NEWS

Disease surveillance needs a revolution

Poor track record: the efforts of teams to monitor bird flu suggest the world must invest in epidemiology.

With avian flu spreading around the world at a frightening rate, scientists are welcoming an international proposal for state-of-the-art labs to monitor emerging diseases in developing countries. But they add that the bird-flu crisis has exposed glaring deficiencies that demand a radical rethink of the world's veterinary and disease-surveillance systems.

Avian flu is now endemic across large parts of Asia, and in the past few weeks has exploded across Europe and into Africa. "H5N1 has focused the spotlight of the world on disease surveillance, and it's showing up all the pimples and warts," says Bill Davenhall, who develops health mapping schemes for countries and is head of health at ESRI, a geographic information systems company in Redlands, California.

Developing countries, in particular, lack decent human-disease surveillance, and animal monitoring is often virtually nonexistent, with few basic laboratory and epidemiological resources available. "On the ground in Indonesia, there is no systematic programme at all," says Peter Roeder, a field consultant with the United Nations' Food and Agriculture Organization (FAO). "It's just a bloody mess."

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Global danger

It is a problem that the developed world cannot ignore, because a disease that emerges in Bangkok or Jakarta could ultimately trigger a global disaster. So researchers at the US Department of Defense have suggested setting up a network of high-tech labs in developing countries to monitor cases of infectious disease (see page 25). The labs would be modelled on the US network of infectious-disease labs, such as the naval research unit NAMRU-2 in Jakarta. But they would be funded by the international community to avoid the local distrust that has often hampered labs run by the US military.

Such a network could vastly speed up and improve the diagnosis of viruses such as H5N1 when outbreaks occur, says Roeder. He points out that misdiagnosis of H5N1 as Newcastle disease in recent outbreaks in Nigeria and India led to long delays in control measures.

Mark Savey, an epidemiologist who heads animal health at France's food-safety agency, also welcomes the proposal, but cautions against the "mirage of technology" in surveillance. "You don't need satellites, PCR and geographic information systems to fight outbreaks," he says. The labs' top priority should be building large teams of local staff, who are familiar with the region and its practices, he argues. "If you do not have that, then surveillance will stay in the Middle Ages."

Savey recalls his trip to Russia last summer as part of a European team investigating outbreaks of avian flu. "You have a paper Michelin map; you have people who speak the language; you put red circles on outbreaks; and you use a pen and paper to compare them with things like the dates of market openings, and with how outbreaks line up with railways." Such local knowledge is crucial to interpreting data, he says. "If you don't know what the Trans-Siberian Express is like, with people cooped up for days, exchanging chickens and eggs at every stop, you would never guess that it was the Trans-Siberian that mainly spread avian flu across Russia."

Roeder agrees that the focus must be local. "No amount of setting international guidelines and publishing global action plans is going to help when you have an organization within the country that doesn't know what to do," he says.

Back to basics

But many feel that alongside setting up local centres, epidemiology needs a fundamental overhaul. Even in developed countries, the field has been chronically underfunded, says Antoine Flahault, director of Sentinelles, France's national disease surveillance network. He adds that he is jealous of the multimillion-dollar satellites that climate scientists enjoy and the powerful accelerators being built for physicists. In comparison, epidemiologists "are still in the nineteenth century", he says.

Flahault points out that his own national flu-monitoring system relies on a few hundred volunteer doctors submitting patient data to an online database. From these data, Flahault's team tries to build up a picture of disease across the country, spotting outbreaks and predicting when the year's flu season will hit.

The 122-city programme run by the US Centers for Disease Control and Prevention is the only one in the world where disease reports are made in real time, Flahault points out. And such lack of data prevents the field from developing sophisticated models of communicable disease. "It's as if we were trying to study the weather, but collected data only

when there was a heatwave or storm," he says.

Ward Hagemeijer, the bird-flu programme manager at Wetlands International in Wageningen, the Netherlands, also complains of the general lack of resources. He has been on recent missions to sample H5N1 in affected countries, but says he has been unable to get his African samples sequenced because certified labs have been too busy analysing samples from European outbreaks.

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Leading light

Another fundamental problem is the lack of strong international leadership: there is no global body able to take overall responsibility for emerging diseases, particularly those that jump to humans from animals. The World Health Organization would be an obvious choice, but although it has a strong remit for public health, it is not responsible for monitoring outbreaks in animals — that duty belongs to the FAO and to the Paris-based World Organisation for Animal Health (OIE).

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Neither of those organizations traditionally monitors outbreaks from a public-health point of view, however — the FAO is concerned with food safety and the OIE is responsible for trade issues. "Veterinary services throughout the world, particularly in developing countries, are very weak on this. They are not set up to watch for emerging disease events," says Roeder.

As well as a lack of expertise, the FAO and OIE do not have the funds for disease surveillance. "We need much more day-to-day interaction with locals on the ground, but we haven't had the resources," Roeder admits.

The situation is slowly improving, however. The FAO and OIE had set a target of $102.5 million for fighting flu in Asia, and by the end of 2005, countries had donated just $25 million. But, in January, donors at a Beijing conference pledged $1 billion in grants, and $900 million in loans to support the FAO/OIE Global Strategy for the Progressive Control of Highly Pathogenic Influenza.

Many hope that resources pumped into avian flu will benefit the surveillance of emerging diseases generally by strengthening infrastructure. But the money available so far is only a start. And the rate at which new diseases appear — currently around one a year — is increasing. Mark Woolhouse, an epidemiologist at the University of Edinburgh, UK, has analysed all recognized human pathogens and he suggests that this rise is mainly due to changes in land use and the way that people live. Of the 117 emergent human diseases that he has studied, more than half jumped from animals.

"The world has to get to grips with the fact that what is happening now is going to happen repeatedly," says Roeder. "We have to develop a global structure to tackle emerging diseases. ■

Declan Butler

R. VOGEL/AP PHOTO

Physicists told to confront those big questions

Time travel, multiple universes and extraterrestrial intelligence might seem more the purview of *Star Trek* scriptwriters than of serious researchers. But the scientists behind a new institute have announced their intention to change that perception.

On 27 February, the Foundational Questions Institute (FQI) made its inaugural call for proposals from scientists interested in asking the really big, and really odd, questions about the Universe — questions such as: why does time flow in a single direction, or, can intelligence survive in our Universe in the very long term?

"These are the very questions that a lot of scientists got into physics and cosmology to tackle," says Anthony Aguirre, a cosmologist at the University of California, Santa Cruz, and the FQI's associate scientific director. "But they don't tackle them, because they either don't have time or don't have monetary support."

The institute's directors hope it will remedy this. The FQI was set up last October with a grant from the John Templeton Foundation, which promotes research at the boundary of religion and science. With US$8 million in seed money from the foundation, the FQI will fund dozens of researchers' part-time work on these questions, Aguirre says. All proposals will be peer reviewed, he adds.

Boldly go: a new institute will fund work at the frontiers of science.

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"I'm very happy to see that a project has started to address these needs," says Lee Smolin of the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, who is also on the FQI's scientific advisory board. Smolin says he believes the project will help shake up the current culture, "which emphasizes technical brilliance over ambition and originality".

But not everyone welcomes the institute's unusual remit. There is no shortage of crazy ideas in theoretical physics, says Paul Steinhardt, a cosmologist at Princeton University, New Jersey. "Metaphysics is running rampant through string theory and cosmology," he says. "I would like to see things go a little bit in the other direction." ■

Geoff Brumfiel

www.fqxi.org