other means — typically through radioactive β-decay. This happens when a nucleus gains so many neutrons that it becomes unstable, and one or more of its neutrons turns into a proton, creating an element with a higher atomic number.

This can occur when nuclei are bombarded with neutrons in brief but cataclysmic events, such as a supernova or the merger of two neutron stars. The most well-studied event of that type, which was observed in 2017, was consistent with models in which the colliding orbs produce elements heavier than iron. But astrophysicists could not observe which specific elements were made, or in what quantities, says Hendrik Schatz, a nuclear astrophysicist at MSU. One of FRIB's main strengths will be to explore the neutron-rich isotopes that are made during these events, he says.

The facility will help to answer the fundamental question of "how many neutrons can one add to a nucleus, and how does it change the interactions inside the nucleus?" says Anu Kankainen, an experimental physicist at the University of Jyväskylä in Finland.

FRIB will be complementary to other state-of-the-art accelerators that study nuclear isotopes, says Klaus Blaum, a physicist at the Max Planck Institute for Nuclear Physics in Heidelberg, Germany. Facilities in Japan and Russia are optimized to produce the heaviest possible elements, those at the end of the periodic table.

The €3.1-billion (US$3.3-billion) Facility for Antiproton and Ion Research (FAIR), an atom smasher that is under construction in Darmstadt, Germany, is scheduled to be completed in 2027 (although the freezing of Russia's participation following the invasion of Ukraine could bring some delays). FAIR will produce antimatter as well as matter, and will be able to store nuclei for longer periods of time. "You cannot do everything with a single machine," says Blaum, who has been on advisory committees for both FRIB and FAIR.

US BIOSECURITY BOARD REVISITS RISKY-PATHOGEN RULES

Researchers call for stricter guidance on 'gain-of-function' experiments.

By Max Kozlov

Researchers and biosecurity specialists are calling on the US government to issue clearer guidance about experiments it might fund that would make pathogens more transmissible or deadly. They made these pleas on 27 April, during the first of a series of public listening sessions organized by the US National Institutes of Health (NIH). The sessions are part of a months-long review, conducted by the National Science Advisory Board for Biosecurity (NSABB), of US policies governing risky pathogen research.

The board, which advises the US Department of Health and Human Services (HHS), was supposed to begin this review in 2020, but the COVID-19 pandemic delayed it. Given that enhanced pathogens could accidentally cause disease outbreaks, the need for the review is now greater than ever, some researchers say.

"Pandemics are on people's minds," says Marc Lipsitch, an epidemiologist at the Harvard T.H. Chan School of Public Health in Boston, Massachusetts, and an outspoken critic of 'gain-of-function' research that modifies pathogens to make them more dangerous to humans. "It's no longer abstract to think about the destruction that the spread of a new virus can cause."

Although most virologists say that the coronavirus SARS-CoV-2 probably spread to humans directly from wild animals, some politicians and scientists have argued that the COVID-19 pandemic could have been set off when a modified virus escaped from the Wuhan Institute of Virology (WIV) in China.

To address these concerns, in late February, the NIH and the White House Office of Science and Technology Policy asked the NSABB to make swift progress on its long-overdue review. The panel plans to draft a report of its recommendations by the end of the year.

A long-running debate

Manipulating viruses by, say, making them more transmissible in humans can help scientists to answer important questions about how a pathogen evolved or how to defeat it. But US policymakers have struggled to determine when the risk of making a pathogen more dangerous outweighs the benefits of the research. The worry is that such a pathogen could be accidentally released or even weaponized.

The listening sessions mark the latest chapter in a decade-long effort to better regulate such experiments. Debate erupted in 2011, when two research groups separately reported creating a mutant avian-influenza virus that could be readily transmitted between ferrets breathing the same air. Many worried that such a virus could also spread easily among humans. In 2014, the US government announced a funding moratorium on such experiments after a series of accidents involving mishandled pathogens occurred in government laboratories.

The moratorium was lifted in 2017, and the HHS adopted a policy that would add a layer of review to such experiments. The policy created an independent advisory panel to review any research proposals submitted to agencies reporting to the HHS (including the

AKOS STILLER/BLOOMBERG VIA GETTY

The number of laboratories equipped to conduct risky disease research is rising.

NIH) that describe work on what are known as enhanced potential pandemic pathogens (ePPPs). Two years later, *Science* reported (see go.nature.com/3kykntg) that the advisory panel quietly approved two experiments to manipulate avian-influenza viruses similar to those that set off the original uproar, prompting fresh calls for reform.

Although the scope of the NSABB's new review of risky pathogen research remains similar to the one it had planned for 2020, the COVID-19 pandemic will undoubtedly have an influence. The NIH, in particular, has been scrutinized during the pandemic for funding potentially risky coronavirus research.

In 2014, the WIV received funding from the NIH, through a subcontract with the New York-based research organization EcoHealth Alliance, to manipulate bat coronaviruses. Some of the funding came during the federal moratorium on gain-of-function research. But the NIH says it approved the funding because the experiments didn't meet its definition of ePPP research, a stance that has been contested by some US policymakers.

In response, Republican lawmakers have introduced draft legislation that would again place a moratorium on the funding of gain-of-function research. This move has alarmed some researchers, including those who attended the 27 April listening session. Felicia Goodrum Sterling, president of the American Society of Virology, based in Ann Arbor, Michigan, pointed out that rapid advances in COVID-19 therapeutics and vaccines were made possible, in part, by manipulating viruses. For example, to create the Johnson & Johnson and Oxford–AstraZeneca COVID-19 vaccines, scientists modified adenoviruses to produce the SARS-CoV-2 spike protein.

Policy reform wanted

Many at the listening session pushed for stricter oversight of risky pathogen research, however. Some suggested that the HHS advisory-panel approach be extended to other US entities. Gregory Koblentz, a biosecurity-policy specialist at George Mason University in Arlington, Virginia, pointed out that pharmaceutical firms, philanthropic institutions and federal agencies, including the Department of Energy, also conduct research on potentially risky pathogens. They should adhere to the same guidelines, he said.

In a nod to concerns about the WIV, others thought that the US government should consider more carefully how it funds gain-of-function research abroad, and should encourage other countries to adopt a similar ePPP review process.

Some are also calling for changes to the HHS ePPP review panel itself. Lipsitch would like the identities of the advisers on the panel to be revealed and their comments on research grants to be published (these details are currently confidential). Others worry that if this were to happen, advisers might decline to participate over concerns about harassment. Scientists have reported an uptick in harassment during the pandemic, particularly those who discuss the origins of SARS-CoV-2.

Still, the US government could be more transparent when it comes to biosecurity research, experts said. Tom Inglesby, director of the Johns Hopkins Center for Health Security in Baltimore, Maryland, called for the risks and benefits of funded experiments to be shared openly, the specific criteria used to evaluate projects to be disclosed and for better guidance in communicating results to the public. This would go a long way to improving public trust in science and the NIH, which has declined during the pandemic, he said.

The fact that policies governing ePPPs continue to be tweaked more than a decade after the controversial avian-influenza experiments shows that the issue is extremely nuanced, Koblentz told *Nature*. He acknowledges the benefits of risky pathogen research, but he worries that researchers will become complacent about the inherent risk if stricter policies aren't put in place — especially given that the number of laboratories equipped to handle dangerous pathogens is increasing worldwide.

The NIH plans to host more listening sessions and a public stakeholder meeting before the NSABB finalizes its draft report.

ARE COVID SURGES BECOMING MORE PREDICTABLE?

New Omicron relatives BA.4 and BA.5 offer hints about the future of SARS-CoV-2.

By Ewen Callaway

Here we go again. Nearly six months after researchers in South Africa identified the Omicron coronavirus variant, two offshoots of the game-changing lineage are once again driving a surge in COVID-19 cases there.

Several studies released in the past week show that the variants — known as BA.4 and BA.5 — are slightly more transmissible than earlier forms of Omicron[1], and can dodge some of the immune protection conferred by previous infection and by vaccination[2,3].

"We're definitely entering a resurgence in South Africa, and it seems to be driven entirely by BA.4 and BA.5," says Penny Moore, a virologist at the University of the Witwatersrand

SHIRAAZ MOHAMED/AP/SHUTTERSTOCK

Infections with new variants of Omicron are rising in South Africa and Europe.