SYSTEMS OF EPIDEMIOLOGICAL CONTROL AND SURVEILLANCE OF ANIMAL DISEASES AT THE NATIONAL AND REGIONAL LEVELS

G.K. Brückner
Deputy Director, Animal Health, Directorate of Animal Health, Private Bag X138, Pretoria 0001, South Africa

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Summary: Reports of 21 Member Countries of the OIE in Africa are evaluated against the criteria for the establishment and maintenance of systems for epidemiological control and surveillance of animal diseases. Emphasis is placed on the unique animal management systems practised in Africa with particular reference to communal ownership of livestock, the existence of nomadic and transhumant livestock, and the effect thereof on disease surveillance and disease control activities. It is concluded that the apparent inability of some countries in Africa to meet all the requirements of an ideal disease surveillance and disease control system, is not common only on the African continent, but occurs wherever the data resource potential of the epidemiological triad (agent, host and environment) is not exploited and utilised to its full potential.

1. INTRODUCTION

The expansion in the world trade in animals and animal products, changes in the world order, the concepts of risk assessment and regionalisation, and the General Agreement on Tariffs and Trade (GATT), have brought a new dimension to and focus on the ability of countries to substantiate claims in respect of their status of disease control and disease surveillance (8). While the OIE has taken numerous initiatives relative to Africa to facilitate and encourage the creation of disease-free zones (18), the ability of countries to meet these demands, will be put to the test. However, the new emphasis placed on the ability of countries to minimise the risk of disease transmission in the trade of animals and animal products, might necessitate a re-evaluation of the methods and results of disease surveillance when practised under different environment/host relationships. Farming practices unique to the African continent, such as the communal ownership of livestock and the existence of nomadic and transhumant livestock, do not easily fit into the classic perception of methods of disease surveillance or disease control.

2. CONTRIBUTIONS RECEIVED FROM OIE MEMBER COUNTRIES

In the reports received from the various countries, the ability or inability to institute satisfactory disease control or to set up an ideal system of disease surveillance, were often related to the apparent incompatibility of traditional farming practices with modern ways of disease surveillance and disease control. Emphasis will therefore be placed on some problems unique to the African continent that might hinder the application of satisfactory disease surveillance and disease control practices.

Contributions were received from 21 of the 43 Member Countries of the OIE in Africa: Algeria, Angola, Benin, Botswana, Burkina, Egypt, Ghana, Guinea, Kenya, Morocco, Namibia, Niger, Senegal, South Africa, Sudan, Swaziland, Tanzania, Tunisia, Uganda, Zambia and Zimbabwe. To expand coverage of the report, observations made during visits on behalf of the OIE Working Group on Informatics and Epidemiology to Botswana, Malawi, Mozambique, Swaziland, Zambia, and Zimbabwe, are included.

The contributions received varied from short summaries to detailed descriptions on methods of epidemiological disease control and surveillance. In order not to exclude relevant information from Member Countries, a holistic approach will be followed by not referring to reports of individual countries, but rather describing methods of epidemiological disease control and surveillance and associated problems that were commonly identified by most of the countries.
3. THE CLASSICAL APPROACH TO EPIDEMIOLOGICAL CONTROL AND SURVEILLANCE OF ANIMAL DISEASES

Various systems for the epidemiological control and surveillance of animal diseases have been developed, adapted and changed over the years concurrent with new developments in the discipline of epidemiology. The science of epidemiology constitutes the foundation for surveillance and monitoring, providing essential information for the formulation and execution of disease control measures. An epidemiological approach to disease control and surveillance implies that each aspect of the epidemiological triad of agent, host and environment are addressed to document trends over time in order to portray an accurate representation of the animal health status of a country (8). Yet, animal health policy and regulation decisions are being made daily in the absence of current animal health information (9).

The ideal surveillance programme should have a very high probability of detecting a disease if it is present in a country. Surveillance also implies that official action will follow from the discovery of evidence of disease or infection - in contrast to monitoring, in which the gathering of data from the field takes place similarly, but no official action based on the findings is implied in the data-gathering activity (16). To enable the outcome of a surveillance activity to result in the institution or formulation of disease control measures, the surveillance programme should satisfy the following criteria (10):

- It must be sensitive to detect true health-related events.
- It must be specific to minimise the false identification of a health-related event.
- It must be representative of all the health-related occurrences.
- It must provide information within a reasonable time to enable valid analysis of data.
- The system should be simple and easily understood and not create a burden on participants.
- The system must be flexible to adapt easily to new reporting needs in response to changes in health-related events.
- It must be acceptable to those persons conducting surveillance and those providing data.
- The system must be relevant and applicable to current needs and problems.

In the evaluation of the contributions from the various Member Countries, it was evident that although there was an honest attempt to meet most of the above criteria in the execution of disease surveillance programmes, the attributes were not always compatible with African pastoral conditions. It was also obvious that while animal health information systems can play an important role in the development of a veterinary model for African pastoral livestock populations, the information which they collect and process, must also be appropriate and useful to the future development of veterinary medicine (20) and the formulation of disease control strategies. These criteria will be evaluated against the reality of the cultural, economic, social and physical conditions of the African continent.

4. EPIDEMIOLOGICAL SURVEILLANCE AND DISEASE CONTROL PROGRAMMES APPLIED ON THE AFRICAN CONTINENT

4.1. Methods of disease surveillance

The methods of surveillance applied in the various regions of Africa are determined by the existence of a functional organisational structure, the degree of economic constraints, availability of personnel and resources, the type of farming practice dominating the area of surveillance, cultural beliefs, and physical conditions. The scope of disease surveillance activities is also narrowed down by the nature of the data to be collected in respect of specific diseases.

* Editorial Note: See also Monitoring and surveillance systems for animal diseases, taking as models the following diseases: mycobacterial infections in animals, Newcastle disease, foot and mouth disease and rabies, p. 45 of this same volume.
This restricted involvement allows little or no room to exploit alternative ways of surveillance or sources of related data and variables affecting data collection. Little or no attention is given to the fact that animal health data will be difficult to interpret without an understanding of the complexities of pastoral management strategies, the high biotic variability of arid and semi-arid ecosystems, pastoral modes of production, and the physical environments and societies of the area under surveillance (21).

a) An organisational structure composed of a hierarchy of official veterinarians, animal health technicians and veterinary assistants, exists in most of the countries, and is deployed on a regional and district level to execute active and passive disease surveillance programmes.

b) Surveillance programmes are carried out in various degrees of intensity, frequency or magnitude:
   - continuous and country-wide surveillance programmes in accordance with national disease eradication schemes (e.g. sero-surveillance for bovine brucellosis) and compulsory routine inspections in disease control zones;
   - incidental surveillance actions during vaccination campaigns for e.g. rabies, foot and mouth disease, anthrax, rinderpest and contagious bovine pleuropneumonia (CBPP);
   - retrospective surveillance generated by data from diagnostic laboratories and abattoirs; import and export control; issuing of movement permits; vaccines, drugs, acaricides or stock remedies issued or sold;
   - surveillance activities generated by research projects and international aid programmes e.g. the Pan African Rinderpest Campaign and the Pan African Tsetse and Trypanosomiasis Programme;

c) The key field of reference for surveillance data constitutes a dipping tank or crushpen area (in communal systems), grazing area or pastoral management system whether it be nomadic or transhumant livestock. This implies that in almost all the countries, individual owner data becomes irrelevant when formulating disease control strategies resulting from surveillance data. The boundaries of communal grazing systems determine disease control measures to be instituted or constitute the frame of reference for the epidemiological analysis of data.

d) It appears that in most of the countries, data that are generated by clinical and other surveillance activities of private veterinarians are not exploited or utilised to supplement the national data base on disease occurrences.

e) Disease surveillance activities in most of the countries are aimed at the collection of data related to diseases and the host, with little or no data on environmental variables. The result is that, especially in those countries where data are generated almost continuously as result of the nature of disease control measures applied (compulsory inspections and vaccinations in disease control areas), an abundance of data on disease occurrences and host variables are available, but mostly in manual form. Data collected during the course of zoo-sanitary interventions, are entered onto disease reporting forms and sent on a monthly basis to the regional and central offices. In many of these countries, the data available offers a proverbial gold mine for the epidemiologist if they could be collated and analysed according to given epidemiological and statistical analytical procedures. Further analysis of available data, as has already been attempted in some countries, also helps to reveal shortcomings in existing data collection systems, the need for information on other related variables and areas in the logistics of data collection that need to be rectified.

f) Very few Member Countries have access to or utilise computerised systems to capture disease surveillance data for epidemiological analysis. The result is that in many of the Member Countries, the lack of facilities and resources inevitably results in an accumulation of disease reports with a delay in the feedback to the primary suppliers of data or stock owners. The inevitable result is that officials responsible for supplying data or carrying out disease surveillance programmes, lose interest and are reluctant to participate or commit themselves to further similar activities. It was also evident that in those countries where data capture programmes are in use and facilities for the statistical analysis of data or the manipulation of data in e.g. geographical information systems are available, people participating in disease surveillance programmes, were better motivated and willing to commit themselves to the programmes. The reason is
most likely the speed of feedback made possible by available resources rather than the knowledge of the existence of such facilities.

### 4.2. Methods of epidemiological control

The nature and intensity of disease control methods applied are determined by almost the same factors as mentioned under methods of disease surveillance, thus suggesting a direct linear relationship between disease surveillance and disease control. A variety of disease control methods are practised within the different countries, all of which include one or more of the following:

- **a)** The establishment of disease control zones for e.g. foot and mouth disease, rinderpest, rabies, African swine fever. In these control areas stock are inspected and vaccinated at set weekly, monthly or three-monthly intervals. Strict movement control is enforced for movement of susceptible animals from and to these areas. A system of compulsory stock identification is enforced in most of the countries where control zones for specific diseases exist.

- **b)** Border control is common to almost all the Member Countries, although strict enforcement of control measures is difficult in those countries with nomadic and transhumant livestock, where free movement and migration of game across international borders is common, or where political unrest prevents the proper application of disease control strategies or deployment of personnel.

- **c)** Compulsory vaccination at State expense is applied for most of the major epizootic diseases, of which foot and mouth disease, anthrax, bovine brucellosis, rinderpest, CBPP and rabies are the most important.

- **d)** Disease control strategies, especially in respect of diagnosis of diseases, are supported by a system of either national or regional laboratories. In most of the national laboratories or the laboratories financed by international organisations or pharmaceutical firms, vaccines are produced against the major endemic and economically important animal diseases.

- **e)** Legislation to support and legalise disease control strategies exists in all the countries, but the application of the control measures and the scope of diseases that can be attended to in accordance with existing legislation, are restricted by available finances, manpower and other essential resources.

- **f)** Coordination and cooperation in respect of methods of disease control within the African Continent are facilitated by the OIE, other international organisations such as the Food and Agriculture Organisation of the United Nations (FAO), European Union (EU), Organisation for African Unity / Interafrican Bureau for Animal Resources (OUA/IBAR) and regional organizations such as the Southern African Development Coordination Conference (SADCC) and the Southern African Regional Commission for the Conservation and Utilisation of the Soil (SARCUSS).

### 5. EVALUATION OF EPIDEMIOLOGICAL CONTROL AND SURVEILLANCE OF ANIMAL DISEASES IN AFRICA

In view of the above observations on disease surveillance, it may well be asked if the end result of disease surveillance activities in Africa, always satisfies the quantitative criteria of sensitivity, specificity, timeliness and representativeness, or the more subjective measurements of simplicity, flexibility, relevance and acceptability. However, no single nation has successfully implemented or satisfied all criteria related to an ideal surveillance system (8). The reasons for this are not that obvious, but the criteria do suggest a more detailed evaluation of the apparently unique conditions that prevent a "100%" score for the majority of African countries and for that matter any other country that fails to satisfy all the criteria.

It should not be difficult to propose reasons why some countries in Africa are unable to improve on their existing level of disease surveillance and disease control. While it is true that economic constraints, the apparent continuous decrease in the funds allocated for State Veterinary Services, lack of resources, and a backlog in the training of personnel are all contributing factors, is also true that rectifying some or all of these shortcomings, does not necessarily imply that a sound disease surveillance and disease control programme will automatically fall into place.
It is important to rectify shortcomings in the utilisation of technological advances and to make resources available to enhance the utilisation and analysis of data, thereby strengthening the ability to make sound decisions in respect of epidemiological disease control methods. However, these remedial steps are regarded as of secondary importance compared to concerted efforts to exploit to the full the enormous potential of data resources offered by each aspect of the epidemiological triad. Thus, getting the technology right is only part of the solution; making it compatible with cultural, economic, social and physical conditions is also essential (21).

Sollod (21) list five objectives that he regards as crucial in establishing an appropriate animal health information system on the African continent and as a prerequisite for establishing disease surveillance methods:

- to monitor the information necessary for rational pastoral development strategy;
- to clarify culturally-bound disease complexes, both for the pastoralists and for personnel involved in animal health care delivery;
- to determine the technical feasibility of addressing specific diseases through epidemiological investigation, therapeutic or preventive field trials and cost-benefit analysis;
- to test the social acceptability of animal health interventions; and
- to give pastoralists an opportunity to participate in their own development.

The full potential of data resources available at pastoral level has yet to be exploited. In Zimbabwe extensive studies on the potential and utilisation of data obtainable from dipping tanks and stock owners at dipping tanks, were carried out revealing an enormous potential source of data still to be utilised (15). These findings and findings from other similar studies, confirm the important role that stock owners themselves play as a source of data and as an instrument to institute acceptable and workable disease control measures. The utilisation of laboratory diagnostic tests and sophisticated surveillance methods becomes more valuable after an animal information system is established (21). Only by utilising all the sources of information offered by the host (animal), the agent and the environment (particularly the pastoral environment), can a sustainable epidemiological approach to disease surveillance and control be ensured.

If these potential resources are exploited as suggested, countries in Africa who are now in an unfavourable position to enter the demanding arena of international trade, will be able to enhance and improve their existing methods of disease surveillance and disease control. They will through their own efforts thereby ensure that they can meet the demands required for regionalisation for specific animal diseases and risk assessment by their trading partners.

REFERENCES


