Julio Pinto (DVM, PhD) joined the EMPRES group of the Animal Health Service in May 2006. Having graduated in Veterinary Science in the University of Chile in 1994, he completed his PhD studies in Veterinary Epidemiology and Economics at the University of Reading, United Kingdom, in 2000 completing his thesis on “Hazard analysis of classical swine fever (CSF) reintroduction in Chile”. Dr Pinto joined the World Organisation for Animal Health (OIE) in Paris where he worked as deputy head of the animal health information department between February 2003 and May 2006.

Dr Pinto is currently member of the EMPRES/GLEWS task force (joint FAO/OIE/WHO Global Early Warning System), being responsible for epidemiological projects on animal disease surveillance and risk assessment and technical leader of the FAO global animal health information system for transboundary animal diseases (EMPRES-i). He is providing technical assistance to countries or regions through: the design and implementation of disease prevention and control programmes and projects; joint research on co-ordination of activities with other organisations or national governments by participating in task forces, field investigations, project formulation and appraisal teams, evaluation and monitoring exercises, and providing regular technical backstopping to veterinary services worldwide.

JULIO PINTO

Veterinary Epidemiologist

Animal Production and
Health Division
Food and Agriculture
Organization of the
United Nations
Italy

INNOVATION TO FILL THE GAPS IN DISEASE SURVEILLANCE:

Participatory Surveillance, Applied Technologies for Better Understanding and Reporting

Julio PINTO / Juan LUBROTH (FAO)

Traditional surveillance tools for collecting information about animal health at national, regional and global levels have made significant contributions to the timely reporting of animal disease events, and to analyze animal disease drivers and patterns of transmission and spread. However, ongoing challenges relate to the sensitivity of surveillance systems for capturing information about new pathogens or old pathogen emergence, spread and persistence. The proliferation in recent years of official and non-official systems, such as ProMED, Health map and the Global Public Health Intelligence Network (GPHIN) and the use of new technologies, data requirements and standards. Overlaps between national, regional and global information systems are evident in some regions and most data relating to animal disease outbreaks are entered and processed at national, regional and global levels with serious delays and lack of appropriate analysis. The development and the growing use of new technologies for data collection or disease reporting is filling an important gap for reporting and respond effectively to diseases risks.

FAO is supporting Bangladesh to conduct syndromic surveillance for poultry diseases and to detect particularly Highly Pathogenic Avian Influenza (HPAI) surveillance in 260 out of 487 subdistricts as part of an USAID funded FAO project. A total of 780 Community Animal Health Workers (CAHW), 88 Additional Veterinary Surgeons (AVS) and 260 Upazilla Livestock Officers (ULOs) are using the Short Message Service (SMS) for sending and receiving SMS messages between computers and mobile phone to collect data and report on disease and death in poultry. The results of the use of this SMS technology indicate that since October 2008, almost 80% of all HPAI outbreaks have been detected and reported through this active surveillance programme. At the end of the working day, each CAHW sends a SMS message with the total number of all investigated poultry (chickens, ducks and other birds) and their health status. This data is used to; a) monitor trends in disease and mortality in poultry, and b) monitor who is working that day. The system automatically contacts the ULO who initiates an investigation by sending an AVS to conduct visits to outbreaks and collect samples that require further diagnostic tests. Initially a Gateway server receiving these messages was located at the Department of Livestock Services in the capital, Dhaka. The SMS Gateway is internet based. On average 20,000 messages are received every month. Specialized staff monitor the change in mortality and morbidity rates and perform spatial and temporal analysis against concurrent HPAI outbreaks and monitor the number of suspect cases and the results of the ULOs and AVS investigations. The result of the analysis is submitted to the Chief Veterinary Officer. This real-time reporting using SMS has been contributing to effective HPAI outbreak response and control. Information is shared in near real time with human health services.

In Egypt, as part of its effort to strengthen the national capacity for H5N1 surveillance in Egypt, FAO, in close collaboration with ILRI started a participatory disease surveillance (PDS) program in 2008. The program was modified to widen its scope to include HPAI outbreak investigation and communication functions. Currently some 108 veterinarians operate as CAHO practitioners in 15 governorates. Since its inception, the CAHO program was proved to be a robust surveillance wing for the veterinary services in Egypt (GOVS). It has contributed a significant proportion of the reported HPAI cases. As of 2010, the program is fully integrated into the national veterinary services and shares findings with the other Ministries. In 2011-2012, when the overall surveillance system was slowed down due to the socio-political situation ('Arab Spring'), the CAHO program proved to be an important tool contributing to over 50% of the reported HPAI outbreaks cases. In recent months of 2012, CAHO practitioners were mobilized to assist in the containment of the FMD epidemics in Egypt due to a new SAT2 strain. GOVS has expressed its desire to replicate the CAHO program for the control of other high impact diseases in the country. FAO , ILRI and GOVS published 'A manual for practitioners in community - based animal health outreach (CAHO) for highly pathogenic avian influenza and is available both in English and Arabic (http://www.fao.org/docrep/014/i1799e/i1799e00.pdf).

In Indonesia, teams trained PDSR method use a two-step process to diagnose HPAI. PDSR teams randomly selected an area of household chickens for investigation each working day, and perform investigations in response to notifications by farmers of chicken deaths. Clinical and epidemiologic information are gathered from poultry farmers by the team using semi-structured interviews in order to determine whether a disease situation fits the clinical case definition (CD) for sudden death in chickens. When surveillance team identify a household flock with a positive CD, results from a rapid antigen detection test for Type A avian influenza (Anigen® AIV Ag Test, Animal Genetics Inc., Kyonggi-do, Korea) on oropharyngeal or cloacal swabs taken from sick or recently dead chickens are used for confirmation. The advantage of this methodology is rapid field diagnosis to enable timely outbreak response. If positive diagnostic following a positive CD, then the village is declared as "HPAI infected" and outbreak control activities are immediately initiated. Outbreak control activities include focus culling of the infected household flock with safe disposal of dead and culled carcasses, containment of surrounding flocks and movement restrictions for 14 days, cleaning and disinfection of affected premises, and communication and awareness-raising activities with the affected community. All control activities are conducted voluntarily upon agreement of the village leaders and affected households. Following detection of a village HPAI outbreak, PDSR teams also immediately contact their local government human health counterpart, known as a District Surveillance Officer, responsible for conducting an investigation in the infected village to identify humans with influenza-like illness who should be examined, tested, and treated.

In 2006 FAO introduced the Digital Pen Technology (DPT) into southern Africa as an innovative way of collecting and sending animal disease surveillance data from remote areas in the field to the Central Epidemiology Units for analysis and decision making. The DPT is essentially a forms processing technology that allows for rapid collection, transmission and processing of data. Information is written, using a digital pen, on a custom made form and transmitted from the pen, via Bluetooth technology, to a central database over the internet. The DPT therefore essentially employs four primary components: (1) A paper form (disease surveillance form) which has been programmed with a special dot pattern to capture instructions in prescribed areas; (2) A digital pen, which captures hand written strokes on the paper form through a micro-camera and stores the information on a 1.3 MB memory stick; (3) A mobile phone with Bluetooth technology and an installed router application that allows for transmission of data via GPRS/EDGE/3G to a server and (4) A server which hosts the database and is equipped with hand recognition and interpretation software. Users are able to interact with the data at different user-levels (password protected) through a web application, ensuring secure access to data from anywhere in the world. The DPT has since been deployed in remote veterinary districts of Angola, Malawi, Mozambique, Tanzania and Zambia. Through use of this technology, the overall rate of reporting has greatly improved and animal disease surveillance data is now able to reach decision makers based at central epidemiology units within minutes of diseases being reported to field veterinarians. Data quality check mechanisms (editing, validation and confirmation) inbuilt into the system have allowed supervising officers to monitor field activities with subsequent production of good quality disease data. An important advantage of this technology is the low technical training required as it is based on the conventional pen to paper reporting, with the added advantage in data transmission. The export functionality, inbuilt into the system, allows for ease of data sharing with other information management systems.

In response to the challenges that face animal health services in providing timely field surveillance and reporting, FAO has been exploring ways of using the expanding array of personal electronic devices to report data from animal disease events in the field. Smartphones have been used for FAO users and partners to report confidential and non confidential information from to a database server, and FAO has been examining the possibilities of using this technology to report emergency disease information to the FAO Global Animal Disease Information System (EMPRES-i). As part of these efforts, an application (app) called the EMPRES-i Event Mobile Application (EMA) has been developed to enable smart phones to deliver disease information directly to the EMPRES-i database. The rationale for EMA is that in some developing countries access to the Internet can be difficult, especially away from main population centers, while telephone networks have good signal coverage over wider areas, so rapid connection is possible while in the field. EMPRES-i EMA has been designed to facilitate FAO officers and partners in providing disease information from the field. The application allows the user to enter key epidemiological data directly from the field, or to save the data on the device for transmission later. All the data entered are automatically geo-referenced, so key field data are captured in EMPRES-i when uploaded. Once a report is submitted to the EMPRES-i database using EMPRES-i EMA, data are verified and validated, and the submitter can be contacted if necessary. Validated information is either published on the EMPRES-i public Web site or kept in the EMPRES-i internal database as confidential or sensitive, as appropriate.

EMPRES-i EMA allows direct access to the database through a "near me" mapping function, which provides users with a map based on geo-referenced data on nearby outbreaks that are recorded in the EMPRES-i database. EMPRES-i EMA is currently available for Blackberry™ devices and smart phones using Android™ technology. The 'app' will allow users to contribute to FAO's early warning activities and forecasting (which can feed into FAO/OIE/WHO GLEWS platform). FAO plans to develop guidelines and undertake field trials through FAO projects, to validate the approach and improve functionalities to meet beneficiary needs. EMPRES-i is available at http://empres-i.fao.org

Disease reporting systems suffer from a level of underreporting which affect appropriate data analysis, monitoring and the understanding of disease emergence or spread. New technologies can speed up disease reporting, effective disease response and risk management. The use of new technologies improve the capacity of surveillance systems to process high quantity of information and data and flow of communication when diseases or syndromes are reported from local to central servicers. These technologies are used to enhance traditional passive and active surveillance systems based on the priorities and objectives of disease control programs. The main challenge with disease surveillance systems and reporting systems remain to ensure that cases of animal disease are timely communicated from farmers, local veterinarians to central veterinary services, with the farmer and field services often representing weak points in this communication chain. Cost effectiveness of surveillance systems and acceptance of stakeholders need to be assessed regularly to compare and justify the introduction of new technologies for disease surveillance and reporting.

(a) SMS in Bangladesh (Loth L[2], Mahabub AM[3], Hannan ASMA[3], Kalam MA[3], Yamage M[3])

(b) Community Participatory networks in Indonesia and Egypt (McGrane J[5], E Brum[5], Lubis AS[5], Azhar M[5], Jobre Y[6], Ihab E[6], Hendrickx S[7])

(c) Hand held applications (Pinto J[1], Mokopasetso M[8], Larfaoui F[1], De Maio E[1])

[1] Animal Health Service, Food and Agriculture Organization of the United Nations, Rome, Italy

[2] Consultant Veterinary Epidemiology, Animal Health, International Project Management, Wellington, New Zealand

[3] Food and Agriculture Organization of the United Nations, Avian Influenza Unit, Department of Livestock Services, Krishi Khamar Sarak, Farmgate, Dhaka, Bangladesh

[4] Epidemiological Unit, Department of Livestock Services, Krishi Khamar Sarak, Farmgate, Dhaka, Bangladesh

[5] Food and Agriculture Organization of the United Nations, Emergency Centre for Transboundary Animal Diseases, Jakarta, Indonesia

[6] Food and Agriculture Organization of the United Nations, Emergency Centre for Transboundary Animal Diseases, Cairo, Egypt

[7] International Livestock Research Institute, Nairobi, Kenya

[8] Food and Agriculture Organization of the United Nations, Emergency Centre for Transboundary Animal Diseases, Gaborone, Botswana