

We have been warned

The world is celebrating the news that the SARS outbreak now seems to be contained. But the epidemic has revealed gaps in our defences against emerging viral diseases and the ever-looming threat of a flu pandemic.

It's official: on 5 July the World Health Organization (WHO) announced that the global outbreak of severe acute respiratory syndrome (SARS) had finally been contained. The chain of local transmission of SARS in Taiwan, the last region to bring the disease under control, seems to have been broken.

But the WHO rightly muted the euphoria with a warning that SARS has not actually gone away. About 200 people remain sick; others may be infected but not showing symptoms; and the SARS virus could hop over from its natural animal host at any time to haunt us once again. Global vigilance, the WHO argued, must be kept up. Indeed, the reprieve we are now celebrating may be no more than a breathing space. SARS could turn out to be seasonal, like influenza, and come back with the next Northern Hemisphere winter. If so, the intense level of scientific research into the disease must also be maintained, to develop therapies and vaccines.

The announcement that SARS has been contained provides an appropriate landmark against which to ask some searching questions about the epidemic (see page 121). There are several stages to bringing a newly emerging disease under control. First, a cluster of unusual symptoms must be recognized and public-health authorities alerted. These officials must respond by isolating patients, tracing their contacts and controlling their movement. Meanwhile, the pathogen involved must be identified. In the longer term, therapeutic strategies must be developed and the source of the infection — usually animals that harbour the virus — must be pinned down.

Rapid response

A certain amount of backslapping is warranted. Although a more infectious disease would probably have been impossible to contain, our success in controlling SARS was a consequence of rigorous international activity in isolating infected people. And when it came to characterizing the pathogen, the scientific response was exemplary. The credit goes to the network of virologists put together by the WHO, which quickly identified the SARS virus. The unsung hero was Klaus Stöhr, the WHO official who built the SARS team and nurtured an atmosphere in which normal scientific competition could be suspended. Stöhr, who leads the WHO's influenza project, built his team around the WHO's existing flu network. Even as the SARS crisis was at its peak, this network quietly reinforced its merit by identifying the virus responsible for a virulent type of avian flu that had broken out in poultry farms in the Netherlands and was jumping over into humans (see *Nature* **422**, 247; 2003).

Having been taught the merits of a network culture, we should encourage its continuation, so that when the next deadly virus starts to circulate, scientific networks of various types — for basic and clinical research, and the development of drugs and vaccines — can be activated immediately.

On other fronts, however, the SARS outbreak has revealed serious shortcomings in our ability to respond to emerging diseases. Even now, there is an urgent need for more studies to find the natural animal reservoir from which the SARS virus emerged. Without this knowledge, it will remain impossible to assess the likelihood of recurrent outbreaks.

Perhaps the biggest chink in our armour is the initial stage of clinical surveillance for unusual clusters of disease. Had China been more attentive to this, and launched a vigorous investigation into the outbreak of atypical pneumonia that emerged in its southern Guangdong province in November last year, SARS might have been nipped in the bud before it established its initial human foothold. Unfortunately, disease surveillance has never had a high priority in health spending. Although it is reasonably sophisticated in the United States, Canada and some other developed countries, it is very patchy elsewhere.

Under surveillance

In the wake of SARS, some experts are suggesting that surveillance for emerging diseases should extend to sampling and characterization of the entire panoply of viruses circulating in people and animals (see *Nature* **423**, 471; 2003). One model is the existing WHO influenza network, which samples the flu viruses in general circulation, to monitor for dangerous variants and to help plan vaccine production. Extending this approach to other viruses would be extremely expensive, however. Given the difficulty of getting politicians to spend large sums of money on averting unknown, future threats, the immediate priority should instead be on improving basic clinical surveillance. This already has a strong foundation in the form of the WHO's Global Outbreak Alert and Response Network. Established in 2000, this network involves 145 countries and aims to monitor and investigate rumours about unusual disease symptoms. But its effectiveness is limited by the fact that it merely coordinates existing, poorly resourced national surveillance activities.

We also have to face the grisly fact that even the most powerful surveillance and the most rapid scientific responses will not be enough to rapidly contain a disease that is as deadly as SARS but as infectious as influenza. But with better all-round preparedness — from better surveillance to a guaranteed capacity for vaccine production — the fight could be made more even, reducing the scale of the tragedy that would result.

The next disease that fits this description will probably not be entirely novel, but could be a new and deadly strain of influenza. Given this, the desultory state of our preparedness for a flu pandemic is shameful. SARS was a genuinely new disease, so drugs and vaccines couldn't immediately be brought into play. In contrast, effective drugs that target the flu virus do exist, and methods for the rapid production of vaccines are already established. Yet no government has stockpiled drugs, and only Canada has organized capacity for producing flu vaccines for all of its citizens. With the WHO's flu network doing such a sterling job in monitoring for potential pandemic strains, this failure to prepare for converting the knowledge it provides into widespread immunization is shockingly negligent.

The 1918 flu pandemic killed tens of millions, and we know for certain that a strain with a similar combination of virulence and infectiousness will at some point cross over again from animals to people. The SARS outbreak should be seen as a timely warning to health officials who have yet to make adequate preparations for this eventuality. This time, we had a lucky escape. ■