

Pressure is derived using gravity and a measurement of the density of that particular sample of mercury. Manometers have also reached their limit of precision, whereas there is room to improve the new method's uncertainties, says Jay Hendricks, a metrologist at NIST who is leading the project.

NIST's new pressure sensor, called a fixed-length optical cavity (FLOC), compares the speed of a laser travelling through a gas-filled cavity with that of an identical beam in a vacuum. The speed of light varies with the density of the gas in a way that quantum chemists can calculate on the basis of the properties of atoms. For a steady-temperature system, metrologists can combine these density measurements — effectively, the number of particles in the cavity — with the Boltzmann constant, which relates temperature to kinetic energy. This gives the 'energy density' of the gas, which is equivalent to pressure.

The method is "neat", says Hendricks, because it measures pressure by counting the number of gas particles in the cavity, using just quantum calculations and a fundamental constant of nature. This is in the spirit of the newly reformed SI base units, which last month were all redefined so that they link to fundamental constants, rather than to arbitrary references or objects. "This is fantastic from a metrology point of view," he adds.

The technique has potential, says Gao. But some issues, such as understanding how impurities in the gas affect measurements, need ironing out. The team is working on these issues to reduce uncertainties, but Hendricks says that, at certain pressures, the FLOC will be ready to use as a primary standard — against which NIST calibrates sensors used in industry — within a year.

The team says that FLOC measurements have an uncertainty of six parts per million at atmospheric pressure — almost on a par with the mercury method — but for lower pressures, its uncertainties are one-third of those of the manometer. The results are "impressive", says Stuart Davidson, a metrologist at the National Physical Laboratory in Teddington, UK.

But metrologists worldwide still need convincing that the FLOC is ready for prime time. NIST must first make the FLOC its primary standard, by publishing comparisons made against its manometer and doing an internal review. To gain official recognition that its FLOC claims are accurate, NIST must apply to a group at the International Committee for Weights and Measures, which will oversee a comparison against conventional equipment at Germany's metrology institute, the PTB, in Braunschweig.

To fully embrace the new method, metrologists might need to see a FLOC that has been created in another lab achieve the same results. "For new experiments to be validated and for people to have confidence in them, it's going to take a long time," adds Davidson. ■



The origin of organs used in transplants in China is the focus of a startling report.

## ETHICS

# Transplant research under scrutiny

*Report concludes that prisoners in China are being killed for their organs — and raises the alarm about research.*

BY DAVID CYRANOSKI

A startling report concluding that prisoners in China are being killed for their organs has renewed concerns about the origins of some organs used in research.

On 17 June, the China Tribunal, a panel established by the non-governmental organization the International Coalition to End Transplant Abuse in China (ETAC), concluded that prisoners in China, in particular those imprisoned for their political or religious views, have been killed for their organs for years. It said that the practice — which it branded a crime against humanity — probably still continues.

The seven-member panel took evidence in London and was chaired by barrister Geoffrey Nice, but has no legal authority. It looked at lines of evidence including analyses of Chinese transplant data and expert testimony from doctors, human-rights workers and former prisoners.

The Chinese government has yet to respond to the tribunal's report, but has previously admitted that, in the past, it took organs from prisoners who had been sentenced to death. It says the practice has been banned since it introduced a voluntary donor programme in 2015. The government has denied that it ever killed people solely to harvest their organs.

The report "illustrates the gravity of events transpiring in China", says Wendy Rogers, an ethicist at Macquarie University in Sydney, Australia, who has investigated the extent to which studies in the scientific literature have relied on organs obtained unethically in China, and who chairs the international advisory committee of the ETAC.

"I hope hospitals and journals will take a closer look at their policies," adds Rogers, who testified on her research findings to the panel.

The World Health Organization and the World Medical Association condemn the practice of procuring organs for transplant from executed prisoners. The use of data from such organs for research is also widely criticized, and a number of journals have policies that ban the publication of such data.

Some journals took action following the publication in *BMJ Open* in February of a paper, co-authored by Rogers, that analysed almost 450 studies of transplants — representing more than 85,000 organs — that took place in China (W. Rogers *et al.* *BMJ Open* 9, e02447; 2019). The studies were published between 2000 and 2017. The analysis found that 86% of the papers failed to follow ethical standards by stating the provenance of the organs or giving a statement about the cause of death of the donors. Only ►

► 1% of the papers reported whether consent was sought or granted for the donations and only 7% of papers included a statement that no organs from prisoners were used.

The authors conclude that a large number of the studies conducted before 2015 probably contain data from executed prisoners, given that China says prisoners were a source of organs at this time.

*Nature* contacted six journals that each published ten or more of the 445 papers in the *BMJ Open* analysis.

Joerg Heber, editor-in-chief of *PLoS ONE*, which published 15 papers without information on the source of organs that were cited in the study, and one without an ethics statement, told *Nature* that the journal has been investigating articles for which the source of organs is unclear.

“I strongly believe that any research involving human participants or organ transplantations must follow the highest ethical standards,” says Heber. The journal will retract papers if it becomes clear that ethical standards have not been met, he says.

The journal *Liver Transplantation* published 12 papers cited in the *BMJ Open* study that didn't include details of organ origin, and 3 without ethics statements. A spokesperson says that before the study was published, *Liver Transplantation* already had a policy of asking authors submitting papers to confirm that their data do not come from executed prisoners. They say the journal has not launched an investigation, but will retract a paper if it becomes clear after publication that it contains data from executed prisoners. The other four journals have yet to respond to *Nature's* questions.

And the journal *Transplantation*, which is also named in the *BMJ Open* study, has moved to retract papers that lack details of the origin of the organs. In an editorial posted online on 5 June, the journal said that it had investigated nine papers, including five cited in the *BMJ Open* study (J. R. Chapman *et al. Transplantation* <http://doi.org/c7nj>; 2019). In one case, the author was able to provide a satisfactory description of the single transplant described in the paper, and another paper was published before the journal had clear guidelines on donor-reporting requirements. In the other seven cases, neither the authors nor their institutions had offered explanations. Editor-in-chief Jeremy Chapman told *Nature* that the journal will retract the seven papers in its August issue.

Springer Nature, which publishes several of the journals named in the analysis, is concerned by the findings and is investigating the papers reported, says Suzanne Farley, director of research integrity at Springer Nature in London. “We will not hesitate to take editorial action in cases where appropriate,” she says. (*Nature's* news team is editorially independent of its publisher, Springer Nature.) ■



Haitian epidemiologist Marie-Roseline Darnycka Bélizaire is helping to coordinate the Ebola response.

## SOCIETY

# Battling Ebola in a war zone

*Health workers in the Democratic Republic of the Congo face violence as they battle deadly virus.*

BY AMY MAXMEN,  
BENI, DEMOCRATIC REPUBLIC OF THE CONGO

A crack runs down one window of the armoured vehicle transporting epidemiologist Mamoudou Harouna Djingarey through Beni, a city in the eastern Democratic Republic of the Congo (DRC). An outbreak of the Ebola virus has killed nearly 1,500 people in the region since August, but it is not the only danger that Djingarey and other Ebola responders must confront.

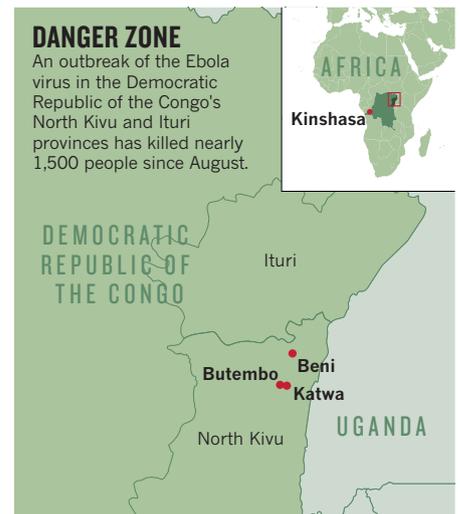
The window cracked on 5 June, when townspeople in Beni hurled rocks at a convoy of vehicles carrying staff from the World Health Organization (WHO), the DRC Ministry of Health and other authorities. One stone hit the head of a traditional leader from the neighbouring Butembo district, who was travelling in the convoy. He survived, but was hospitalized for several days.

Such clashes neither deter nor bewilder Djingarey, a programme manager at the WHO. “We just need to ask them why they throw stones,” he says. The crowd that attacked the convoy was upset that officials and health workers drove through a checkpoint

without stopping to wash their hands in chlorinated water, as local residents have been ordered to do.

“We must also respect the rules,” Djingarey says. After all, he says, Ebola responders need to win the trust of those they are trying to help.

That is a difficult task in the eastern DRC, where more than a dozen armed groups have killed millions of civilians over the past 25 years.



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