**CARBON** End the one-hit wonders of climate-change action **p.130**

**WORLD VIEW** Structural changes to tackle sexual harassment **p.131**



**TRUMPET NOSE** Fossil shows animal had handy hidden hooter **p.133**


# Benefits of sharing

*A swift and effective response to emerging infectious diseases demands that researchers have ready access to the latest data on the pathogens responsible. There is still a long way to go to ensure this.*

Another year, another virus. As the Ebola-virus epidemic recedes, Zika dominates the news. The virus, which usually causes only mild symptoms, has been linked to a reported increase in the number of babies born in Brazil with microcephaly — abnormally small heads and brains. The possible implications of this for pregnant women demand a rapid and evidence-based approach.

The immediate priorities are to gather epidemiological and clinical data to establish whether the apparent spike in cases is real and, if so, to what extent the Zika virus is involved (see page 142). And researchers elsewhere must have full access to all of this information as soon as it is available.

Conventional scientific publishing, based on rounds of peer review, can be too slow to rapidly disseminate research findings during a public-health emergency. One solution is the immediate release of data to public databases and subsequent publication of peer-reviewed analysis. As we have said before, prior release of data and analysis to public databases, preprint servers and forums will not jeopardize consideration of a submission to Nature journals. And Nature journals will make all papers relating to Zika virus free to access until further notice.

Already, there have been promising moves to make data on microcephaly, and on the epidemic of Zika in the Americas, readily accessible. The World Health Organization (WHO) has announced a 'Zika Open' initiative, in which all relevant submissions to its *Bulletin* will be posted online within 24 hours.

In this issue, we publish research that demonstrates the need for rapid data sharing during outbreaks. As detailed on page 228, genome-sequencing technology has advanced to the point at which the whole genome of a virus sample can be sequenced in the field within 24 hours by means of a portable sequencing system. Previously, such sequencing during the course of an epidemic has been slower because it has relied on sending samples to a laboratory. Although this method still faces technical challenges, it should prove a crucial tool in epidemiological research. It offers the potential to rapidly trace how a disease is being passed from person to person, and so help to guide authorities to direct resources that can break these transmission chains.

But the full potential of this advance can be realized only if scientists can access sequence data obtained from samples taken at different times and places during an outbreak. Pathogen genome sequences are most useful when studied alongside epidemiological and clinical data.

Many scientists across the research fields, but notably in genomics, have been enthusiastic champions of early data release. Infectious-disease researchers make use of public forums and databases such as virological.org and GISAID (Global Initiative on Sharing All Influenza Data). The former resource is becoming a major platform for sharing and discussing preliminary analyses of data and it already hosts a genomic analysis of the Zika virus. And, launched just over four years ago, ISARIC (International Severe Acute Respiratory and Emerging Infection Consortium) works with clinicians and epidemiologists to put in place pre-agreed protocols and data-sharing processes that can then quickly be adapted to a new situation.

Almost one year ago, this journal published a Comment article that called for the immediate sharing of outbreak data, a policy that the authors themselves had adopted during their early sequencing of Ebola-virus genomes in the 2014–15 outbreak (N. L. Yozwiak *et al. Nature* **518,** 477–479; 2015). They also called on the WHO to convene a meeting to develop guidance for data sharing during infectious-disease outbreaks. Such a meeting took place last September. It was attended by government representatives, public-health agencies, scientists, research funders, ethicists and publishers. All acknowledged that pathogen sequence information collected during a public-health emergency is of greatest value when released openly, in as close to real time as possible.

A statement released by the WHO after the meeting emphasized the "fundamental moral obligation" of every researcher who generates information related to a public-health emergency to share their preliminary results once these have undergone quality control. Representatives from leading biomedical journals also unequivocally emphasized that disclosure of such information would not prejudice journal publication.

Scientists still face challenges to swift data sharing. For example, as was seen during the emergence of the H5N1 and H7N9 avian influenza viruses and Middle East respiratory syndrome coronavirus, rapid data sharing can be hampered by a lack of international rules that govern how credit and rights (including intellectual property) should be fairly distributed among scientists and authorities in the countries where outbreaks occur as well as researchers based elsewhere.

To play our part in driving the shift towards fast data sharing during public-health emergencies, Nature journals will now encourage authors who haven't already deposited their relevant sequence information in public archives to do so on submission. ■

# A good precedent

*Jimmy Carter's efforts to eradicate Guinea worm should be applauded.*

When former US President Jimmy Carter wanted Ghana to take his goal to eradicate the Guinea worm seriously, he came up with a novel threat. Carter told the country's president that he would try to get the parasitic disease's name changed to Ghana worm. "There isn't a Guinea worm left in Ghana now," Carter told journalists with a grin in London last week.

Carter might just be the United States' most productive ex-president. In the 35 years since he left the White House, the peanut farmer from

Georgia has brokered peace deals, helped to see off despots such as Panama's Manuel Noriega and still found time to spend one week each year building houses for the needy.

But Carter's most lasting accomplishment is likely to be disease eradication. Last year, just 22 people in 4 countries in sub-Saharan Africa had Guinea-worm disease, compared with the 3.5 million who suffered the parasitic infection in one year in the mid-1980s, when the non-profit Carter Center in Atlanta, Georgia, began to lead a global campaign to wipe out the disease.

The former president spoke last week at a meeting to drum up support for Guinea-worm-eradication efforts, barely showing his 91 years or his fight with cancer (he revealed last year that he has metastatic melanoma). He has said that he wants the last Guinea worm to leave the world before he does, and he may also live long enough to see the back of another global menace: the three-decade effort to eradicate polio is nearing completion. The virus is now present in only Afghanistan and Pakistan, which together recorded an all-time low of 73 cases last year.

Neither disease will go without a final struggle. Violence and political instability threaten both efforts, and a Guinea-worm epidemic in dogs in Chad demonstrates the unpredictability of disease eradication. But both campaigns have come too far and cost too much to be left incomplete, and world leaders should provide the resources needed to finish the jobs.

What next? Carter is among those who would like to see other diseases exterminated. His centre launched the International Task Force for Disease Eradication, which has drawn up a list of candidates, including measles, mumps and lymphatic filariasis (a parasitic infection also known as elephantiasis). "We're ready and eager to go on several diseases," Carter said. He even needled the World Health Organization for its sluggishness in adopting Guinea-worm eradication as an official goal, and its reluctance to target other diseases for eradication.

Carter might be right on Guinea worm, but given the tools available to twenty-first-century science and medicine, is an all-out assault to eradicate disease still the best way to go?

Putting the fight against a pathogen on a pedestal can warp efforts to tackle other diseases and develop health systems. Amid regular door-to-door campaigns to deliver oral polio vaccines, northern Nigeria had (and still has) low rates of routine childhood vaccination for diseases such as measles and diphtheria. (Officials have argued that future eradication campaigns could do more to improve health systems, for instance by starting eradication efforts in a particular country only once routine immunization coverage reaches a certain threshold.)

The Guinea-worm and polio campaigns have been decidedly old-school in approach. The main tool against polio has been a decades-old oral vaccine (although a switch to an injectable vaccine is under way). There is no vaccine or treatment for Guinea worm, and eradication efforts have focused on community-based approaches to change behaviour, such as teaching people to filter all drinking water, to avoid recontaminating water sources, and to report cases to health authorities.

***"Eradication success spares countries from the economic burdens of a disease."***

Future eradication campaigns have obvious appeal. Although they are costly, success spares countries from the economic burdens of a disease. Guinea-worm efforts have also helped to provide clean drinking water to millions of people in some of the world's poorest and most remote areas. And eradication is an appealing target that can court donors who might not otherwise support public health.

Future eradication campaigns (and other public-health efforts) should find inspiration in the fact that Guinea-worm eradication has been focused on behavioural change, but they are likely to have other approaches to choose from. One of the most promising is gene-drive technology, which allows a gene that is harmful to a pathogen or vector to rapidly spread through a sexually reproducing population.

Last year, two teams developed experimental gene drives that made mosquito populations infertile or resistant to malaria. It will be years before the technology is ready for field trials. But it is one reason that people are beginning to talk seriously again about malaria eradication, after failed efforts in the 1950s and 1960s.

Gene drives could also be applied to other vector-borne infections, including tick-borne infections such as the bacteria that cause Lyme disease. President Carter's hit list may yet grow longer. ■

# Outside the bubble

*Governments must stop proposing solutions and invest in large-scale removal of carbon dioxide.*

Every generation throws a different hero up the pop charts, sang musician Paul Simon. And every political cycle, it seems, promotes its own signature solution to the problem of how to curb and prevent climate change. This year's answer is bioenergy with carbon capture and storage — a plan on a colossal scale to grow grass and trees on an area half the size of the United States, harvest and ship this biomass to power stations, burn it and then trap the carbon dioxide from the exhaust gases. The greenhouse gas would then be piped underground and stored indefinitely. The scheme's acronym — BECCS — barely does its complexity justice.

Perhaps this is the first you have heard of BECCS. That wouldn't be a surprise. It is something of an overnight sensation — the boy band launched to number one on the back of a reality television show, rather than the grizzled rockers who earned their fame after years of concerts attended by three people and a dog. Yet at the Paris climate talks late last year, which were widely acclaimed as a triumph, the BECCS scheme was quietly installed as the world's Plan A.

That's because it comes with a very catchy tune that politicians can't get out of their heads. BECCS solves the problem of future carbon emissions and cleans up the past. The plants suck $CO_2$ from the atmosphere, which ends up safely underground. We get the benefit of burning them to generate electricity, the world gets to keep its power infrastructure, and the atmosphere experiences what BECCS enthusiasts call negative emissions. Rather brilliantly, the more energy the scheme produces, the more the planet edges away from dangerous levels of global warming.

What's not to like? Well, in a World View article published after the Paris talks, climate scientist Kevin Anderson compared BECCS to a fairy godmother, conjured up to wish away reality in a puff of optimism (see *Nature* **528,** 437; 2015). And in a Comment piece on page 153, environmental scientist Phil Williamson takes a hard look at some of the questions that BECCS seems to pose, and finds few answers.

How would we preserve forests and grasslands, faced with such a demand for energy crops? How much carbon would be released during the agricultural stage? How much water will we need, and where will we get it? How much will it cost to build the network of compressors, pipes, pumps and tanks that will be needed to liquefy and transport the separated $CO_2$? Can it even be separated at a sensible cost?

Recent years have seen a series of solutions to global warming thrown up the political agenda. From biofuels and carbon offsets to ocean fertilization and conventional carbon capture, each has had its moment in the sun, only to be replaced by something younger with a new sound.

BECCS may yet prove to have staying power. But to avoid another one-hit climate wonder, governments must spend the money to do the groundwork — as Williamson says — and to answer those questions and plenty more. Politics is the art of the possible. But serious action on climate change must be based on the science of the probable. ■

**➲ NATURE.COM**
To comment online, click on Editorials at: go.nature.com/xhunqv