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A VIRUS, THEORIES OF ORIGIN, AND A PLACE FOR SCIENCE

Relevant for: Developmental Issues | Topic: Health & Sanitation and related issues

Imagine a town with a nuclear power plant close by. If its residents displayed signs of radiation sickness, the finger of suspicion will point towards the plant, however much the plant's operator might swear to its safety.

Suppose the town was also home to a research centre where radioactive material was stored and used in experiments. The finger of suspicion would now waver between the nuclear plant and the research centre. To complicate matters, if nuclear waste from both the plant and the research centre was buried in an underground dump a fair distance away from the town, a third focus of suspicion would arise.

Public opinion would be divided. Those suspicious of the nuclear power industry would be convinced that the plant was the source of their pollution. Little bits of circumstantial evidence would begin to circulate on social media as well as in the opinion columns of newspapers pointing to the power plant.

The nuclear industry would fight back and accuse the research institute of causing a radiation leak. The scientific establishment would close ranks around the research lab and testify to safety standards in the laboratory as well as the quality of the researchers.

A third group of people would probably accuse both the power plant as well as the research institute of poisoning the world by using and storing toxic nuclear waste.

Each of these groups would believe they had the truth and others were wrong. They would be critical of any investigation that did not agree with their beliefs.

The debate over the origins of SARS-CoV-2, the virus that has caused the COVID-19 pandemic, mirrors this scenario. One school of thought is convinced that the Wuhan Institute of Virology, a leading coronavirus research centre, is responsible for introducing a new coronavirus that it was secretly creating in its laboratories.

This hypothesis is driven by evidence ranging from reports of documents missing from the website of the Wuhan Institute, to the re-naming or re-numbering of a virus originally discovered in a mine in 2012 that is the closest known ancestor to SARS-CoV-2, to reports of researchers mysteriously falling ill at the Wuhan Institute in late 2019, and other reports of a researcher who has reportedly gone missing. The fact that the outbreak occurred in Wuhan, home to the institute, is seen as additional evidence of where the virus emerged from. This hypothesis is greatly favoured by those who believe China is responsible for the pandemic, but lacks evidence that would stand up to rigorous scientific scrutiny.

The second hypothesis is that the virus emerged through a natural "spillover" event, where a bat coronavirus jumped species and infected humans either directly or through intermediary animals that in turn passed it to humans. SARS (severe acute respiratory syndrome), the predecessor of this current pandemic, started similarly in late 2002 when a bat coronavirus probably infected animals and then humans in the markets of Guangdong province in southern China. New viral infectious diseases, whether it is HIV/AIDS, Ebola, Middle East respiratory syndrome (MERS) or Nipah, have all arisen from spillovers of animal viruses to humans.

As with SARS, many of the early cases of COVID-19 were associated with animal markets, particularly the Huanan market in Wuhan, which sold a variety of live and frozen animal meat. This could be one route the SARS-CoV-2 virus took. But no evidence has been found so far to support this hypothesis either.

To find scientific proof of either hypothesis is a task as challenging as an archaeologist painstakingly digging through hundreds of metres of tightly packed layers of mud and stone and debris in the hope of recovering tiny clues to the existence of an ancient civilization.

For virologists and molecular epidemiologists, the challenge is not sifting through earth, but finding virus samples from the earliest stages of the outbreak in Wuhan, reconstructing their genetic sequences, and then fitting them to a family tree that will hopefully lead to the common ancestor of the diverse strains and variants of SARS-CoV-2 that have spread globally. This could also provide clues as to whether this ancestor emerged in wildlife, in farms and markets, or from a laboratory.

While this viral archaeology sounds simple, it is not straightforward. The earliest detected cases and the earliest viral samples came from those who were hospitalised in Wuhan in December 2019. But none of them is likely to have been patient zero, the first person to have been infected by the virus. Most people with COVID-19 display very mild or no symptoms, so for every hospitalised case, there are likely to have been many earlier cases that were not detected.

It is known that two strains, an A strain and a B strain, were circulating in Wuhan in the early stages of the outbreak. But most of the samples and cases were of the B strain, which caused the first recognised disease cluster in people associated with the Huanan market, while the A strain could have been an earlier strain. These earlier viral samples would have helped build a clearer picture of how the virus emerged. But these cases were never identified or sampled, and they will forever remain unknown.

The other source of evidence are samples from the live animals sold in all the markets in Wuhan in the last months of 2019; this too is also not available, since the animals have long been sold and slaughtered, and the markets more often than not sanitised. The samples that were collected in late December from the Huanan market did have the virus, but it is not clear whether the market was a source of the virus, or merely a place where it was amplified.

So where does one go from here? The scientific unearthing and classification of viral samples in humans and animals to see where they lead is the only way ahead. But science is being elbowed aside by politics. Those who believe in a Chinese conspiracy are convinced that the truth will only come out after an investigation of the Wuhan laboratory and its staff by international investigators with a wide mandate to search the lab and question staff. This is not going to happen. China will no more allow this than India would allow international investigators to march through the National Institute of Virology in Pune or any other national laboratory in search of evidence of supposed wrongdoing.

The only solution is to work with China. The World Health Organization investigation into the origins of the virus, though rightly criticised for dismissing the laboratory leak theory with little explanation, did unearth evidence on the early stages of the pandemic and suggested a number of studies for the next phase. One important step would be widespread sampling of animals in farms across China that supplied the markets in Wuhan in the search of ancestor viruses to SARS-CoV-2. Workers in farms need to be tested as well for exposure to SARS-CoV-2 or related viruses.

Another suggested step is for blood banks across China to test blood samples from 2019 to see

whether they carried antibodies for SARS-CoV-2. This could provide a clue to how early the virus was circulating in human populations. None of this can happen without Chinese cooperation.

For this to happen, polarisation on political lines needs to be put aside, and space needs to be created for science to do its work.

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