verify the efficacy of their treatments. "But," she asks, "who's going to pay?" She adds that first-hand experience with patients is enough to show that stem-cell treatment is worthwhile. "First, it's safe; second, it's effective. We know that," she says.

Leading stem-cell scientists think otherwise. Commenting on Tong Yuan's treatment for Parkinson's disease, Oliver Cooper, director of the Stem Cell Facility of the Neuroregeneration Institute at McLean Hospital in Belmont, Massachusetts, and a specialist in Parkinson's disease, says, "The products offered by Tong Yuan may provide anecdotal, poorly controlled, transient improvements in the patients, but Parkinson's-disease patients need long-term therapies."

"There are neither scientific nor clinical data to support the long-term benefits of haematopoietic- or neural-stem-cell therapies for Parkinson's patients," he adds. "In fact, it's not clear if the infused cells will survive for more than a few days in the patients."

Meanwhile, neurobiologist Ricardo Dolmetsch, an autism researcher at Stanford University in California, says, "The consensus in the autism research community, as well as in the stem-cell community, is that there is no scientifically valid reason for using stem cells to treat autism spectrum disorders". He worries that, without the proper safety studies in place, the treatments could "lead to serious complications like cancer and autoimmune disease".

In addition to anecdotal case studies, some Chinese stem-cell companies bolster their reputations by claiming to have connections with leading politicians and scientists. A glossy 'information memorandum' from Shanghai WA Optimum Health Care contains pictures of staff with various local- and central-government figures, including Li Keqiang, the powerful executive vice-premier of the State Council who is tipped to succeed Wen Jiabao as China's next premier.

It also lists Li Lingsong, director of the Peking University Stem Cell Research Center, as a member of its science and technology board. Li denies this. "I have so far nothing to do with WA," he told *Nature*, adding that he has asked the company to remove his name. WA also claims a strategic alliance with Harvard Medical School, although neither the medical school nor the Harvard Stem Cell Institute is aware of any such connection. Likewise, the University of California, Irvine, where WA claims to have research facilities, denies any formal relationship.

When pressed, all of the stem-cell clinics approached by *Nature* said that they were aware of the government regulations, and that they were necessary — but only for other clinics that were not operating safely. Most emphasized that their own businesses were entirely legitimate. *Nature* did find one company, Shanghai Puhua, which says that it has already stopped offering stem-cell treatments to comply with government regulations. And Beijing-based Wu Stem Cells will probably do likewise for the same reason, says company director Cheng Bo.

Bioethicist Zhai Xiaomei at Peking Union Medical College in Beijing, a member of one of the government's technical audit boards, was surprised to hear that any stem-cell companies were still operating. She says that the regulations are "absolutely clear" that companies must not administer unapproved stem-cell treatments.

A Ministry of Health representative told *Nature* that it was aware of the problem, and that it would be making greater efforts to clean up the stem-cell business.

Asked how WA operates despite the ministry's ban, Lu describes the regulations as "a grey area". Grishina agrees: "We're in China, so there are different stipulations." ■ SEE EDITORIAL P.141

BIOSAFETY

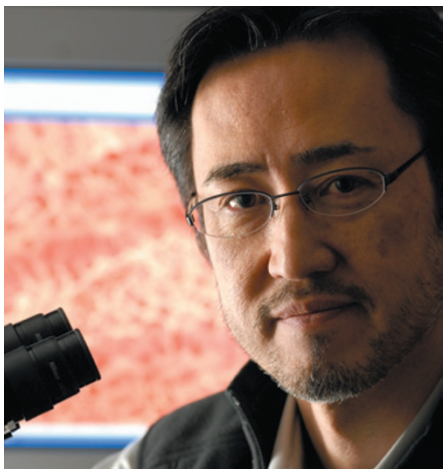
Post-mortem on mutant flu

Virus papers get green light but controversy highlights lack of global rules on biosafety.

BY DECLAN BUTLER

The dust is beginning to settle on the months-long controversy over two studies in which the H5N1 avian influenza virus was modified to be transmissible between mammals. But scientists and authorities still need to address the lack of international oversight for studies in which pathogens are deliberately made more dangerous, speakers emphasized at a two-day meeting held last week at the Royal Society in London. The meeting brought together scientists, research funders and experts in security, bioethics and foreign policy, just days after the US National Science Advisory Board for Biosecurity (NSABB) revised its earlier stance and recommended publication of the two studies.

In December 2011, the board recommended redaction of experimental details of the studies, on the basis of concerns about bioterrorism and the increased likelihood of accidental release of the viruses. But after considering revised versions of the manuscripts on 29–30 March, the NSABB voted unanimously in favour of full publication of the paper submitted to *Nature* by Yoshihiro Kawaoka of the University of Wisconsin–Madison, and 12–6 for publication of the content (although not the specific wording) of the paper submitted to *Science* by Ron Fouchier of the Erasmus Medical Center in Rotterdam, the Netherlands.



Yoshihiro Kawaoka can now publish his flu study.

J. MILLER/UNIV. WISCONSIN-MADISON

Kawaoka presented his findings for the first time at the Royal Society meeting (see *Nature* http://doi.org/hsn; 2012), but Fouchier gave only a summary of his, saying that a more detailed description was prohibited by Dutch export-control laws, which require a permit to disseminate samples of, and information about, certain dangerous pathogens.

In December, the NSABB said that the information in the papers could help H5N1 surveillance efforts and so should be made available to experts on a need-to-know basis. A major factor in the board's change of heart was that subsequent international discussions concluded that there was no practical way to selectively share the data, and that national export controls may restrict distribution anyway, says Michael Imperiale, a virologist at the University of Michigan in Ann Arbor and a member of the NSABB.

This left the board with the stark choice of publishing either all or none of the research, with publication becoming "the only way for public-health authorities to know what to look

for", says Imperiale, who this time voted in favour of publishing both papers.

Some on the board were also influenced by clarifications to both papers — particularly those suggesting that Fouchier's viruses were not as pathogenic as they had initially seemed — and by presentations from Kawaoka and Fouchier indicating that some combinations of the mutations generated in their laboratories had already been seen in the wild. But Imperiale says that his vote was unaffected by the revisions. "I don't think the risks have changed; the authors have changed the host range and transmission properties of a deadly virus," he says. "I don't think the benefits have changed either."

Another factor in the NSABB's decision was the announcement on 29 March of a new US policy requiring that all publicly funded research on certain pathogens be assessed from the outset by the funding agency for the risk that it may be misused (see *Nature* http://doi.org/hsp; 2012). Experts have generally welcomed the guidelines, which they say should, if properly applied, also help to avert future repeats of the H5N1 controversy, in which the NSABB learned of the papers only shortly before their planned publication.

Arthur Caplan, a bioethicist at the University of Pennsylvania in Philadelphia, was one of several speakers at the Royal Society meeting to argue that it would be a "mistake" to think that the issues raised by the papers are now fully resolved. Besides bioterrorism, a major concern is that publishing them will result in worldwide proliferation of similar research, possibly in labs that may not have well developed biosafety cultures and training. Both Fouchier and Kawaoka worked in facilities rated at 'biosafety level 3 enhanced', but to expect that all such research would be done carefully everywhere is "utter malarkey", Caplan told the meeting.

The World Health Organization has recommended that work to make H5N1 viruses more transmissible in mammals, which flu researchers voluntarily halted in January, remain suspended until the relevant authorities have assessed the safety conditions for such research (see *Nature* **482,** 447–448; 2012). US and Dutch authorities are expected to release their verdicts within weeks, which Kawaoka said "would be the time to lift the moratorium". But others warned that doing so before broader debate, including planned hearings by US lawmakers, would be premature and could be perceived as arrogant.

The challenge for any oversight system will be to avoid discouraging important science while ensuring that work is limited to labs with appropriate safety standards, says one scientist, who criticizes the reluctance of many flu researchers to admit that such studies carry risks. "You'd have to have your head in the sand not to accept that there are some risks here." ■

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K. SCHNEIDER/CIRCLE OF BLUE

Despite delays, China's GreenGen coal-fired gasification power plant in Tianjin is going ahead.

CLIMATE CHANGE

Slow progress to cleaner coal

China moves forward with demonstration power plant as United Kingdom revives carbon-capture programme.

BY JEFF TOLLEFSON AND RICHARD VAN NOORDEN

With many of the world's nations dragging their feet on cleaning up fossil-fuel emissions, even slow progress stands out. This spring, China's state-owned Huaneng Group plans to fire up the first phase of its flagship clean-coal demonstration project, moving the country one step closer to capturing and storing the carbon it emits. Despite being more than a year behind schedule, the GreenGen coal gasification plant in Tianjin puts China at the forefront of global efforts to exploit coal resources without releasing carbon dioxide.

In 2008, leaders of the G8 group of nations called for the development of 20 large-scale projects demonstrating technologies for carbon capture and storage (CCS) by 2010, but countries have been slow to embrace the costly plants. Delays and cancellations have affected all but a handful of high-profile initiatives in Europe, the United States and Australia, whereas China, despite delays of its own, is still pushing forward to develop indigenous technologies.

"GreenGen represents both a high degree of technical sophistication and a real commitment on China's part to clean-energy technology," says Julio Friedmann, head of the carbon-management programme at Lawrence Livermore National Laboratory in Livermore, California. "There can be no doubt that China has achieved something remarkable."

Originally estimated to cost US$1.5 billion, GreenGen is being developed by a consortium of Chinese companies, including Huaneng, together with Peabody Energy of St Louis, Missouri. The first phase is a 250-megawatt integrated gasification combined-cycle power plant, which will convert coal into 'syngas' — a mixture of carbon monoxide and hydrogen — to be burned in specialized turbines to produce electricity. Waste carbon dioxide from these processes can be separated more easily than in conventional coal-fired power plants.

Huaneng has already begun work on a second phase — a smaller pilot plant that will send a clean stream of hydrogen through fuel cells and turbines to produce electricity, with carbon dioxide being captured for industrial use. The third phase, scheduled for 2015–20, will be a 400-megawatt power plant with full-scale carbon capture and storage in underground rock layers. That represents a substantial delay beyond the original completion date of 2015. Huaneng officials say that they revised the schedule in response to technical issues and delays to ▶