agencies such as the NIH justify overtly political funding decisions for critically important work. A great amount of good can be done by debunking misinformation consistently and educating the public about the need for unbiased, data-focused research into virus origins.

In virology, as in many other fields, knowing your enemy is critically important. We can’t do this without the ability to study the origins of SARS-CoV-2 using an evidence-driven approach. □

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Published online: 13 January 2021
<https://doi.org/10.1038/s41591-020-01205-5>

Competing interests

The author declares no competing interests.