Editorial

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In the 1950s and '60s there was optimism in the air – medical science had disease on the run. Diseases like cancer might still have been a problem, but with penicillin putting bacterial disease to flight and vaccinations controlling polio and small pox it seemed like only a matter of time before infectious diseases would be wiped out, along with many other conditions.

Now the opposite is the case – governments around the world are in a race to stock up on supplies of Tamiflu before an outbreak of avian influenza can cause millions of deaths. AIDS is killing similar numbers more slowly in the developing world and, despite plenty of new drugs and superb public health campaigns, keeps coming back even in wealthy countries.

What went wrong? The answer is many things. One problem is that many of the diseases are much more slippery than we thought.

Influenza is the perfect example. As each new strain comes along we can produce a vaccine to protect people, but nothing stops the disease mixing and matching its surface features to find new ways past our immune systems. In most cases a new 'flu variety does some damage before the vaccine can be created, but it is usually only fatal for those who are already vulnerable.

However, when a really new variety of 'flu comes along we lack the immunity acquired by having encountered something vaguely similar. If the virus is particularly potent it can kill even the strongest people, as the pandemic of 1918–19 did. Sure we'll produce a vaccine in a few months, but 'flu spreads so fast that tens of millions could be dead by then.

Other diseases, such as AIDS resist simple vaccines in the first place. In May 2006 the University of New South Wales started enrolling people in a trial of an anti-AIDS vaccine. However, there have been plenty of vaccines tried before against HIV, with little success. Even if one "works" it is more likely to reduce infection rates a little rather than offering the almost complete protection that vaccines can offer against simpler diseases.

Even some of the diseases we thought we had beaten are reappearing as natural selection ensures that those bacteria with resistance to antibiotics spread to take the place of the vulnerable versions. Dr Catherine Bennett of the University of Melbourne grimly informs us: "Today up to 95% of the bacteria causing common skin infections (e.g. boils) are penicillin-resistant" (see pp.22–24).

The problem, however, is not just with the diseases. Chlamydia can be cured with a dose of antibiotics, but 100 million new cases (and rising) appear each year partly because people fail to get themselves checked before passing it on.

Furthermore, rates of AIDS, chlamydia and many other diseases would plummet if we practised safer sex, but not everyone does. As Heather Corinna of www.scarleteen.com explains: "Plenty of young adults have the idea that condoms put 'something between' them and their partner" (see pp.25–29). "A pregnancy and child absolutely puts something in the middle, as does a sexually transmitted infection." For a lot of diseases the problem is not that we lack solutions, it's that so many of us fail to think sensibly about using those that we have.

The problem is not just at an individual level. Although no cure for AIDS exists, great work has been done to create drugs that dramatically extend the lives of people infected with HIV. By reducing the viral load in a person's body, these drugs also reduce the risk that someone who is taking them will infect everyone else.

However, James Nichols of Médecins Sans Frontières (MSF) points out: "Even today, 95% of the [AIDS] drug market is in the developed world, yet 95% of patients live in Africa, Latin America and Asia" (see pp.30–35).

MSF's programs make antiretroviral drugs available in limited areas. These projects demonstrate that answers are possible, but the failure of the rich world to provide the money has meant that the disease runs unchecked across most of Africa and large parts of Asia.

As if our neglect was not bad enough, we face the danger that people will deliberately choose to infect each other with diseases as a method of war or terrorism. Stephen Leeder and Anne-Marie Boxall of the University of Sydney point out that biological warfare is not new. "In the 15th century, during Pizarro's conquest of South America, he improved his chances of victory by presenting gifts to the natives – clothing laden with smallpox virus" (see pp.39–40).

Now, however, bioterrorism can cause chaos even without killing many people. "The consequences of bioterrorism often have nothing to do with the biological agent used and everything to do with public panic and the need for community leaders to be seen to be 'doing something'," Leeder and Boxall argue.

The definition of emerging diseases is not entirely clear.

Some people apply it only to new and expanding infectious diseases, while others include any diseases that are becoming more common.

We've used the latter interpretation, considering two diseases that have increased dramatically in recent decades – asthma and RSI. Although both seem to have levelled off recently they're interesting because we don't fully understand the factors that have influenced their frequency. As Dr John Woods and Prof Philip Thompson note: "The underlying reasons why some people develop asthma are still poorly understood".

There are other emerging diseases where our understanding is better. Rates of Type II diabetes are shooting up, mainly as a result of our diets and lack of exercise (see *Issues* 72).

Sometimes we do manage to stop diseases emerging. Variant Creutzfeld Jacob disease (CJD) appeared as a result of people eating meat from animals with "mad cow disease". The disease attracted plenty of attention, partly because it is so horrific and also because the infectious agent, known as a prion, is so bizarre.

However, since it was realised that mad cow disease resulted from the truly mad behaviour of turning grass eating cattle into cannibals, the disease has largely been brought under control. Deaths from variant CJD have been falling since 2000.

The Hendra virus caused panic in the horseracing industry in 1994, and bouts of the closely related Nipah virus have caused hundreds of deaths in Asia (see pp.20–21). However, a vaccine is now being tested, and it looks like we may be able to protect ourselves against this pair before they can do much more damage. Similarly the use of effective public health measures brought an end to the SARS crisis of 2003, although re-emergence is possible.

This has happened because all diseases have weaknesses. A disease can't afford to kill its hosts before they can infect a new host – which is why the ebola virus makes for good horror movies but isn't likely to turn up in Sydney any time soon. Of the 1500 people known to have been infected with this terrible disease – which causes bleeding from every opening in the body – fatality has occurred in 80% of cases. However, most have died too quickly to transmit the virus, and only poor hygiene in impoverished hospitals has allowed the number of deaths we've seen.

Which is why the disease that really gives experts sleepless nights is avian flu. There is a huge reservoir of birds out there with the disease (some of which carry it without getting sick), and we know how easily flu can be transmitted from one person to another.

So far the H5N1 variety hasn't managed to spread from person to person, and jumps poorly from birds to humans. However, other flu viruses have no problems travelling from one human host to another, and flu viruses share a frightening ability to interchange DNA, so just one person infected with both a normal dose of flu and with the avian variety could start a pandemic such as the one that killed more people than World War 1.

For a time the world shut its eyes and pretended that the problem would go away, but recently governments and individuals have been waking up. Wealthy nations are stocking Relenza and Tamiflu, two drugs that protect against, and reduce the severity of, flu.

The need for such stocks is so widely acknowledged. It's less well-known that both drugs are based on research uncovering the structure of the flu virus by Prof Graeme Laver of the Australian National University. Laver identified sections of the virus' surface that don't change, enabling the production of drugs that prevent the virus from escaping infected cells.

However, Laver doubts that the Australian government will make the best use of its stores. "The plan the Health Minister announced was to use the stockpile to enable one million 'essential workers' to take Tamiflu each day for a period of 6 weeks to prevent infection," he writes (see pp.7–10). "This is a complete waste of a valuable drug. What happens after 6 weeks, when the stockpile is exhausted and the pandemic is still raging?"

Athol Yates of the Australian Homeland Security Research Centre is not so damning, but he sees nine ways that the Australian pandemic plan could fail (see pp.15–19). One issue that Yates doesn't mention is our heavy reliance on Tamiflu. Relenza is Australian, and taxpayers invested almost $250 million in its development. Yet our stockpile is mostly Tamiflu, which, while based on Australian research, was developed overseas.

Tamiflu has been chosen because it comes in pills while Relenza is inhaled. However, more than patriotism suggests that we might want to even up the balance. Widespread use of Tamiflu will cause the same selection pressures that see bacteria become resistant to antibiotics. Having a different drug as a second line of defence may prove invaluable.

The government has reasons for its choices. Maybe they're the right choices, but what is really worrying is how little debate there has been on these topics. An avian outbreak could be the greatest disaster since World War II, yet there's hardly any discussion on how best to prepare for it.