

Drugs could head off a flu pandemic — but only if we respond fast enough

If a strain of avian influenza emerges that can spread easily from person to person, could rapid deployment of antiviral drugs stop a local outbreak from becoming a global disaster? Yes, conclude the most detailed modelling studies yet of an emerging pandemic — if the world can muster its scientific and logistical efforts quickly enough.

The two independent studies were carried out by an international team led by mathematical biologist Neil Ferguson of Imperial College London¹, and by a group led by Ira Longini, a biostatistician at Emory University in Atlanta, Georgia². They reach markedly different conclusions about how easy it would be to contain an emerging pandemic. But both agree that it would be possible — if the virus was detected quickly, if it did not spread too fast, if sufficient antivirals were deployed quickly and massively around the outbreak's epicentre, and if strict quarantine and other measures were also used.

That in itself is something of a breakthrough: all previous pandemics have swept unchecked across the planet. "What is striking is that these models, although quite different, both conclude that a flu pandemic could be contained at source," says Jeremy Berg, director of the US National Institute of General Medical Sciences in Bethesda, Maryland.

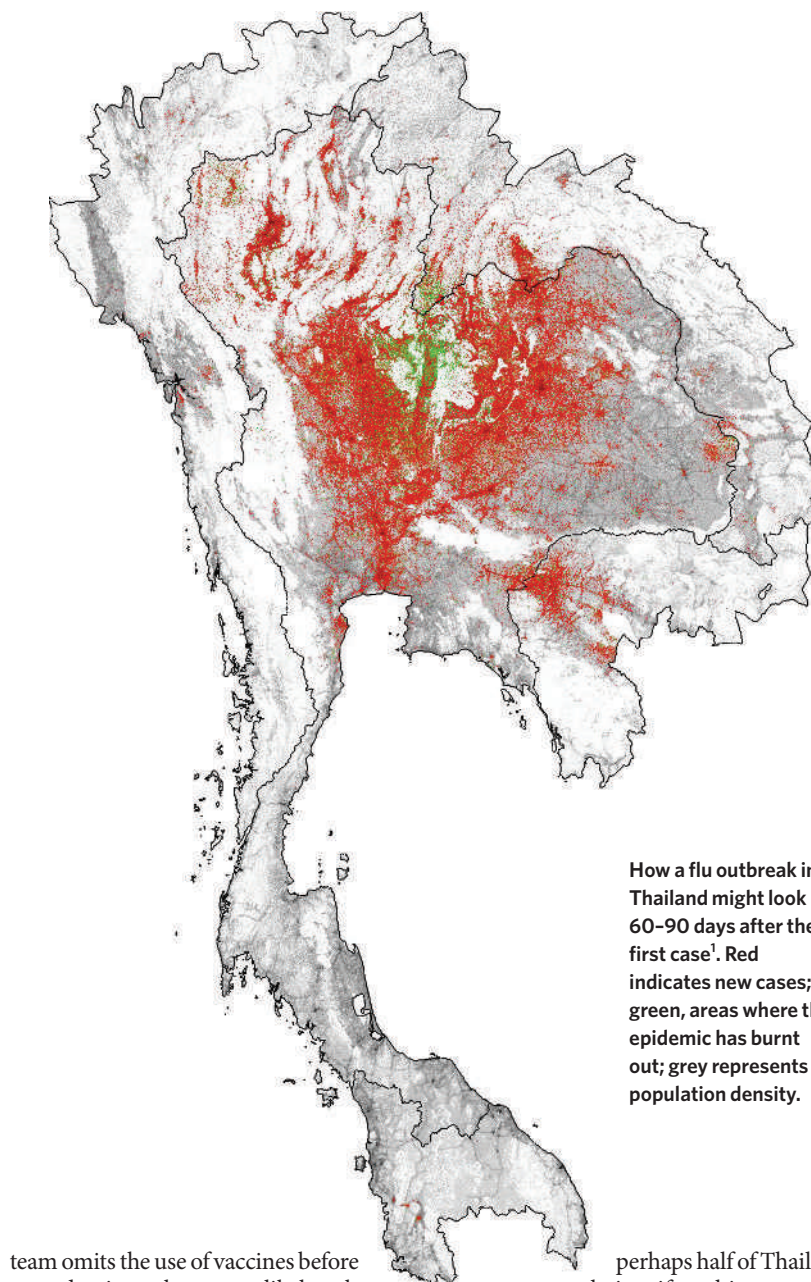
Buying time

Treating sick patients with antivirals is not enough to stop a flu pandemic. You have to at least treat their contacts as well, because patients cough out virus before they fall ill, as do others who don't get ill at all.

But must you treat just those in contact with the patient, or everyone within, say, a 1-, 10- or 100-kilometre radius? How many drugs would that take? And how fast would they need to be delivered?

The studies, which are both based on data from Thailand, give different answers. Longini and his colleagues found that just 100,000 to 1 million drug courses, administered to those who fall ill and their social contacts, would give a high probability of success. They also predict that even a rapidly spreading virus could be contained by extra measures such as quarantine and pre-pandemic vaccination. "There is a lot of fatalism about avian flu," says Longini. "But we are saying it is perhaps not hopeless."

Ferguson's scenario is more pessimistic. His



How a flu outbreak in Thailand might look 60–90 days after the first case¹. Red indicates new cases; green, areas where the epidemic has burnt out; grey represents population density.

team omits the use of vaccines before a pandemic, as they are unlikely to be available. It concludes that a slowly spreading pandemic might be stopped, but it would mean treating everyone in a 5-kilometre radius, involving some 2 million to 3 million drug courses and measures such as quarantine from the start. If the policy succeeded, only 200 people might get infected, compared with

perhaps half of Thailand's population if nothing was done. The model also concludes that a faster-spreading virus would be unstoppable, although it might be held back for a few weeks, buying precious time for a vaccine to be developed, something that takes 6–8 months.

One reason for the differences in the studies' results is that the groups calculated the initial



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rates of viral spread differently. Longini's group assumed it takes four days for an infected individual to be able to infect others, a figure used in previous models. But Ferguson reanalysed historical data and came up with a figure of just 2.6 days.

Longini's simulation also models 500,000 individuals laid out on a regular grid, whereas Ferguson's maps the population densities of all of Thailand's 85 million people, albeit in less detail. The larger scale makes it easier to take account of clusters arising outside the initial outbreak area.

Too slow

Both groups agree that, for a containment strategy to have any hope of working, it must be in place within a few weeks at most of the first people being infected with a virus capable of sustained human-to-human transmission.

If such a virus arose today, that is unlikely to happen. Surveillance systems in southeast Asia are poor; recent cases have taken weeks to detect and diagnose. Whereas Cambodia has typically reported cases to the World Health Organization (WHO) within about a week, Vietnam has often reported cases after several weeks, and in some cases months.

Marc Lipsitch, an epidemiologist at Harvard University, says the papers leave him concerned that too little is being done to plan containment strategies. "We are simply not moving fast enough," he says.

For example, the WHO currently has just 120,000 courses of antivirals in its stockpile, although it is in discussions to get more. "I think the take-home message is that the current stockpile is very unlikely to be adequate to stop anything," says Lipsitch.

What's needed, says Ben Schwartz of the National Immunization Program at the Centers for Disease Control and Prevention in Atlanta, are international agreements on how to investigate and report clusters; training and resources to strengthen surveillance; and measures to ensure that the WHO has enough antiviral drugs. The countries where a pandemic is most likely to emerge need detailed plans and drills, he adds.

The \$25 million spent by the United States last year in boosting surveillance in Asia is inadequate, says Schwartz. He points out that the country spent more than \$800 million on anthrax vaccines, "against a pathogen that has killed only a handful of Americans and whose bioterrorist potential is unproven".

Declan Butler

1. Ferguson, N. M. *et al.* *Nature* doi:10.1038/nature04017 (2005).
2. Longini, I. M. Jr *et al.* *Science* doi:10.1126/science.1115717 (2005).

US energy bill pushes research but fails to cut consumption

WASHINGTON DC

The US Congress slapped an energy bill, four years in the making, on President George W. Bush's desk last week.

The United States uses vastly more energy than any other country on the planet, and the bill was initially seen as a chance to set out a clear strategy for the country in terms of energy efficiency.

But in the end, critics say, the 1,700-page Energy Policy Act is more of a compromise than a strategy. It has been shorn of many of its controversial provisions, and won't do much to make the country's energy use more environmentally friendly, at least in the short term. But its various tax breaks and incentives may change the landscape of energy science.

In the past few months, sections of the bill protecting manufacturers of the water-contaminating petrol additive MTBE and opening the Arctic National Wildlife Refuge to oil drilling were scrapped so that Congress could finally pass it. The bill sets no emissions limits and does not change fuel-efficiency standards for cars. A proposal that 10% of US electricity should come from renewable sources by 2020 was also ditched.

In fact, energy efficiency and renewables take home just \$5 billion of the bill's \$14.5 billion in tax incentives, which are spread over ten years. The rest is

largely a list of benefits for traditional energy industries, including a \$1.5-billion scheme for research and development into drilling for oil and gas in the Gulf of Mexico.

The bill may also pave the way for a resurgence of the nuclear industry in the United States, which has not signed off a new nuclear-plant construction since 1973. Energy companies interested in ending that streak can now count on a tax credit and reimbursement of any losses associated with unforeseen regulations, although it is not yet clear whether the industry will bite.

Science seems to do well out of the bill, with more than \$30 billion assigned to various research and development programmes over three years. But these are really just a starting point for negotiations by the appropriations committee, which is widely expected to be more frugal.

One clear change, however, is the creation of an undersecretary for science in the energy department, a position that many physical scientists hope will increase the clout of research in the department's budget wrangles. "This provides a voice at the table where the crucial decisions are made," says Michael Lubell, head of public affairs at the American Physical Society. ■
Emma Marris



Guzzle on: the proposed US energy bill will not improve fuel efficiency in cars.