
P. Pavlicek/IAEA

One World, One Health

The links between animal and human health are clearly emerging.

by David Nabarro

There is widespread concern among governments, farmers' organizations and civil society groups, that too many people are unable to enjoy the right to food and nutrition, to have the wherewithal to feed themselves and their families, and to be resilient in the face of economic shocks, climatic events or acts of violence. The UN Secretary General is deeply concerned that food insecurity and hunger are being experienced every day by at least one billion of the world's inhabitants. That is one person in six, or 14% of the global population, with a child dying of malnutrition every six seconds.

Improving Performance

Unhealthy animal rearing practices in small and medium scale commercial operations can affect all who earn their living from animal rearing, especially those who keep a few animals in their backyards. They can also undermine the prosperity of the whole livestock sector, one which is growing at an extremely rapid rate. The prompt diagnosis of, and response to, diseases in animals is vital both for disease control and for assessing practices that are most likely to result in risks to animal health. This, in turn, is important not only for those who rear animals but also for the wider population given the importance of animal illness as a source for emerging disease in humans. At least two new pathogens capable of harming humans emerge each year, and 75% of these come from the animal kingdom. Frequently we do not know the potential pathogenicity of such an organism when it first emerges.

Within the United Nations System High Level Task Force for Global Food Security we work with nations as they contribute to national, regional and global partnerships for agriculture, food security and nutrition. We seek to help farmers and end users mobilize and improve access to the resources that are necessary to initiate and sustain improved production, with financial coordination mechanisms that gives them a better chance to access the investments they need in an integrated rather than piecemeal manner.

We will be guided in our work by the extent to which we are able to demonstrate reduction in hunger and poverty through improvements in production, agriculture related income, and the contribution of agri-

cultural systems to mitigation of and adaption to climate change.

Influenza Viruses

During the last few years we have witnessed the agreement and application of important standards for animal and human health to the trans-boundary threats posed by disease — the World Organisation for Animal Health (OIE)'s animal health standards and the Revised International Health Regulations (IHR 2005) developed by member states of the World Health Organization (WHO). The IHR, for example, is an important intergovernmental framework and rules for collective responses to infectious disease. The proper implementation of the IHR 2005 depends on the full participation of national authorities and other stakeholders. Some of them question the extent to which systems for global governance on health reflect the interests of poor people and their nations: they question the value of globalized thinking and working.

During 2005 there was broad agreement on the scientific basis of work being undertaken on avian and pandemic influenza: outstanding research questions were also clear. These include a better understanding of risks associated with the movement of highly pathogenic avian influenza among poultry (particularly in ducks); the relative roles of wild birds, trade, and cross border movements in spreading H5N1 among birds; however the behaviour patterns that increase risks for human infection still needing some work.

WHO, Food and Agriculture Organization (FAO) and OiE had established clear strategies for national actions to be undertaken: stamping out Highly Pathogenic Avian Influenza (HPAI) when identified — through quick and thorough action; reducing the threat to poultry by introducing biosecurity; monitoring wild birds and charting their movements so that where possible wild birds that might be infected with this virus could be separated from domestic birds; reducing the risk of sporadic human cases by limiting the degree to which humans would be in contact with infected birds, and preparing to contain and mitigate the next influenza pandemic when it happens.

The challenge was to ensure that governments gave these strategies the impetus necessary for their implementation, leading to the control of HPAI and preparedness for an influenza pandemic. The technical work had to be taken forward within the momentum of the emerging political environment. As well as ASEAN, the US, the EU, Canada and Japan took political initiatives.

Within the UN system Influenza Coordination Office we helped align the work of different international institutions — including the World Bank, the international organizations of the UN, the regional development banks, other international, regional and local research bodies and so on — and to encourage the collective pursuit of international norms and standards, with the specialized organizations (WHO, FAO and the OIE) charting a path for the rest of the UN system and the myriad of other organizations becoming engaged in work on avian and pandemic influenza.

From the start, most of those who were involved in this work demonstrated unity of purpose and synergy of action. In general, coordination between the bilateral donors, the foundations, national governments, regional bodies and international non-governmental groups (including the Red Cross movement) was strong.

We have subsequently sought to identify the incentives that brought many disparate groups to work together. Finance was important, and the partnership has mobilized over US$ 3 billion in assistance for avian and human influenza actions between 2005 and 2009. But this — on its own — cannot explain the extent to which national authorities have worked together on these issues. The funds that have been pledged are primarily made available to governments: these have moved comparatively slowly.

An International Partnership on Avian and Pandemic Influenza was established as a basis for this cooperation. Other partnerships were organized at regional level through the EU, APEC, ASEAN and other regional groupings. Few of these partnerships were formal: most had real impact on the alignment and ways of working of their members.

We concluded that most of the groups working together on this issue recognized the value of working together, in synergy. They found it both operationally useful, and reassuring, in a situation where there was considerable political urgency and need for concerted action by institutions. Stakeholders from the public, private and voluntary sectors have valued the opportunity for coherence, working jointly and participation. They have worked together on disease surveillance, reporting and response. They have joined together to support the evolution of an inclusive movement that enables hundreds of different stakeholders to feel at home within it.

Pandemic preparedness work has moved forward over the last four years thanks to the efforts of this broader movement, and the effort has been tracked through annual global progress reports using information from participating countries. The reports, which have involved the full range of UN system agencies and the World Bank, have served as the basis for collective accountability. The reports reveal that over the four year period, there has been more rapid reporting of HPAI and more effective, sustained responses to outbreaks of the disease in poultry. The OIE is now pursuing the elimination of H5N1 in the next few years. There has also been a massive effort to initiate pandemic preparedness work which we believe has stood us in good stead as the world faces up to the first outbreak — potentially pandemic — of a novel influenza virus of this century.

Our annual reports identify seven factors critical for success. These are:

- consistent political commitment;
- resources and capacity to respond rapidly and effectively to a threat;
- interdisciplinary work (particularly animal health and human health) within countries and across borders;
- predictable, prompt, fair and sustained compensation schemes for those who lose property or animals as a result of control measures;
- strong engagement of public and private sectors and voluntary agencies;
- clear communication of reliable information (and sharing of uncertainty as appropriate); and
- a viable and scientific response strategy.

Experiences with SARS and other diseases suggest that if information is kept from people they will not feel empowered to be part of the response.

What are the incentives for success? First is the availability of good quality and accessible information about HPAI outbreaks — based on good mapping of issues, tracking of progress and risk analysis. The information that is available has been synthesized and made available to those who need it through the efforts of international organizations in response to the needs of their primary clients. Without well functioning surveillance and reporting systems we are stuck: OIE and FAO have played a major role, working with the support of a number of member states to establish better diagnostic surveillance and reporting capacity. The IAEA is probably not well known for the work that it does to help develop methods for measuring and detecting either virus or antibodies in animals and humans. There is a great deal of work that is being done as a result of the standards that are set and the methods that are developed through the IAEA.

A second incentive is the ready availability of instruments, services and assets needed for effective action. These include the Global Outbreak Alert and Response Network (GOARN) in WHO, or the FAO-OiE Crisis Management Center for Animal Health, that provide a backbone for solidarity and international action. This encourages countries and other stakeholders to be engaged — they know that dependable systems exist that can help them.

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The cooperation among the IAEA, FAO and OIE is a reflection of the fact that these organisations have been working together in a very intense and productive way trying to get better systems for the production of healthy animals. Areas of cooperation include how to control new diseases that are emerging, trying to make sure that they are quickly detected and then managed in the most appropriate way, and how, at the same time, make sure that there is production of safe and continuous supply of food.

Another focus is also how to link together the different research groups that are involved in trying to make sure that these food systems work to the advantage particularly of poor people in our world."

— D. Nabarro speaking at the opening of the FAO/IAEA Symposium on Sustainable Improvement of Animal Production and Health held from 8-11 June 2009 in Vienna, Austria.

A third incentive is the existence of the right legal codes (and means for enforcement) at country level — for controlling movements of animals, for ensuring compensation when animals have to be killed and for enabling the consistent nationwide implementation of public health functions.

A fourth incentive is the widespread appreciation, among the public, of the pandemic threat and the need to be prepared. Unfortunately it has not proved easy to sustain the appreciation that animals, and

ways in which they are cared for, can pose a risk not only for their own health but also for human health. The risk can be reduced by changed behaviour. The information and compensation needed to encourage such changes are often not sufficient. It is vital that the potential for animals to serve as the source for diseases in humans, and vice versa, result in better attention to the animal-human health interface — what we tend to refer to as the One World, One Health movement following the groundbreaking work of the wildlife conservation movement.

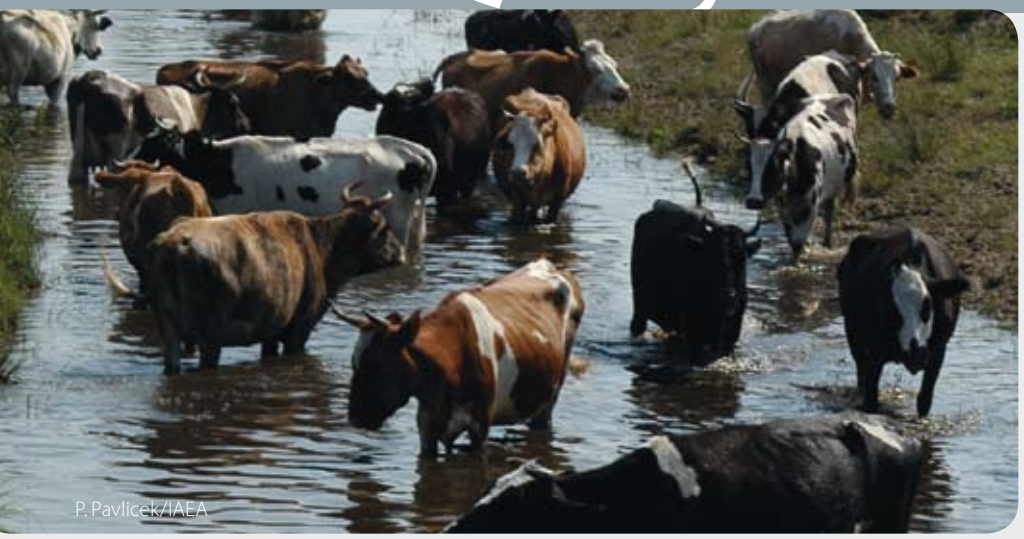
A fifth incentive is empowered and professional administration — people in government who feel that they are in a position to take the initiative in the face of a disease threat. They sometimes do not believe that their own authorities, or international authorities, are working to support what they seek to achieve. This is a challenge. H5N1 — or other diseases — will not be controlled through compulsion and sanctions. It does not work. People start to hide, they do not explain: they do their best to avoid involvement. So it is absolutely essential to build the necessary trust for effective action.

There are a number of continuing challenges for our collective effort to control HPAI caused by the H5N1 virus and to prepare for pandemics.

The first is the continuing lack of adequate systems and capacities for data collection and surveillance, laboratory services, and analysis, and for the management and use of information derived from the data. This applies to both animal and human health.

The second is the reality that some key groups (in some countries) are not fully engaged into the movement for pandemic preparedness. How to ensure that those who run the poultry industry in a HPAI-affected country see it as in their collective best interest to work together with the veterinary services, NGOs, researchers, and governments on control and prevention of HPAI? This requires a

Better Quality Beef and More Milk



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Cattle breeders are now able to screen and select cattle for specific features, such as the ability to produce high-quality milk or resist specific diseases. After six years of work by more than 300 researchers from 25 countries and $53 million in funding, in April scientists were finally able to reveal the genome of the cow - the first mapping of the genetic composition of a mammalian livestock animal ever completed, providing crucial information about the evolution and biology of cattle.

According to researchers at the Joint FAO/IAEA Division of Nuclear Applications in Food and Agriculture, who participated in the cattle genome study, this research is expected to provide breeders and farmers with the opportunity to address the issue of achieving efficient and sustainable food production for a rapidly increasing human population.

"This study is a first of its kind in the world," says Gerrit Viljoen, who heads the Animal Production and Health (APH) Section of the Joint FAO/IAEA Division.

"By looking at the bovine genome we will be able to select for features that cattle breeders want in their cows, for example, better quality beef, more milk or disease tolerance/resistance and understand the genetic basis of the evolutionary success of ruminants which will provide opportunities to address some of the crucial issues of the present time — efficient and sustainable food production for a rapidly increasing human population."

The cow genome characterization study was conducted through two projects: the Bovine Sequencing Project and the Bovine HapMap Consortia Project — a HapMap is a map of genetic diversity among different populations of the same species. Funding for these projects was provided by an international group that included the IAEA through the Joint FAO/IAEA Division.

Nuclear techniques were also extensively used in the study and technical officers from the APHS contributed to data analysis and annotations.

continuous effort to build and sustain a movement. Movements wither away if they are not persistently supported and kept going.

The third challenge is to maintain trust through fostering action networks. For example: committed professionals from countries in South East Asia worked with the Rockefeller Foundation to build Mekong Basin Disease Surveillance Program over many years. This covers several different disease issues. It has generated trust between technicians across borders, has survived and continues to do well, despite occasional difficulties at the ministerial or high political level. Similar systems are being established between Bangladesh, India and Nepal following their HPAI outbreaks in 2008 and 2009.

We are all involved in this effort to build trust. We should ask ourselves, from time to time, whether we are contributing to trust as effectively as we could.

Conclusion

We need viable animal and human health services based on the best available technologies, and to be sure that the incentives are tangible. OIE's Performance of Veterinary Services scheme offers us some valuable pointers.

It is worthwhile getting the incentives right so that pandemic preparations are successfully put in place. The reward may well be that when the next severe influenza pandemic strikes, millions of people survive who might otherwise have been expected to die.

David Nabarro is UN System Coordinator for Influenza and Global Food Security. This article is an excerpt from a statement he gave at the International Symposium on Sustainable Improvement of Animal Production and Health, held on 8 June 2009 in Vienna.

through Nuclear Research

"Radioactive isotopes were used for labelling and characterizing the genetic information of the cow genome, a process known as radiolabelling of DNA," explains Viljoen.

Specifically, the Joint Division´s APH Section sponsored the study of Sheko breed, which is native to Ethiopia and is resistant to trypanosomosis, a disease transmitted by the tsetse fly, and has the ability to achieve good productivity under difficult environmental conditions.

It is hoped that the information obtained from the study can be a first step in the greater utilization of the Sheko and other related indigenous breeds to improve livestock productivity and the livelihoods of farmers.

The results of the bovine genome sequencing and characterization studies were published in the journal "Science".

Genome Sequencing

By determining the order, or sequence, of the structural units in a DNA molecule, genome sequencing helps scientists study biological processes and identify key genetic characteristics in the animal or plant being examined.

The Bovine Genome Sequencing Project identified, or sequenced, the complete genome of a female Hereford cow. The Bovine HapMap Consortia, on the other hand, described genetic variation among different cattle varieties, starting with the major division between the humpless taurine cattle most commonly found in Europe, Africa and East and West Asia, and the Bos *indicus* cattle found in India, South and West Asia and East Africa.

The researchers used the complete sequence from a single Hereford cow and comparative genome sequences from six more breeds to look for variations in DNA molecules (known as single nucleotide polymorphisms, or SNP) in 497 cattle from 17 geographically and biologically diverse breeds and two related species, the Anoa and the Water Buffalo.

Their studies indicate the cattle have a diverse ancestral population that has undergone a recent rapid decrease in effective population size, probably because of domestication, selection and the development of breeds.

The evolution of humans and cattle intertwined between 8,000 and 10,000 years ago, and today there are more than 800 cattle breeds selected for different economic, social and religious reasons.

The Bovine Haplotype Map is generating excitement because it offers the chance to select for features that cattle breeders want in their cows -in particular, high-quality milk. Until now, the only way to guarantee the best cow's milk was by taking a bull, inseminating cows with his semen, and then waiting for the female offspring to grow and produce calves and milk to feed them, at a cost of $25,000 to $50,000 per bull. (Most of the genetic improvements in the cattle industry come through males, because each male can produce tens of thousands of females.) Already, cattle breeders are eagerly mapping SNP in most of their bulls, with an eye toward identifying which SNP are linked with various desirable qualities.