THIS WEEK

Viral complacency

The first outbreak of yellow fever in Angola in almost 30 years illustrates the danger of a short attention span when confronting epidemic threats.

The World Health Organization (WHO) last week declared that the Ebola epidemic in West Africa no longer represents an international public-health emergency. But as experts also warned last week, there must be no let-up in improving readiness for the next Ebola outbreak — including the nightmare prospect of an epidemic in the megacities of Africa.

An expert panel of researchers convened by the London-based Wellcome Trust and the Center for Infectious Disease Research and Policy at the University of Minnesota, Minneapolis, warned in particular that support for Ebola vaccine research must not be allowed to slip. Although a successful experimental Ebola vaccine has been developed, much work remains to be done if safe and effective vaccines are to be ready in sufficient amounts to quickly nip future outbreaks in the bud.

"As Ebola infection rates come under control it's a huge concern that complacency sets in, attention moves to more immediate threats, and Ebola vaccine development is left half-finished," cautioned Jeremy Farrar, director of the Wellcome. Too often in the past, the world has stumbled from epidemic to epidemic, failing to learn the lessons of the last. Emergency responses to the latest threat capture headlines, research and political attention. But too often this attention quickly fades.

Yellow fever, a virus that kills many of those it infects, is just one example of the failure to sustain control efforts. The virus is spread by *Aedes aegypti*, a mosquito adapted to live in urban areas. An ongoing yellow-fever outbreak in Angola, the first for nearly 30 years, began in December and has since spread within the country, infecting at least 490 people and killing 198. It now threatens the wider region.

Yet mass vaccination and intensive mosquito-control programmes largely eliminated this vaccine-preventable mosquito-borne disease by the 1940s. In South America, where the disease was widespread, the mosquito vector was virtually wiped off the map by the 1970s. But the success of mosquito control led to complacency and scale-back.

As a result, *A. aegypti* is now present across more of the continent than before control began. It is similarly resurgent in tropical and subtropical regions worldwide, resulting in sporadic outbreaks of yellow fever in at-risk countries. Moreover, the mosquito's comeback has fuelled large urban outbreaks of dengue, chikungunya and now Zika viruses, with at least tens of millions of people infected.

There's a long list of other *Aedes*-borne viruses that are currently restricted to animal reservoirs in the wild. But some of these, including potentially deadly ones, will inevitably establish themselves in cities with *Aedes* mosquitoes. Given rampant urbanization throughout the tropics and subtropics, dense human and *Aedes* populations are ticking time bombs. The failure to sustain *Aedes* control illustrates the need for long-term persistence to curb epidemic threats.

The Angola outbreak has already depleted an international emergency stockpile of 6 million doses of vaccine, leaving authorities scrambling to obtain extra vaccine from national immunization programmes. The WHO and other international agencies launched the Yellow Fever Initiative in 2006 to reboot yellow-fever mass-vaccination programmes and routine vaccination in the highest-risk African countries. But vaccine stocks are still insufficient, and vaccine coverage in many African countries too low, leaving many vulnerable. The problem, says one official associated with the initiative, is that yellow fever is a "forgotten disease", which makes it difficult to attract sustained political interest and funding.

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Following the Ebola epidemic in West Africa, a slew of commissions and reports laid out a broad consensus on what needs to be done for a more proactive and sustained preparedness against epidemic threats. These measures include reinforcing public-health systems, surveillance and diagnostic capacities, and training health workers to identify and respond early to disease outbreaks. Weaknesses in these areas have been identified as factors that allowed what was a small Ebola outbreak to spiral out of control.

Monitoring viruses in the wild, and a better understanding of how factors such as deforestation, and the hunting and consumption of bushmeat, influence spillover of animal viruses into humans, is key. So, too, is the pre-emptive development of drugs and vaccines against known potential epidemic threats.

The Ebola epidemic has prompted vigorous discussion on all these points, on what shape or form any new global initiatives should take, and where the required multibillion-dollar investment will come from. The big risk is that as the Ebola epidemic fades from memory, the sustained political commitment and funding required will not materialize, and business as usual will resume. That must not be allowed to happen. ■

Safety in neutrons

To boost nuclear security, research reactors must eliminate highly enriched uranium.

Working with the United States, Japan has removed all of the highly enriched uranium (HEU) and the separated plutonium from one of its nuclear reactor facilities, to minimize the risk of theft and use by terrorists. The two countries have now pledged to convert a second research reactor to use safer, low-enriched uranium. These are among the latest in a series of accomplishments that have stemmed from US President Barack Obama's biennial Nuclear

Security Summit, which wrapped up on 1 April. More than 50 countries attended, most represented by heads of state, making a variety of commitments to reduce the risk of nuclear terrorism.

These projects are also a reminder of just how slow progress has been — and how much remains to be done.

Obama launched the agenda in a 2009 speech in Prague, calling on governments to secure or eliminate all vulnerable nuclear materials in four years. His speech underscored the fact that the threat of a nuclear attack has increased even as the danger of apocalyptic nuclear warfare has receded. Recent revelations that the Islamist terrorist group ISIS may have been targeting a nuclear facility in Belgium make this all too clear.

The initial focus has been on HEU, because of simple physics. Whereas plutonium must be compressed with explosives to produce a nuclear explosion — a feat that is probably beyond the technical capability of terrorist groups — the process is simpler for weapons-grade HEU, which is also used in many reactors. The United States and Russia, which have supplied the world with the bulk of HEU, have stepped up efforts to secure, remove or blend these materials into low-enriched uranium (LEU), which has 20% or less of the key isotope uranium-235. Security has been upgraded at 32 facilities, and 12 countries have been declared HEU-free since 2010.

Many of these materials are located at civilian research reactors. The risks were recognized long ago; in 1978, for example, the United States began eliminating HEU fuel in these reactors. In 1992, the US Congress enacted a law requiring countries that receive its HEU to commit to converting reactors to LEU fuel. To maintain reactor performance, however, scientists needed to develop a new generation of high-density LEU fuels, which are now available for most research facilities.

This is good news, but challenges remain. Existing high-density LEU fuels cannot be used without degrading performance in 11 specialized US and European research reactors. Certifying new fuels and converting these reactors could take nearly two decades. In January, the US National Academies of Science, Engineering, and Medicine recommended that specialized US reactors adopt an interim solution and convert to less-enriched fuel sources containing 30–45% uranium-235. This could — and should — be accomplished over several years, without impeding efforts to complete the shift to safer LEU fuel as soon as possible.

"Research reactors are just one part of the puzzle."

Researchers also need a comprehensive strategy to maintain research reactors. The European Commission is sponsoring a research consortium called HERACLES to do just that. The White House Office of Science and Technology Policy should convene agencies and research facilities to develop a path forward, and engage internationally. Many of these specialized research reactors are getting old; in some cases, given delays with new LEU fuels, it may make sense to start anew.

But research reactors are just one part of the puzzle, and the question now is how to carry the broader nonproliferation agenda forward once Obama leaves office. His four nuclear summits have boosted political attention and accelerated progress, but the world is awash with nuclear materials. Nuclear safety and security falls to a problematic patchwork of international institutions, including the International Atomic Energy Agency (IAEA), Interpol and the United Nations, and the latest summit produced a variety of initiatives to bolster these institutions.

That is a start. Ultimately, the world needs a new convention that sets specific standards for nuclear security and allows inspections and enforcement by the IAEA. In the meantime, governments must work through existing institutions to share and implement best practices. Regardless of cost, research facilities must ensure that their nuclear materials are safe and secure. ■

Mind matters

Mental illness is moving up the global agenda — but there is still much to do.

Nominally, 2016 should be a good year for mental health. On 13 and 14 April, the World Health Organization (WHO) and the World Bank will hold an unprecedented joint conference in Washington DC to discuss mental health as both a global disease and an economic problem.

It is a welcome gesture after many snubs. Mental illness was left out of the United Nations' influential high-level meeting on non-communicable diseases (NCDs) in 2011. Almost begrudgingly, the UN gave mental health a brief mention in the entry for NCDs in its 2015 Sustainable Development Goals. As well as reducing deaths from NCDs such as heart disease by one-third, it said, the world should also "promote mental health and well-being".

The UN failed to recognize that in terms of impact, mental disorders are at least as harmful as those better-recognized and better-funded diseases. Mental-health conditions account for 37% of the healthy life years lost to NCDs. This reflects shortened lifespans and a loss of ability to work effectively, and it translated to a global loss of US$2.5 trillion in 2010; that figure is projected to rise to $6 trillion by 2030 (see go.nature.com/dfdkbh). Simply 'promoting' mental health is not enough.

Many developed countries scarcely give mental illness more than lip service. In the United States, for instance, the topic is brought up only when a mass shooting launches a 'conversation' about the poor state of mental-health treatment — and then only as a distraction from the gun-control debate. Such attention rarely leads to new funding for mental-health research.

Underlying much of this neglect is the persistent bias, conscious or not, towards believing that many mental-health conditions are a moral failing rather than the result of complex biology, despite overwhelming evidence for the latter. For poor countries wracked by infectious and childhood diseases, it can be easier to confine people with psychosis than to try to treat them. And treatment is hard to find the world over: globally, there are only nine mental-health providers for every 100,000 people, and some countries have only one or two providers. A Comment on page 25 calls for a global strategy to combat care deficiencies in both developing and developed countries.

Even in developed countries, people find it difficult to consider depression as a condition to be combated with the same clarity of purpose as heart disease. This is exacerbated by the failure to develop drugs for depression that are as clear-cut and effective as statins. This is unlikely to change soon: if anything, neuroscience is painting a bleaker picture by showing how complex these diseases are. More than 100 genetic regions have been associated with schizophrenia — and autism and depression are probably even more complex. Addressing all of these will require entirely new approaches. A News Feature on page 20 looks at the latest developments on one emerging, but still unproven, front: phone apps intended to assist people with mental-health disorders.

The annual Mental Illness Awareness Week in October promotes mental health, as do many organizations devoted to erasing the stigma and bias that harm patients and inhibit politicians. But so much more is needed in terms of improved treatments and access to care.

Finance ministers at the meeting next week should recognize the positive economic returns of investing in this direction. The UN, the WHO, the World Bank and governments should be expected to contribute something tangible to this pressing issue. The summit's attendees should come away with plans for creating specific development targets, and mechanisms for funding research, ensuring that treatment is available in low-income countries, and holding nations responsible for giving mental illnesses as prominent a place in health care as other NCDs. ■

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