



Investing in the monitoring of new infections in Asia would speed public-health and clinical responses.

Shift expertise to where it matters

Tools and training for responding to diseases such as avian flu must relocate to countries where infections are most likely to emerge, says **Jeremy Farrar**.

Every day on my way to the hospital, I pass streets lined with poultry. The birds disappeared a few years ago, but have gradually returned. This would be of little concern if I was in Europe or North America — but I work in Vietnam studying emerging pathogens, including the avian influenza virus (H5N1). There is a patient with H5N1 in the hospital as I write. This is a region where the H5N1 virus has killed millions of birds and several people, where SARS and Nipah virus emerged and where the threat of antibiotic and antimalarial drug resistance is growing. Because of this, we have become acutely aware of the continued danger of infectious diseases, and the inadequacies of our current systems for tracking

them and responding in a timely fashion.

Too often, surveillance is crisis-driven, ad hoc and reactive; it is incorporated into overextended and under-resourced systems. It frequently relies on outside experts, who arrive with little understanding or appreciation of the country, local infrastructure or culture. Inevitably, a lot of time and resources get wasted — a purchased PCR machine ends up collecting dust in an empty lab, commitments to supply consumables are not honoured and there are too few trained people to service and run things after short-term projects end. Much donor funding is wasted on meetings, teleconferences, workshops and flying in consultants.

This disconnect between the people and

places involved continues to create problems. In 2007, Indonesia put on hold the sharing of H5N1 samples with the World Health Organization, out of a concern that they would be used to create vaccines and other therapies that only wealthy countries could afford. No one can condone refusing to share information of such public-health importance, but today, eight years after Vietnam's first human case of H5N1, too few endemic countries have access to the vaccines or intravenous antiviral drugs that continue to be stockpiled in richer parts of the world. Recent research has pinpointed specific mutations in the H5N1 virus that may render it more transmissible in mammals — but scientists like us in endemic areas are still waiting to learn what those mutations are.

ON THE SPOT

With moderate investment, we could be conducting surveillance for H5N1 and other emerging infections much more effectively, and could link that surveillance with immediate action. Surveillance on its own without a public-health need or clinical response is of questionable value, and unlikely to be sustained. I believe that we have to bring some of the huge investment by the developed world in genomics, technology and training to affected countries

in Asia and elsewhere. In this way, surveillance, analysis of samples, and — crucially — the public-health and clinical-research response can be conducted in the same place, making the process faster and more flexible in dealing with rapid developments. It would require a transfer of technology, prolonged exchange of scientists and a sustained commitment to investment and training locally — along with an equitable sharing of the benefits of the research.

The unit in which I work in Vietnam shows that this type of project is possible. Over the past 21 years, we — alongside our sister programme in Thailand and with partnerships across Asia — have helped to train thousands of regional scientists in clinical medicine, epidemiology, microbiology, bioinformatics and other disciplines crucial to monitoring, controlling and understanding infectious diseases and outbreaks. We are small and flexible, which keeps bureaucracy and costs down — we employ only a few hundred staff across several countries, but collaborate with many more. Thanks to funding from the Vietnamese government, the UK Wellcome Trust, the US National Institutes of Health and the Li Ka Shing Foundation in Hong Kong, we have some

“There is now a window of opportunity to build global scientific capacity before another crisis hits.”

of the capacity and flexibility needed to respond immediately to the rapidly changing dynamic of infectious diseases such as H5N1, enterovirus 71 or artemisinin-resistant malaria, and can make results available in real time. Such an approach is impossible when the work requires individuals to fly in and out and to analyse samples in another country.

SMALL BUT POWERFUL

There are other great examples of long-term research partnerships between national and international organizations, but they are all too few. These infrastructures are easier to build than many believe — you need only a small group of committed people, a shared vision and ethos, flexible funding that encourages local decision-making, and a focus on excellence. There can be great power in such small institutions — which may need as little as a few hundred thousand dollars a year to operate — if only we made better use of them (G. T. Keusch and C. A. Medlin *Nature* **422**, 561–562; 2003).

Because our research unit is based in the region where the story is unfolding, we can appreciate the social issues that can stymie even the best scientific endeavour. For instance, small-scale backyard poultry farms (often family farms with mixed chickens, ducks and pigs) remain a crucial livelihood and the main source of protein for many households in rural Asia. Because no adequate compensation schemes have been developed to encourage reporting of sick poultry and livestock, the usual responses are to cull all local poultry and apportion blame. Such activities can ruin small farmers and their families.

There is now a window of opportunity to build global scientific capacity before another crisis — such as a new pandemic — hits. This means collaborating with the people who share a vested interest in using the money efficiently and effectively to prevent outbreaks and address daily public-health and clinical issues in their own countries. After living in Vietnam for more than 16 years and raising my family here, I can understand the feeling of urgency. Everyone I work with who sees chickens each day on their way to work, hears about local outbreaks in the news or treats patients is united in the effort to stay one step ahead of H5N1 and other potentially deadly outbreaks. We must share the available knowledge and the tools to make it possible — an undertaking that will require us to shift the centre of gravity for such research to where the needs are greatest. ■

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A swab sample is taken from a pig in the village of Yeh Kuning, Bali, to test for H5N1 influenza.

How to track a flu virus

Four experts pinpoint ways to improve monitoring of H5N1 avian influenza in the field.

YI GUAN

Monitor outbreaks in domestic ducks

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The H5N1 influenza outbreak in Asia is unprecedented: never before has a highly pathogenic avian influenza virus prevailed for so long, spread to so many countries or generated so many genetic variants. Why? Partly because of its persistence in domestic ducks.

In parts of southeast Asia such as China and Vietnam, H5N1 has remained endemic. Elsewhere, small outbreaks last for a very short time. The major difference between these regions is their domestic duck populations — more than 70% of the world's ducks are raised where H5N1 is endemic.

In our 12-year surveillance, more than 65% of the H5N1 viruses my colleagues and I isolated were from domestic ducks. Asymptomatic ducks could shed high concentrations of the virus for several days. Although the H5N1 virus resides in domestic ducks, it can interact with other

subtypes of influenza, for which these birds are part of the natural reservoir. This mixing creates novel variants, which may trigger outbreaks and dissemination of the virus. Domestic ducks probably shelter the H5N1 virus during the summer and then seed the next outbreak, which, in bird populations, usually peaks during the winter.

At present, surveillance of duck populations is limited. Eradication of H5N1 will require more active surveillance in affected areas, along with widespread vaccination of duck populations, segregation of poultry species and local moratoriums on poultry production when outbreaks occur.

RICHARD WEBBY

Improve surveillance of pigs

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One major problem with H5N1 surveillance is the lack of coordinated monitoring in pigs. Although H5N1 is considered to be avian flu, the same mutations that ▶