Rev. sci. tech. Off. int. Epiz., 2003, **22** (3), 977-987

Animal disease surveillance: prospects for development in Pakistan

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Submitted for publication: 11 February 2002
Accepted for publication: 30 January 2003

Summary

Surveillance is a continuous and systematic process of collection, consolidation, analysis, interpretation and dissemination of relevant information on the occurrence of health problems. Data from surveillance can be used to calculate the incidence and prevalence of events, to categorise disease distribution by relevant characteristics, to guide investigations into the occurrence of epidemic and endemic disease, and to contribute essential information for the design and evaluation of effective disease prevention and control programmes.

Disease surveillance systems should also respond to the information needs of government agencies, agribusiness, academia, producers and consumers. However, in most developing countries, including Pakistan, animal disease surveillance systems are not well developed, and do not produce a desirable quality of information on disease status and trends. In this paper, the authors describe various facets of a generic surveillance system and propose a structure for a surveillance system at district level. Such systems have been designed and implemented for public health surveillance in a number of countries, and may be developed to meet the needs of veterinary public health.

Keywords

Approach – Attribute – Disease surveillance system – Livestock – Objective – Pakistan – Ruminant – Surveillance design.

Introduction

Dependable statistics on the morbidity and mortality of animals are required for successful disease prevention and control (14). In many developed countries, such as Japan (12), disease surveillance systems are relatively well developed and can realistically be viewed as 'early warning systems'. In most developing countries, however, surveillance systems are not so well developed, and do not produce the desired quality of information. In the area of human health, progress has been made in some countries, such as the People's Republic of China and Thailand (9, 10). In Pakistan however, both human and animal health surveillance are in need of attention.

In relation to animal health, although traditional reporting systems have been augmented by laboratory monitoring, meat inspection findings and other sources of information, these approaches often lead to invalid conclusions and limited information of little practical value. Generally, the prevalence, incidence, trends or economic significance of a disease cannot be adequately determined from the data collected through existing types of investigations. Data which merely list cases (numerator data), without including information about their population base (denominator data), are of little use. Therefore, there is a fundamental need to define the animals at risk of developing a disease (denominator) during a specified time period, relative to the number of animals that actually developed the disease (numerator) during the same interval. There is a need to establish a more capable country-wide surveillance system, which includes a national centre and other provincial centres for collecting, compiling, analysing and disseminating such information. These centres should become centres of reference for epidemiological and related economic assessments, as well as field services.

In Pakistan, since the Ministry of Agriculture and the Pakistan Agricultural Research Council work at federal level throughout the country, they are in an ideal position to develop a nationwide surveillance system which produces timely and valid information on animal health and productivity. Such a

system will require properly designed methods of collecting data to facilitate epidemiological and economic analyses. If the surveillance system is properly designed and implemented, analysing the resulting surveillance data will provide descriptive statistics on health and productivity which will be useful to the agricultural industry. Data at farm level can be extrapolated to construct regional and national estimates, so that trends can be identified. Potential risk factors associated with disease and sub-optimal productivity can be explored in more detail, so that alternative disease prevention measures and control strategies can be evaluated. The surveillance system should be able to respond to the information needs of the following sectors:

– government agencies

– agribusiness

– academia

– producers

– consumers.

In this paper, the authors describe the various facets of a generic surveillance system (8, 22) and propose a structure for a surveillance system at district level. Such systems have been designed and implemented for public health surveillance in a number of countries, and may be adapted for the needs of veterinary public health.

To take the example of an animal disease now under active surveillance, the Pan American Health Organization (PAHO) (20), in co-operation with national Ministries of Agriculture throughout the Americas, co-ordinates a foot and mouth disease (FMD) surveillance programme with the goal of eventual eradication. Among the many benefits of the elimination of FMD from various areas in Latin America is the decision of the United States to open its markets to meat exports from Argentina and Uruguay.

In fact, as South American countries have begun to acknowledge their animal disease and epidemiological status more openly, their image has improved, which has helped to consolidate regional markets and promote improvements in local management. Various social and commercial sectors have recognised this success, as well as the need to work alongside official Veterinary Services in the common goals of improving animal health and protecting the food supply (20). In other words, surveillance (linked to disease prevention and control) is the key to improving animal health. It serves as a good management practice (a form of 'continuous quality improvement'), and can result in beneficial economic impacts.

Surveillance

Surveillance is a continuous and systematic process of the collection, consolidation, analysis, interpretation and dissemination of relevant information on the occurrence of animal health problems. This information should be disseminated to all who have contributed to its gathering, as well as all those who require it for disease prevention and control (15). Surveillance systems require the formation of networks of people, the free-flow of information, and well-designed procedures for disease prevention activities, control measures and epidemiological investigations. This process requires constant attention to maintenance and quality improvement, and may function at many levels, from the local to the international.

The most common primary objective of surveillance is to monitor the occurrence of a disease over time within a specific population. When a surveillance system needs to identify all the occurrences of a specific health event within a defined population, data from the surveillance system can be used to calculate the incidence and prevalence of that specific health event. Surveillance systems can also characterise the human or animal populations which are affected by these health problems and help to identify the groups at highest risk. Data from a surveillance system can also be used to describe these health problems, including their manifestations and severity, the nature of aetiological agents, and the use of treatments. Populations under surveillance may also be narrowly defined to meet a particular purpose. For example, an international network of diagnostic laboratories collaborates with the World Health Organization (WHO) to track the emergence, spread and impact of new influenza virus strains. Equally, there are laboratories which collaborate with the OIE (World organisation for animal health) and the Food and Agriculture Organization (FAO) of the United Nations to address the epidemiological dimensions of FMD and rinderpest (RP).

Objectives of surveillance

The objectives of a surveillance system can be described as follows:

– monitoring trends in health events

– triggering links to services

– providing starting points for research

– evaluating the effectiveness of interventions

– estimating future trends or 'disease forecasting'

– promoting education, good practices and informed policies.

Descriptive epidemiology of health problems

Monitoring trends is a key function of most surveillance systems. The detection of an increase in adverse health events can alert health agencies to the need for further investigation when outbreaks or disease clusters are suspected (7, 11). Such surveillance can also provide an historical perspective in

assessing the importance of perceived or documented changes in disease incidence, perhaps in relation to changing environmental conditions (e.g., the impact of floods or drought). Alternatively, trends identified through surveillance can provide an indication of the success (or otherwise) of specific interventions. In the context of animal health, information on the demographic characteristics of flocks/herds with health problems can help to identify groups at risk of disease and provide insights into aetiology or modes of spread.

Providing links to services

At herd level, surveillance is often an integral part of the delivery of preventive and therapeutic services by a veterinary services department in each province. This role is particularly true for infectious diseases, where:

– interventions are based on known modes of disease transmission

– therapeutic interventions or disease prevention measures are valuable

– receiving a case report may trigger a specific response.

The notification of a case may lead to an investigation and the establishment of disease control measures to avert more widespread disease. For example, the notification of cases of RP and FMD in livestock may lead to investigation and appropriate veterinary public health action.

Providing links to research

Surveillance data can be valuable in characterising the basic epidemiology of health problems. These data, however, seldom provide sufficient detail for in-depth epidemiological hypotheses. Nevertheless, surveillance can provide an important bridge to researchers by generating clues (or hypotheses) for further investigation, using more rigorous study designs.

Evaluating interventions

The planners of Veterinary Services need information about the effectiveness of interventions, yet full-scale evaluations may not always be possible. A well-designed surveillance system enables trends to be charted by numbers, rates of events or the characteristics of affected individuals, by focusing on the requirement of 'minimum essential data'. Trained epidemiologists can then identify possible interventions and estimate their impacts by analysing these essential data.

Projections or 'disease forecasting'

Planners must anticipate future demands for health services. Observed trends in disease incidence, combined with other information about the population at risk and underlying environmental conditions, in addition to economic data, can be used to estimate the future trends in specific diseases. Various mathematical models and specialised statistical software programs have been developed for this purpose, for example, epidemic models for RP (18) and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) (19).

Education and policy

As surveillance data are important for veterinary public health, any information which comes from these data should be widely and effectively disseminated, not only to those who helped to collect the data but also to anyone who can use them, including public media and local leaders. Thus, surveillance can promote evidence-based farmer education and livestock health, thereby contributing to improved awareness and knowledge of animal health problems, and good herd health practices.

Elements of a surveillance system

A well-designed surveillance system comprises the following steps:

– defining the case

– placing the population under surveillance

– applying the cycle of surveillance

– ensuring confidentiality

– providing incentives for participation.

Case definition

Defining a case is a basic step in the development of a surveillance system and requires an assessment of the veterinary public health objectives and related logistics. Surveillance definitions must balance competing needs for sensitivity, specificity, predictive value and feasibility. As there is a general need for simplicity (usually linked to feasibility or ease of use), surveillance case definitions are typically brief and generally combine reasonable laboratory criteria and common clinical manifestations.

Placing the population under surveillance

Some surveillance systems may attempt to identify all the occurrences of a specific health event which occur within the population of a defined geographic area (2). Other systems may focus on a representative sample of such events (a population-based system), as proposed and adapted for the health and production surveillance of California dairy herds (3, 21). A further development of the latter approach is to target sites

within a broader geographic area. These sites are selected because of the following:

– their convenience for conducting surveillance-based studies

– their status as being 'typical' (although not necessarily statistically representative)

– the willingness of individuals at the sites to participate.

Such a system is often termed 'sentinel surveillance' and has been applied equally to human and animal health. In Canada, for example, for many years, doctors have participated in sentinel surveillance for influenza, while sentinel chicken flocks are used in surveillance for Western equine encephalomyelitis (21). The principles of sentinel surveillance have been employed in pilot studies of selected health problems in small ruminants (5) and in cattle (4). Sentinel surveillance has also been adopted by many countries in Central America, e.g., Costa Rica, El Salvador, Nicaragua, Guatemala, Honduras and Panama (16), and the resulting data were used to establish new priorities for animal health programmes in the region.

Cycle of surveillance

Surveillance systems can be described as information 'loops' or cycles, with information flowing into the organisations which collect it and being returned to those who need it. In effect, this is simply another application of the self-correcting management information cycle (derived, in turn, from general systems theory). This cycle is illustrated in Figure 1. The loop is complete when the information is applied and action is taken.

The elements of a typical surveillance loop begin with the occurrence of a health event, its detection by a health-care provider, notification of the event to a health agency (with the successive transfer of information from local to central agencies), analysis and interpretation of the aggregate data and dissemination of the results, followed by subsequent action, including disease prevention and control measures.

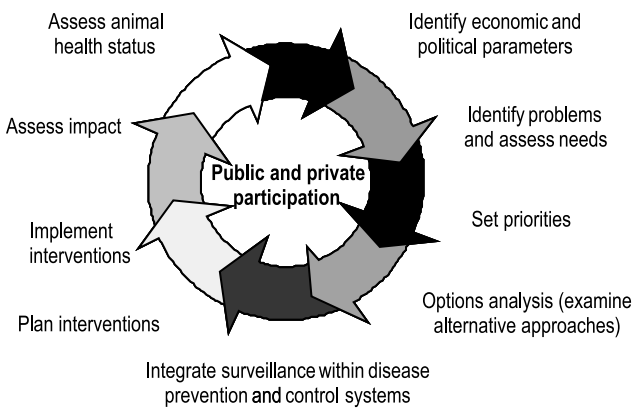

Fig. 1
A conceptual basis for disease surveillance – the animal health system as a self-correcting cycle

Ensuring confidentiality

Detailed information which uniquely identifies a specific event is necessary for the following reasons:

– to identify duplicate reports

– to obtain subsequent or 'follow-up' information, when necessary

– to provide services to identified individuals

– to use surveillance as the basis for more detailed investigations.

Nonetheless, protecting the physical security and confidentiality of surveillance records is both an ethical responsibility and a requirement for maintaining the trust of participants.

Providing incentives for participation

Providing useful information to those who contribute to the system is the best incentive for participation. This feedback may be in the form of reports, seminars and perhaps, for the participating farmers, monetary benefits to maintain their interest in the surveillance system.

Approaches to surveillance

Possible approaches to surveillance include the following:

– active and passive surveillance

– notifiable disease reporting

– laboratory-based surveillance

– volunteer providers.

Active and passive surveillance

The terms 'active' and 'passive' surveillance are used to describe two alternative approaches to surveillance. An active approach means that the organisation conducting the surveillance initiates procedures to obtain reports, such as regular telephone calls or visits to health-care providers, animal-holding facilities and farms.

A passive approach to surveillance means that the organisation conducting the surveillance does not contact potential reporters of adverse health events but rather leaves the responsibility for reporting any such events to others, such as veterinarians, farmers, etc.

While the terms 'active' and 'passive' are conceptually useful, they are insufficient for describing a surveillance method. For example, it may not be feasible to contact all potential reporters. Thus, in taking an active approach to surveillance, a health

agency may decide to contact only large reporting centres routinely. In addition, special investigations may be conducted periodically to identify cases which have not been reported through routine procedures. It is more important to describe the following:

– how the surveillance is conducted

– who is contacted

– how often the contacts are made

– what, if any, supporting or 'back-up' procedures are in place to identify missing cases.

Notifiable disease reporting

Veterinary health agencies have the authority to designate certain diseases as 'notifiable', i.e., by law, their occurrence must be reported. Traditionally, this approach has been used for infectious diseases. The regulations which control disease reporting have varying time requirements and assign varying levels of reporting responsibility to different authorities i.e., farmers, government veterinary officials.

However, the problem with notification systems throughout the world (with relatively few exceptions) is that, once established, they are often poorly maintained and not well used. While these systems can be improved, it is even more appropriate to see notification as simply one important component of a scientifically designed approach to surveillance.

Laboratory-based surveillance

Using diagnostic laboratories as the basis for surveillance can be effective, especially when diagnostic testing for a particular condition is centralised. Laboratory records, however, usually lack information on epidemiologically important characteristics. Moreover, subjects which are undergoing laboratory tests may not be representative examples of all cases of this disease. Nonetheless, as with notification, laboratory monitoring has an important role to play in surveillance. At the very least, laboratory information generally offers a high level of specificity.

The relatively recent development of computerised laboratory information systems offers additional potential for epidemiological applications, including contributions to surveillance. Laboratories which use the same software for internal specimen tracking and recording may be connected for this purpose, if there are appropriate safeguards for maintaining confidentiality.

Volunteer providers

The participation of private veterinary practitioners in such a surveillance system requires a commitment of their resources, particularly time. Thus, while selecting a random sample of sites or health-care providers is desirable, the participation rate is likely to be higher among those with the greatest interest in the success of a surveillance programme. Thus, an effort should be made to identify a mix of volunteers, based on geography or on the characteristics of their client and/or patient populations.

Other approaches for surveillance may include the following:

– the use of existing registries

– periodic and/or continuing surveys

– information systems, such as birth and death records

– sentinel events

– linking records from various sources.

Finally, appropriate analyses, interpretations and presentations of surveillance data, in the form of summary reports, are integral components of a surveillance system. These reports must be made available to the appropriate decision-makers, including politicians, administrators, veterinary officials, veterinary practitioners and participating farmers, so that they can assign priorities to disease control measures and deal more effectively with a disease situation.

Ultimately, if the information produced by a surveillance system is not used to guide disease prevention and control measures, then, of course, there is no purpose in making the investment.

Attributes of an effective surveillance system

The following list of attributes can be used to evaluate an existing system or to design a new system. As some of the attributes are conflicting, it is necessary to determine which are the most important for a given surveillance system. Effort should be invested into strengthening those aspects of the system which address the most important attributes, while accepting that others cannot be fully achieved. These attributes are as follows:

– sensitivity

– specificity

– timeliness

– representativeness

– positive predictive value

– accuracy and completeness of descriptive information

– simplicity

– flexibility

– acceptability.

Sensitivity

Sensitivity poses the question: 'to what extent does the surveillance system identify all relevant events in the target population?' When monitoring trends, low sensitivity may be acceptable if such sensitivity is consistent over time and detected events are representative. However, high sensitivity is required for assessing the impact of a health problem.

Specificity

Specificity addresses the question: 'to what extent does the surveillance system correctly exclude events which are not related to the disease under surveillance?'

Timeliness

This attribute refers to the speed of the entire cycle of information flow, ranging from information collection to dissemination. The need for timeliness depends on the animal health urgency of a problem, the infectivity of the disease agent involved and the types of interventions required.

Representativeness

Representativeness involves the question: 'to what extent do events detected through the surveillance system represent the majority of relevant cases in the target population?' A lack of representativeness may lead to the mis-allocation of health resources.

Positive predictive value

The value of the system for predicting future disease trends depends on its capability to answer the following questions: 'to what extent are reported cases really cases? To what extent are measured changes in trends truly reflective of events in the larger population?'

Accuracy and completeness of descriptive information

Forms for reporting health events often include descriptive information, such as demographic characteristics, the clinical pattern of disease and potential exposures. To what extent are these sections of the forms completed? Is this information sufficiently reliable?

Simplicity

Are the forms easy to complete? Is the software easy to use, i.e., 'user-friendly'? Is the collection of data kept to a necessary minimum?

Flexibility

The attribute of flexibility involves the questions: 'to what extent can the system be changed to address new questions? Can the system adapt to evolving standards of diagnosis or veterinary medical care?'

Acceptability

Acceptability involves measuring the extent to which the participants in a surveillance system (those who report cases, welcome staff into their hospitals or offices, complete forms, etc.) are enthusiastic about the system. What is their participation rate? Do the participants believe that the efforts they invest yield useful information?

Proposed design of an animal disease surveillance system

All the provinces of Pakistan have a network of veterinary hospitals in which staff are supposed to collect and report data on disease occurrences to their district, their province and then to the Federal Office. However, it was found, at least in Punjab and North-West Frontier Province (NWFP) (1), that veterinary staff were not reporting any cases of infectious diseases, including FMD, haemorrhagic septicaemia (HS) and RP. Perhaps this was caused by fear of the consequences of reporting outbreaks of vaccine-preventable diseases, which would have indicated the failure of these staff to achieve immunisation targets. For any surveillance system to be truly effective, it is essential to overcome these hurdles, which are essentially due to human behaviour and the need to create a new management culture within animal health organisations.

Two pilot studies on the design and implementation of a system for monitoring health problems through convenience samples from herds/flocks of large and small ruminants (3, 4) have been conducted in Islamabad and Rawalpindi. This particular system, however, does not allow the collection of information on all adverse health events occurring in the livestock population of a defined geographical area. In addition, *ad hoc* surveys based on cross-sectional design did not yield the rates of various morbid conditions in livestock in four districts of Punjab (6).

An approach to the development of human health surveillance at district level for developing countries has recently been outlined, based on a system developed in the Tamil Nadu region of India (13). The success and sustainability of this particular system have been attributed to the following elements:

– the simplicity of the reporting procedure

– low costs

– the participation of the private sector

– the personal rapport between the people in the network

– the regular distribution of information and feedback through a monthly bulletin

– the visible disease control and prevention measures undertaken after reporting.

There is no good reason why the equivalent development of animal health surveillance at district level should not prove equally successful. In the remaining part of the paper, the authors outline a prototype animal disease surveillance system at district level. This proposed system could be replicated in all administrative units throughout the country. The authors have attempted to identify the main objectives of this animal disease surveillance system, the potential approaches which could be adopted, and some of the attributes and elements of the proposed model, all in the context of the animal health situation in Pakistan.

As noted above, the specific objective of any disease surveillance system should be based on the political, socio-economic and cultural constraints of the area (17). In the context of Pakistan, disease surveillance data must concisely list the occurrences of specific diseases, specifying the times of such occurrences, the locations, the characteristics of the affected animals, and the animal population at risk.

Such a surveillance system should be flexible enough to include the subsequent collection of productivity data, to assess the economic impact of the disease.

A surveillance system in Pakistan should perhaps be based on case definition, including the clinical signs and symptoms of selected diseases. These specific diseases would include both infectious diseases, such as FMD, HS, RP, blackleg and contagious caprine pleuropneumonia; and non-infectious diseases, for example haemoglobinurea, as all of these diseases are reported to have high frequencies in Pakistan (6).

Furthermore, standardised, literature-based definitions of such diseases should be agreed upon and developed by the veterinary regulatory authorities. In terms of Pakistan, buffalo, cattle, sheep and goats are the species which play a pivotal role in the livestock economy, and so these animals should be considered as livestock populations for surveillance.

With regard to surveillance approaches, the authors propose that both active and passive surveillance should be adopted. The resources which are available would determine the sample size of the herds/flocks to be included in the surveillance programme, as well as the design of the sampling method.

Highly contagious diseases such as FMD and RP are already notifiable in Pakistan. However, the mechanism for this notification must be greatly strengthened, perhaps by offering some incentive to the veterinarians who notify the diseases, so that they will do this quickly and efficiently and, in turn, timely action can be taken by the relevant authorities.

The Punjab and NWFP provinces have veterinary disease diagnostic laboratories at district level, and all four provinces have either Veterinary Research Institutes or Central Veterinary Laboratories. There is also a newly established National Veterinary Laboratory at the federal level. These public institutions should serve as the centre or 'hub' of diagnostic activities, as well as maintaining databases on the type, size and geographical location of flocks/herds. Data on the samples submitted in control programmes for highly infectious diseases can play a significant role in the study of the spatial and temporal epidemiology of selected diseases. The animal disease data from these laboratories should be highly specific and thus will have great potential for epidemiological applications, including contributions to surveillance. Furthermore, surveillance data generated through the combination of both active and passive surveillance, substantiated with laboratory confirmation, will aid in ensuring representativeness and completeness of the resulting data.

Depending on the size of the livestock population in each district, a surveillance team should be established. This team should include a district epidemiologist and supporting field workers, who are provided with motorcycles for transport. The office of the district epidemiologist should be equipped with microcomputers and staffed with a data entry technician and clerical support.

As proposed elsewhere in this article, a list of the priority diseases for surveillance should be developed. When setting the priorities for these diseases, the following elements should be taken into account:

– the impact of the disease (both in health and economic terms)

– the availability of cost-effective prevention and control measures, as well as possible resource considerations

– the diseases which farmers and veterinarians consider important in their particular areas.

A case definition for each listed disease should be established and provided to veterinary hospitals and other appropriate people and organisations, including private veterinary practitioners. Education and awareness campaigns will also be required in launching such a system. A simple system of record-keeping should be developed at farm level, and farmers should be educated in recording disease events. Farmers should also be given printed material to support their record-keeping and assist with related educational needs. The staff of veterinary hospitals should visit enrolled (if not all) commercial livestock producers within their area every week, to collect information on disease occurrence. The field staff of the district epidemiologist should receive disease-occurrence data from veterinary hospitals every month.

All enlisted veterinary hospitals should be supplied with printed, self-addressed, pre-paid postcards, to be mailed as and when an outbreak of a listed disease occurs. The postcard should have space for the identification and address of the livestock farm, the size of the herd, and the number of animals affected by a particular disease. If a vaccine-preventable disease is reported, the vaccination status of the herd should be included on the card.

Operational plans and logistic support should be established so that laboratory confirmation of the field diagnosis is readily available whenever the need arises. Thorough epidemiological investigation of any outbreak should be conducted with laboratory support for clinical diagnosis. The knowledge gained from such investigations may be used to guide the development of future educational and other prevention and control measures.

The number of reported cases, together with other crucial characteristics of the disease outbreak, should be summarised by geographical location by the district epidemiologist, and transmitted to the chief epidemiologist at provincial headquarters. Disease summaries (data plus informative interpretations) should be prepared and printed on a monthly basis. These disease summaries should then be distributed to participating veterinary hospitals, provincial and national administrations and to the international organisations of the FAO and the OIE. The staff and any others involved in reporting cases should receive continuing education on the situation at district meetings, as well as copies of the summaries. In addition to continuing education, private practitioners should receive supplies of vaccine, in recognition of their co-operation.

The authors envisage that this model of animal disease surveillance will provide improved morbidity and mortality statistics, as well as more credible estimates of the economic impact of a particular disease. Furthermore, individual disease records in each district will be more detailed than previously, and generating reports will become simpler. In addition, the reports themselves will become increasingly complete and professional.

As any disease surveillance database is constructed over time, each district and province can conduct its own retrospective analysis to discern trends concerning a disease problem of interest to them. Livestock regulatory authorities at the federal level can also request frequent updates on surveillance activities, without increasing the administrative burden on the staff of provincial livestock directorates. The following factors will be crucial in the success of this model:

– continuing commitment and support from management

– regular monthly summary feedback reports from the provincial centre

– regular morale-boosting visits from senior staff from the provincial centre to the field staff who collect the data

– staff motivation

– staff commitment to care and accuracy

– continuing development of the process.

Conclusion

The authors have attempted to provide an overview of the development of disease surveillance programmes, in both developed and developing countries, to demonstrate how such systems contribute to successful disease prevention and control. Furthermore, the authors have outlined the generic principles underlying the design of a surveillance system, and proposed an approach to animal disease surveillance which should be feasible in Pakistan at district level. Such an approach could be highly cost-effective and may contribute many economic benefits through improved animal health. The details of this conceptual outline could be further developed by professional discussion groups.

La surveillance des maladies animales : les perspectives de développement au Pakistan

S. Akhtar & F. White

Résumé
La surveillance est un processus continu et systématique de collecte, de compilation, d'analyse, d'interprétation et de diffusion des informations pertinentes sur l'apparition de problèmes sanitaires. Les données issues de la surveillance permettent de calculer l'incidence et la prévalence des événements, de caractériser la répartition des maladies en fonction de caractéristiques spécifiques, d'orienter les recherches sur l'apparition de maladies épizootiques et enzootiques et de fournir des informations capitales pour la mise au point et l'évaluation de programmes efficaces de prévention et de prophylaxie des maladies.
Les systèmes de surveillance des maladies doivent également répondre aux besoins en informations des pouvoirs publics, de l'industrie agroalimentaire, des universités, des producteurs et des consommateurs. Toutefois, la plupart des pays en développement, et le Pakistan en particulier, ne disposent pas de systèmes évolués de surveillance des maladies animales capables de fournir les informations de qualité voulue sur le statut et l'évolution des maladies. Dans cet article, les auteurs décrivent les différentes facettes d'un système de surveillance générique et proposent une structure adaptée à la mise en place d'un système de surveillance au niveau des districts. Ces systèmes, qui ont été élaborés et mis en œuvre à des fins de surveillance de la santé humaine dans un certain nombre de pays, pourraient être développés pour satisfaire les besoins de santé publique vétérinaire.

Mots-clés
Approche – Attribut – Bétail – Conception de la surveillance – Objectif – Pakistan – Ruminant – Système de surveillance des maladies.

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Perspectivas de desarrollo de la vigilancia zoosanitaria en Pakistán

S. Akhtar & F. White

Resumen
La vigilancia es un proceso permanente y sistemático de obtención, síntesis, análisis, interpretación y difusión de informaciones útiles sobre la aparición de problemas sanitarios. Los datos obtenidos pueden utilizarse para calcular la incidencia y prevalencia de determinados episodios sanitarios, caracterizar la distribución de enfermedades en función de los parámetros adecuados, orientar las investigaciones sobre el advenimiento de epidemias y enfermedades endémicas y aportar información esencial para la concepción y evaluación de programas eficaces de prevención y control de enfermedades.
Los sistemas de vigilancia sanitaria deben atender además a las necesidades de información de organismos oficiales, empresas del sector agroindustrial, universidades, productores y consumidores. Sin embargo, en la mayoría de los

países en desarrollo, Pakistán entre ellos, los sistemas de vigilancia zoosanitaria dejan que desear y no generan información de calidad suficiente sobre la situación y las tendencias sanitarias. En este artículo, tras examinar en abstracto las diversas características de un sistema de vigilancia, los autores proponen la estructura de uno de tales sistemas que funcionara a la escala de un distrito. En muchos países donde se han concebido y puesto en marcha sistemas de esa índole con fines de control de la salud pública pueden aplicarse dispositivos del mismo género al sector de la salud pública veterinaria.

Palabras clave
Atributo – Concepción de sistemas de vigilancia – Ganado – Objetivo – Pakistán – Planteamiento – Rumiante – Sistema de vigilancia sanitaria.

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