A STRATEGY FOR STRENGTHENING NATIONAL EPIDEMIOLOGICAL SURVEILLANCE SYSTEMS IN AFRICA

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Original: English

Summary: Animal diseases continue to be a serious impediment to economic progress in most countries in Africa and the situation is likely to worsen if timely appropriate steps are not taken.

As is the case with other regions of the world, it is becoming increasingly evident that the public veterinary sector in Africa will not be capable of fulfilling this function alone and that private veterinarians, veterinary para-professionals (technicians) and farmers will be called upon to play an important role.

All authors agree that epidemiology is a procedure or activity associated with disease control. Surveillance is defined as "The systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken".

Physical components of epidemio-surveillance are enlisted as: official Veterinary Services, the diagnostic laboratory, the herder and herds and the computer database.

There are many factors impeding running a proper epidemio-surveillance. These include financial, logistical and technical constraints. The evidence collected and the analyses used to reach any conclusion should be reliable enough for the results to be acceptable to both the managers of the monitoring and surveillance systems and the assessors.

Key words: epidemiological surveillance – Africa – monitoring – transboundary animal disease – Pan African Rinderpest Campaign (PARC) – Pan African Programme for the Control of Epizootics (PACE)

Introduction

Animal diseases continue to be a serious impediment to economic progress in most countries in Africa and the situation is likely to worsen if timely appropriate steps are not taken. With the emergence of important animal diseases such as highly pathogenic avian influenza, surveillance has become an essential tool for early disease detection of and rapid response against such diseases.

As is the case with other regions of the world, it is becoming increasingly evident that the public veterinary sector in Africa will not be capable of fulfilling this function alone and that private veterinarians, veterinary para-professionals (technicians) and farmers will be called upon to play an important role in delivery of animal health services.

Many authors have broadly defined epidemiology and surveillance. However, all agree that it is a procedure or activity associated with disease control.

West [15] defined epidemiology as "the systematic characterization and explanation of pattern of disease and the use of this information in the resolution of health problems".

Reid [9] defined epidemiology in specific terms as "the study of nature and distribution, causation, mode of transfer, prevention and control of the disease", while surveillance was defined to be "the epidemiological study of a disease as a dynamic process involving the ecology of infectious agent, the host, the reservoir, the vectors as

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well as the complex mechanism concerned in the spread of infection and the extent to which this spread will occur".

The Food and Agriculture Organization of the United Nations (FAO) [2] defined epidemiology as the study of distribution and determinants of health-related states and events in populations. It is a term now in common usage for studies in animal populations although 'epizootiology' is still occasionally used.

The World Organisation for Animal Health (OIE) [8] defined an 'epidemiological unit' as "a group of animals with a defined epidemiological relationship that share approximately the same likelihood of exposure to a pathogen. This may be because they share a common environment (e.g. animals in a pen), or because of common management practices. Usually, this is a herd or a flock. However, an epidemiological unit may also refer to groups such as animals belonging to residents of a village, or animals sharing a communal animal handling facility. The epidemiological relationship may differ from disease to disease, or even strain to strain of the pathogen". The OIE defined 'monitoring' as "the continuous investigation of a given population or subpopulation, and its environment, to detect changes in the prevalence of a disease or characteristics of a pathogenic agent". 'Surveillance' is defined as "the investigation of a given population or subpopulation to detect the presence of a pathogenic agent or disease; the frequency and type of surveillance will be determined by the epidemiology of the pathogenic agent or disease, and the desired outputs".

Epidemiological surveillance is a "method of observation based on continuous recordings in order to monitor a given population's state of health or risk factors, in particular to detect the occurrence of pathological processes and to study their spatial and temporal development so as to adopt appropriate control measures" [14].

1. What is surveillance?

In the *Terrestrial Animal Health Code*, in the specific Appendix on 'General guidelines for animal health surveillance', 'surveillance' is defined as: "The systematic ongoing collection, collation, and analysis of data, and the timely dissemination of information to those who need to know so that action can be taken" [7].

A well functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of health intervention programmes. The existence of a surveillance system able to provide reliable data is also necessary to document the health status of animal populations in an international trade framework and in the import risk assessment process. Surveillance systems may have several objectives. In general, surveillance is aimed at demonstrating the absence of disease or infection, determining the occurrence or distribution of disease or infection, while also detecting as early as possible exotic or emerging diseases. The type of surveillance applied depends on the desired outputs needed to support decision-making. Animal health surveillance is an essential component necessary to detect diseases, to monitor disease trends, to control endemic and exotic diseases, to support claims for freedom from disease or infection, to provide data to support the risk analysis process, for both animal health and/or public health purposes, and to substantiate the rationale for sanitary measures. Surveillance data underpin the quality of disease status reports and should satisfy information requirements for accurate risk analysis both for international trade as well as for national decision-making [8].

According to the Council of the European Union [1], "the surveillance network system must comprise at least the following elements: the herds, the owner or any other natural or legal person responsible for the holding, the approved veterinarian or the official veterinarian responsible for the holding, the official veterinary service of the Member State, the official veterinary diagnostic laboratories or any other laboratory approved by the competent authority, a computer database".

Kambarage [5] outlined that "partnership is more important now than before because of the recent changes in the Government structures in many developing countries that have necessitated the withdrawal of public delivery of animal health services with the view of creating a room for the private sector to provide the lead role for services offered at farm/animal owner level. Because these are new roles for both the animal owners and the private sector and changed ones for the public sector, the partnership certainly cannot be effective unless farmers, private practitioners, researchers and diagnosticians are empowered to realize the value and obligations towards disease surveillance mandates". This author added that "these new roles and partnership in Tanzania create a very big challenge to regulatory bodies that are the primary stakeholders to effective disease surveillance and monitoring systems. These challenges emanate in particular from the very fact that most farmers are based in rural areas and continue keeping their animals under the very traditional system. Because public animal health service delivery systems were withdrawn abruptly in many countries, most farmers feel that they were abandoned and betrayed by their governments. Most traditional animal keepers have developed a tradition of treating their animals themselves. They buy and stock a variety of drugs, mainly antibiotics and trypanocides. Under these circumstances, the need for animal

health service providers is greatly minimised". In addition, the role of private sector in the rural areas is very limited.

Tambi [12] outlined the importance of epidemio-surveillance in the process of disease control: "A key question is: how can the economic impacts of transboundary animal diseases (TADs) be minimised? A possible answer is that there is a need for the establishment of an early warning or surveillance system that is capable of detecting disease outbreaks and containing them before they spread. Such a system involves a systematic and continuous collection, analysis and interpretation of animal disease (or infection) data. It allows the health and associated factors of given populations to be followed in space and time. It can also be used in planning, implementation and evaluation of disease control measures. More importantly, it is a requirement of the OIE Pathway for verification and grant of disease/infection-free status and is required by importing countries for the purposes of trade in livestock and livestock products".

Sidibe [11] mentioned that "epidemiosurveillance networks actions are based on: an early warning system identifying the presence of a disease as soon as possible; an early reaction system that provides a rapid and effective response to any appearance of the disease; and the quality of the veterinary services. The networks are run by actors that include the public sector, private veterinarians, auxiliaries and livestock producers, using various tools (slaughterhouses, diagnostic and reference laboratories, communication, training and raising awareness amongst the actors involved)".

Mugachia [6] mentioned that "the reports from various African countries imply that Veterinary Associations are relevant in epidemio-surveillance in Africa. The relevance of Veterinary Associations in epidemio-surveillance in Africa is also likely to increase as the number of private animal health service providers, affiliated to the associations, increases".

2. Animal disease surveillance quality assurance

The International Atomic Energy Agency, IAEA [4], in collaboration with FAO, developed performance indicators (PIs) which serve as a tool to assist member countries to evaluate the efficiency of surveillance system for rinderpest eradication. These indicators provide tools to assess the sensitivity, specificity and timeliness of major components of rinderpest disease surveillance. These indicators were categorised into eight groups, namely: 1) for general disease surveillance; 2) for active disease surveillance; 3) for active disease reporting; 4) for stomatitis enteritis outbreak investigation and sample submission to laboratories; 5) for preliminary rinderpest diagnosis testing; 6) for stomatitis enteritis case definitive diagnosis; 7) for sero-surveillance; and 8) for wildlife surveillance. These PIs will assist countries to proceed efficiently along the OIE pathway.

The OIE [8] indicated that "surveillance systems should incorporate the principles of quality assurance and be subjected to periodic auditing to ensure that all components of the system function and provide verifiable documentation of procedures and basic checks to detect significant deviations of procedures from those documented in the design".

Salman *et al.* [10] emphasised that "a reliable surveillance system is the key to early warning of a change in the health status of any animal population". The authors described a set of methods and approaches to evaluate the quality of various monitoring and surveillance systems. The suitability of each method depends on the objective of the evaluation. One essential basic requirement is to use an objective, transparent and systematic approach. The evidence collected and the analyses used to reach any conclusion should be reliable enough for the results to be acceptable to both the managers of the monitoring and surveillance systems and the assessors.

3. The questionnaire

To properly solicit the opinion of the countries member of the OIE Regional Commission for Africa, a questionnaire was prepared and distributed to all 50 countries of the Commission[1]. A schedule was drawn up for receiving feedback from the countries.

The questionnaire seeks to assist the countries to provide an overview of the current situation in African countries in order to provide guidance to them to set up plans to improve epidemiological systems to better combat animal diseases.

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1   The OIE Regional Commission for Africa comprises 50 members, as follows: Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, the Republic of the Congo, the Democratic Republic of the Congo, Côte d'Ivoire, Djibouti, Egypt, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Libya, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Principe, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe

The questionnaire is divided into two parts, namely: "Epidemiological surveillance existing structures and operations" and "Prospects of future development of the epidemio-surveillance strategy".

Nineteen countries, representing 38% of the total number of OIE Member Countries in Africa, responded to the questionnaire and sent their replies (see Appendix I).

The replies present minimal variations from a country to another, indicating that the problems, constraints and even the epidemio-surveillance status in most of African countries are almost similar.

All countries own epidemio-surveillance systems that include, at least, the basic components. Some countries depend on their local laboratories to analyse the collected samples, while others depend on external laboratories. All countries are keen enough to secure technical supervision for the teams. The technical staff of the team is composed of at least a veterinarian assisted with two to five technicians and a number of supporting staff.

A number of countries possess training centres for epidemio-surveillance capacity building. Others rely solely on the technical knowledge of their veterinarians. In all countries, data collected by the operating teams are shared with laboratories, public health authorities, commodity groups and academic institutions.

In all responding countries, with few exceptions, the necessary funds are secured by Government within the annual national budget. Governments recognise Veterinary Services as a public good, and so financial requirements are secured.

All countries stated the main constraints to be logistical, technical and budgetary. Attempts to resolve these constraints are focusing in increasing the national budget allocations. Few countries are dependent on external funding.

All livestock stakeholders and statutory bodies of the Member Countries are actively involved in epidemio-surveillance activities. Although the initiative for epidemio-surveillance usually emanates from the central Veterinary Services, players from the local and rural areas are actively involved in all stages of the operation.

All countries use the OIE World Animal Health Information System (WAHIS). Some countries use other packages, namely, ARIS and TADinfo. All countries conduct surveillance to monitor all the diseases included in the OIE List, with the exception of rinderpest in those countries that have been declared free from the infection. Actually, most countries achieved specific disease freedom by following the procedures recommended by the OIE. In most African countries there is no plan for surveillance of paratuberculosis.

Telecommunication networks are well developed in most countries. The Veterinary Services of the Member Countries use these facilities to send data and share results with other partners, including local, regional and international entities. All countries are keen to report their annual, emergency and six-monthly reports systematically and in a timely manner.

All countries support the 'Performance, Vision and Strategy' (PVS) tool developed by the OIE for the evaluation of Veterinary Services and suggest its immediate implementation.

4. Discussion

A well-functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of health intervention programmes.

Based on the OIE recommendations and guidelines, many countries adopted ideal packages of epidemio-surveillance principles. However, many constraints and impediments are encountered in the implementation of these principles. These constraints are exemplified in many forms, particularly, financial, logistical and mostly technical. Plans and strategies are being developed to resolve these constraints.

Both the Pan African Rinderpest Campaign (PARC) and the Pan African Programme for Control of Epizootics (PACE) contributed significantly in laying foundations for effective epidemio-surveillance systems in countries that benefited from the two projects. The effectiveness of these projects is attributed to the active participation of the concerned international organisations, namely, OIE, FAO and IAEA, together with the regional organisation AU-IBAR[1] in developing and monitoring the necessary technical principles. The outcome from these projects is the eradication of rinderpest disease from most recently infected

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1   AU-IBAR: African Union – Interafrican Bureau for Animal Resources

countries in Africa and the control of other transboundary diseases. The OIE took a lead in the above-mentioned projects. It is the preference of the countries that the OIE continue its leading role in future African regional projects, in collaboration with international and regional organisations.

The OIE Fourth Strategic Plan (2006-2010) emphasises the importance of epidemio-surveillance system as a tool in disease control. Many countries are concentrating their efforts to implement its principles. The most important components are capacity building and training of the personnel engaged in epidemio-surveillance activities.

It is clear from the feedback of countries that they all develop strategies to survey and monitor priority diseases, particularly those of public health and economic importance. Epidemio-surveillance is enhanced by many countries through the use of modern technologies and telecommunication facilities which are yet to be abundant worldwide. Hence database is the conventional target for every country in Africa.

Conclusion

From the feedback and responses received from countries, it is clear that many constraints are capable of impeding the efforts of developing strongly functioning epidemio-surveillance systems. These constraints are mainly of financial, organisational and technical nature.

A well-functioning disease surveillance system provides information for planning, implementation, monitoring and evaluation of health intervention programmes.

Both the Pan African Rinderpest Campaign (PARC) and the Pan African Program for Control of Epizootics (PACE) contributed significantly in laying foundations for effective epidemio-surveillance systems in countries that benefited from the two projects.

The OIE Fourth Strategic Plan (2006-2010) emphasises the importance of epidemio-surveillance system as a tool in disease control. This tool can be strengthened through capacity building to increase the capacities of professionals and non-professionals involved in epidemio-surveillance activities.

The evidence collected and the analyses used to reach any conclusion should be reliable enough for the results to be acceptable to both the managers of the monitoring and surveillance systems and the assessors.

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**Members of the OIE Regional Commission for Africa having responded to the questionnaire
on "Strategy for strengthening national epidemiological surveillance in Africa"**

- 131 -

1. Algeria
2. Angola
3. Burkina Faso
4. Eritrea
5. Ghana
6. Guinea Bissau
7. Lesotho
8. Malawi
9. Mauritius
10. Morocco
11. Mozambique
12. Namibia
13. South Africa
14. Sudan
15. Tanzania
16. Togo
17. Tunisia
18. Zambia
19. Zimbabwe

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