

Building capacity for improved veterinary epidemiosurveillance in southern Africa

C Bamhare^{*a}, G Thomson^b, A Latif^c, M Mulumba^{*d}, C Chisembele^{*e}, N Derah^f, L Mataa^g, M Mokopasetso^{*h}, P Dlamini^{*i}, S Jamal^{*j}, G de Klerk^k, O Letuka^k, P Chikungwa^l, T Mumba^{*m}, E F Dombolo^{*n}, G Wanda^o, S Münstermann^o, L van Schalkwyk^p, B Gummow^q, G Hendrickx^r, D Berkvens^s, T Marcotty^s, E Thys^s and P Van den Bossche^{s,t‡}

ABSTRACT

A workshop to produce recommendations on training requirements for improved epidemiosurveillance of livestock diseases in southern Africa was organised at the Department of Veterinary Tropical Diseases in the Veterinary Faculty of the University of Pretoria. It was attended by 23 persons representing 10 different southern African countries. The majority of the participants were actively involved in veterinary epidemiosurveillance and many of them were members of the SADC Epidemiology and Informatics Subcommittee. Discussions focused on (i) epidemiosurveillance networks and their 2 main components, *i.e.* (ii) *diagnosis* and (iii) *information flow*. The debates were guided by 3 questions; (i) what are the requirements for an effective network, (ii) what cannot be achieved with existing capacity and (iii) how can the current capacity be improved. Workshop participants developed lists of realistic capacity building needs, which were divided into structural needs and training requirements. Structural needs mainly concerned communication means and quality assurance. With regard to training, the need for appropriate continuing education of all actors at the various disease management levels (non-professional, para-professional, professional) was expressed. Special emphasis was put on capacity building at the lowest level, *i.e.* the livestock owner and the para-professionals at the community level. At the international level, it was felt that special emphasis should be put on building capacity to improve the understanding of international agreements on trade in animals and animal products and to improve the capacity of negotiating such agreements.

Key words: capacity, network, training, veterinary epidemiosurveillance.

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for the circumstances prevailing in most of the sub-Saharan African countries^{9,10}. Instead of adopting models that have proven to be effective elsewhere, preference should perhaps be given to a thorough study of epidemiosurveillance systems existing in the region to investigate the role played by the actors at various disease management levels (*i.e.* non-professional, para-professional, professional and international) in the main components of epidemiosurveillance networks. The outcomes of such a study could be used to make recommendations to adjust existing actions according to the requirements identified.

The Belgian Directorate-General for Development Cooperation (DGCD) funded such a study in southern Africa in the framework of its policy supporting research. It was conducted by the Animal Health Department of the Institute of Tropical Medicine (ITM, Antwerp, Belgium).

Six field studies were conducted in 4 southern African countries (Botswana, Malawi, Zambia and Zimbabwe) focusing on the requirements for efficient epidemiosurveillance networking, diagnosis and information flow. The 4 countries were chosen because of their contrasting livestock management systems and differences in disease management practices. The outcomes of the field studies demonstrated clearly that although each of the countries had an epidemiosurveillance network, some of the main components of their system were dysfunctional, thus jeopardising the network's effectiveness. These studies gave a representative overview of current problems encountered by national epidemiology units of the SADC region. Stakeholders involved in national and regional epidemiosurveillance networks were invited to discuss their outcomes in a workshop held at the Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, 21 to 23 November 2005. The prime objective of the work-

INTRODUCTION

Despite the availability of an arsenal of preventive and curative tools, the control of certain tropical animal diseases remains difficult⁸. This is attributed to the limited

resources allocated to animal health and changes in priorities⁹.

Theoretical models indicating how veterinary epidemiosurveillance networks should be developed and function are available⁴. Nevertheless, it remains questionable if such models are appropriate

*Member of the SADC Epidemiology and Informatics Subcommittee

^aDirectorate of Veterinary Services, Windhoek, Namibia.

^bTAD Scientific, Pretoria, South Africa.

^cOnderstepoort Veterinary Institute, Onderstepoort, South Africa.

^dCentre for Ticks and Tick-Borne Diseases, Lilongwe, Malawi.

^eDepartment of Veterinary and Livestock Development, Lusaka, Zambia.

^fDepartment of Veterinary Services, Gweru, Zimbabwe.

^gDepartment of Veterinary and Livestock Development, Chipata, Zambia.

^hDepartment Animal Health and Production, Gaborone, Botswana.

ⁱMinistry of Agriculture and Cooperation, Swaziland.

^jNational Directorate of Livestock, Maputo, Mozambique.

^kNational Department of Agriculture, Pretoria, South Africa.

^lCentral Veterinary Laboratory, Lilongwe, Malawi.

^mDepartment of Livestock Services, Lesotho.

ⁿGeneral Directorate of Veterinary Services, Luanda, Angola.

^oSADC-FANR, PRINT livestock project, Gaborone, Botswana.

^pPeace Parks Foundation, Pretoria, South Africa.

^qFaculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

^rAVIA-Gis, Zoersel, Belgium.

^sInstitute of Tropical Medicine, Animal Health Department, Nationalestraat 155, B-2000 Antwerp, Belgium.

^tDepartment of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria, Onderstepoort, South Africa.

[‡]Author for correspondence.
E-mail: pvdbossche@itg.be

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shop was to develop recommendations with regard to training requirements for improved epidemiosurveillance of livestock diseases in southern Africa. In the process certain structural requirements were also identified. The recommendations on how to improve epidemiosurveillance through training and capacity building formulated by the workshop participants are summarised in this publication.

MATERIALS AND METHODS

The approach adopted is presented schematically in Fig. 1. During the preparatory stage, 6 field studies were conducted in 4 countries of southern Africa^{1-3,5-7,9}. Each study addressed 1 of the main components of an effective epidemiosurveillance network. The scientists involved in the research presented their findings during the workshop. In addition, 3 regional senior experts in the 3 key focus areas of the workshop namely (i) epidemiosurveillance networks, (ii) diagnosis and (iii) information flow were invited to present the gold standard in their area of expertise, based on detailed terms of reference.

The workshop was facilitated by an external advisor and was attended by a total of 23 persons representing 10 different countries of southern Africa. The majority of the participants were actively involved in veterinary epidemiosurveillance and many of them were members of the SADC Epidemiology and Informatics Subcommittee. Others represented training institutions or donor-funded projects aiming at improving epidemiosurveillance in the region (*i.e.* the Promotion of Regional Integration in the Livestock Sector (PRINT)-project) and the Animal Health Department of the ITM.

Presentations given during the 1st day of the workshop were each followed by a short discussion. The organising team, assisted by a regional expert, extracted from the presentations the recurrent key-issues applicable to each of the 3 focus areas and prepared a general check-list to guide the group discussions during the 2nd day.

Points to address in each of the 3 discussion groups were:

- What are the requirements for an effective network?
- What cannot be achieved with existing capacity?
- How can the current capacity be improved?

Discussion groups were constituted according to areas of expertise, and chaired by the respective keynote speaker.

The findings and recommendations of

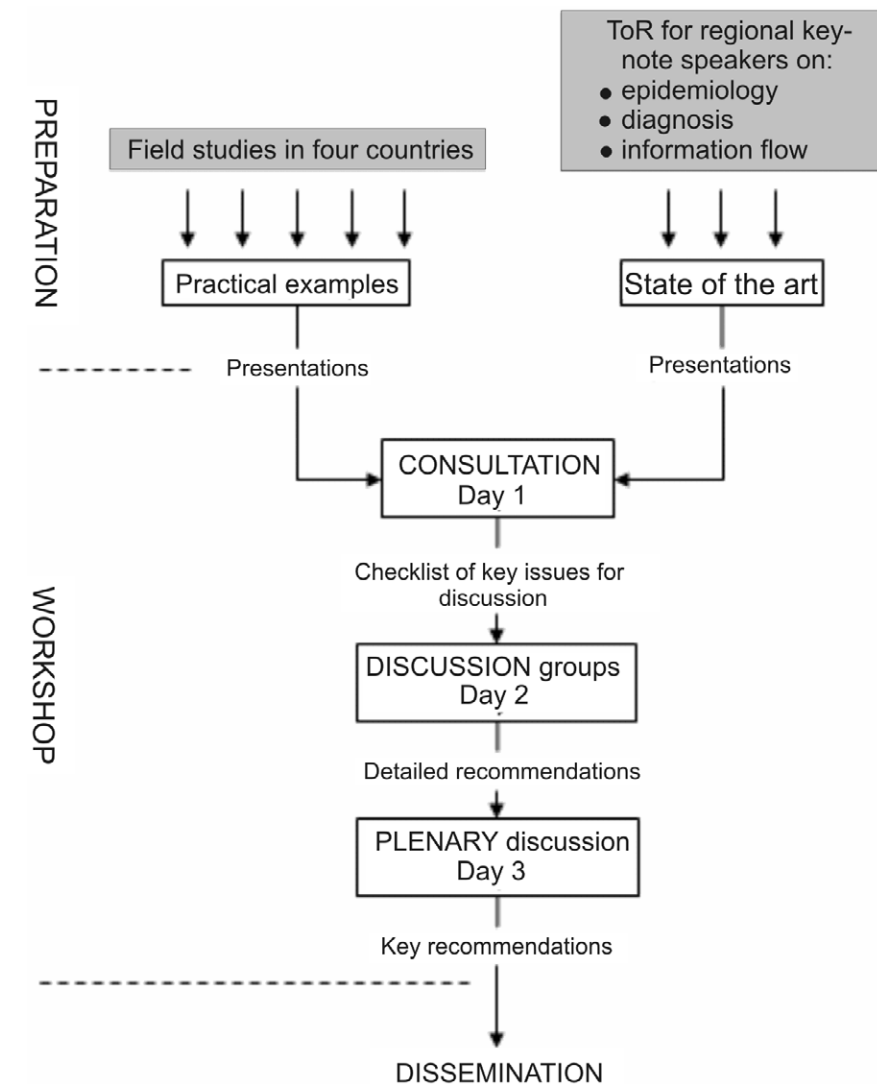


Fig. 1: Schematic representation of workshop approach.

each group were presented and discussed during a plenary session. A 1st set of important key-issues related to capacity building 'in general' was extracted. Finally, specific recommendations related to training in veterinary epidemiosurveillance in southern Africa were drafted for dissemination and implementation.

RESULTS

Outputs of the group discussions

The following essential outputs were recognised by the workshop participants as contributing substantially to the effectiveness of veterinary epidemiosurveillance networks in southern Africa:

- the ability to collect, collate, record and analyse epidemiological information;
- the ability to measure the impact of disease in both relative and absolute terms;
- the ability to provide essential baseline data in response to requests or emergencies;
- the ability to provide major inputs into contingency planning and reaction to

specific disease threats;

- the ability to support trade negotiations in relation to export and import of livestock commodities;
- adherence to well-defined reporting requirements.

Ability to collect, collate and analyse epidemiological information – This essential output of an epidemiosurveillance network requires basic infrastructural and financial resources. In most southern African countries, data collection is a routine activity but its quality could be improved substantially. Diagnosis and information flow were considered as the main components contributing to the quality of data collection. Currently, data are not analysed routinely or data analyses are limited. This was attributed to a shortage in analytical capacity. In addition, data confidentiality was considered to hamper sub-contracting of such essential analyses to the private sector or to other national or international institutions.

Although data collection in southern Africa has so far been based mainly on passive surveillance, workshop partici-

pants recognised the value of active surveillance in generating reliable information that cannot be obtained readily in a passive system. It was suggested that active surveillance has, in some instances, a better cost/benefit ratio.

Ability to measure the impact of disease in both relative and absolute terms – The assessment of the economic and social impacts of livestock diseases is not a routine exercise in the southern African region, although this information is essential to decision making for animal disease control. The workshop participants suggested that such impact assessments could be conducted by veterinarians trained in these specific fields, possibly working in collaboration with institutions that are renowned for their expertise (e.g. International Livestock Research Institute (ILRI)). In the case of zoonotic diseases collaboration with the human health sector could be initiated. The SADC Epidemiology and Informatics Subcommittee is prepared to stimulate and monitor such initiatives.

Ability to provide essential baseline data in response to requests or emergencies – Demographic, infrastructural, biophysical and land-use data were considered to be essential baseline information for an effective epidemicsurveillance network. These data may not necessarily be available at the Central Epidemiological Units (CEU) but should be accessible to them. Since a large amount of baseline data is available on internet, internet connections at the CEU are considered to be essential. Furthermore, technical and scientific staff at the CEU should have the necessary skills to access data from internet or other sources.

Ability to provide major inputs into contingency planning and reaction to specific disease threats – While contingency plans do exist, they are usually ineffectively implemented due to the poor quality of the plans and/or factors that prevent translating the plans into action. For example, socio-political constraints (e.g. granting of authorisation to operate in an area by traditional authorities, non-reporting of 1st cases for fear of repressive measures) can considerably delay the implementation of the plans and must be taken into account when developing contingency plans. The workshop participants recommended the development of a southern African (SADC)-initiative for specific risk analysis related to outside threats and the subsequent development of appropriate responses. It was also proposed that contingency plans be regularly updated and possibly tested. However, simulations should be considered with caution as they might cause confusion in the

media and among the public.

Ability to support trade negotiations in relation to export and import of livestock commodities – CEUs in southern Africa often lack the detailed understanding of international rules and regulations, such as the SPS agreement (Sanitary and Phytosanitary Agreement) and sanitary requirements imposed by other trading partners, which is necessary to support trade of livestock. In addition to acquiring this understanding, each government should have the capacity to carry out risk assessment and to negotiate with major trading partners the rules to be applied within its country (e.g. equivalence of alternative rules). The workshop participants recommended that the regional OIE (World Animal Health Organisation) office be used as source of information on SPS issues and that continuing training of staff at the CEU in (i) requirements for livestock trade and (ii) risk analysis be implemented to enable the CEU to acquire the necessary skills to support the international trade in livestock and livestock products.

Well-defined reporting requirements – In most southern African countries, reporting requirements consist of the production of (i) monthly reports on passive surveillance to be presented to the national government and (ii) 6-monthly reports to the OIE. In addition, reports must be forwarded to regional organisations such as the SADC Epidemiology and Informatics Subcommittee and the AU/IBAR. Emergency reports are submitted to both the government and the OIE according to their respective priorities. All SADC countries are able to meet the reporting requirements, but time schedules and quality of reporting vary substantially. Lower performances were attributed to the high administrative workload of the responsible veterinary officers and the lack of skilled data handling personnel in the CEU. Furthermore, information systems between countries are not always compatible. The workshop participants recognised that the situation could be improved by creating positions to fill the current gaps within the CEU and by training technical personnel in handling of epidemiological data and preparing epidemiological reports. Employing personnel that is knowledgeable in information systems in the CEU would improve both software compatibility and international communication.

Finally, it was recommended that charismatic animators should be involved in epidemicsurveillance networks, to keep the agents of the network active while ensuring the efficient collection and transfer of information. It was also suggested that

ways to speed up and shorten reporting channels be investigated. The use of modern technologies such as cellular telephones should not be neglected. Virtual CEUs could be considered, which would allow their members to be scattered over the country but linked together through the internet. However, concerns over data security and control of the staff operating at long distance were expressed.

Summary of recommendations

Based on the outcome of the group discussions, a set of key recommendations was extracted for each topic. Capacity building needs were divided into structural needs and training requirements. The recommendations were considered to be realistic and achievable within the current epidemicsurveillance environment.

In terms of structural needs, 2 major recommendations emerged from the 3 discussion groups:

- *Communication means for field staff.* Since ineffective mobility of field staff was recognised to be the most pressing constraint for any epidemiological surveillance network, it was strongly recommended that this issue be given high priority. Particular attention should be given to (i) the choice of appropriate vehicles (bicycles, motorcycles or vehicles) and to (ii) the management of these expensive resources, including use and maintenance. Communication means are not limited to transport. Where and when possible access to telephones or mobile telephones should be promoted.
- *Quality assurance of data.* To ensure data quality it was recommended that appropriate quality assurance procedures be designed and adopted at all levels.

Specific recommendations with respect to *epidemicsurveillance systems* were:

- To strengthen the capacity of SADC and SADC member states to conduct risk analysis and contingency planning.
- To strengthen the capacity of each national CEU to conduct in depth needs analyses as well as performance analyses.
- To improve data exchange within and among CEU's.
- Software and data formats should be made compatible.
- The CEU should make best use of access to internet to enable remote experts to contribute routinely to the outputs of national CEU and to facilitate information exchange.
- Formal and informal data exchange networks should be promoted.
- To make better use of logistical and human resources existing in the region. Means of assuring data confidentiality

should be investigated to enable data analysis to be contracted out to an external body (public or private, national or international).

Specific recommendations with respect to *diagnosis* were:

- To develop checklists for simple field level diagnosis. Such checklists should enable farmers to recognise the main diseases of livestock occurring in a given area and, more importantly, to discriminate between benign symptoms and situations where veterinary help should be sought.
- To provide field para-professional and professional staff with basic sampling/diagnostic kits. Where interests overlap, the private sector could be involved.

A detailed summary is provided in Table 1.

Specific recommendations with respect to *information flow* were:

- To improve field networking capacity between traditional leaders, CAHW's and VA's (Veterinary Assistants).
- To allocate financial resources for the purchase of communication equipment after its functionality and sustainability has been objectively evaluated.
- To design standardised national formats for information exchange. Ideally such formats should be compatible with those of other SADC countries.
- To advise that international organisations receive their information from a single source, *e.g.* OIE or SADC, to avoid time-consuming completion of different forms.

Detailed recommendations are summarised in Table 2.

The training requirements identified by the workshop participants are summarised in Table 3, sorted by subject and by level.

DISCUSSION

During the workshop, the diagnosis and information flow components were discussed separately from the general evaluation of epidemicsurveillance networks. This approach proved to be an effective way to guide detailed discussions on the various component-specific issues that contribute to the effectiveness of an epidemicsurveillance network. Furthermore, the combined exchange of field experiences and expert opinions helped the workshop participants to focus on relevant issues and made it possible to come up with realistic recommendations. Special attention was given to changes that can be achieved within the current institutional setup and hence, the list of recommendations was considered by the workshop participants as achievable with minor external inputs.

Notwithstanding these precautions, it

was recognised by the workshop participants that while many workshops are organised and many recommendations are produced, poor implementation of recommendations is a recurrent problem. Therefore a strategy for further dissemination and follow up of the workshop outcomes was adopted. Preference was given by the participants to publish the recommendations in a regional veterinary scientific journal to facilitate dissemination and ensure access to the recommendations for future reference, as well as to reflect the rigorous scientific approach adopted by the workshop participants and the importance attached to the outcomes of the workshop.

The institutions that were involved in the meeting will closely monitor their outputs. The Animal Health Department of the Institute of Tropical Medicine (Antwerp, Belgium) that organised the workshop and designed the basic approach will submit the recommendations to the Belgian Development Cooperation (DGDC). It will also use the outcome to adapt where possible the current Master course on Tropical Animal Health. In addition, the ITM and the Department of Veterinary Tropical Diseases (DVTD) of the Faculty of Veterinary Science (Pretoria, South Africa) will examine how their joint distance learning course in Tropical Animal Health could address some of the recommendations related to training (Table 3). The use of partnerships such as that existing between the ITM, the DVTD and the Centre for Ticks and Tick-borne Diseases (CTTBD, Lilongwe, Malawi) to deliver some of the training needs will be investigated.

Although the workshop failed to develop concrete plans to address the training needs, it is envisaged that SADC member states will benefit greatly from the PRINT project (SADC-FANR). One of the main objectives of this project aiming at promoting regional integration in the livestock sector is 'to put in place an operational network of skilled Animal Health and Production (AHP) professionals'. It was acknowledged by the PRINT representatives that recommendations of the workshop will be fully taken into account when developing the project's training component. Moreover, the PRINT project will focus especially on training in data capturing and handling, issues that were not expanded on sufficiently during the workshop.

While it is clear that training remains largely the responsibility of governments, possible support from the private sector (pharmaceutical, animal feed, agriculture) may be sought. This could translate either in direct financial support or through the

production of training, dissemination and/or extension materials.

Workshop participants have put much emphasis on the need to educate non-professional staff. It was felt that the livestock owner's perception of livestock diseases, disease risk and disease spread should be improved. Furthermore, the links between farming communities, CAHWs and VA's (*i.e.* primary level of epidemicsurveillance networks) should be strengthened. The appropriateness of farmer's schools and participatory epidemiology, both methods that have been used successfully in other parts of the developing world, could be explored.

At the para-professional and professional level, priority should be given to improve extension skills so that important information can be conveyed to livestock breeders who often lack education.

For para-professionals this could be achieved through strengthening existing para-professional networks and developing continued learning programmes. Since para-professionals may have little access to internet such training could be given through refresher courses that could be organised jointly with existing meetings. Existing training material related to animal health issues (*e.g.* ARC-OVI and DVTD) could be disseminated more widely.

At the professional level, continuous education could be addressed through distance learning programmes (*e.g.* the joint DVTD/ITM distance learning course in Tropical Animal Health). Furthermore, post-graduate information sessions could be organised during meetings of veterinary professional societies and/or veterinary departments.

At the national and regional central management level, a series of priority topics has been identified. National institutions and training centres currently involved in post-graduate training in southern Africa should be encouraged to give these topics high priority. The economics of scale and the value of standardisation of organising such specialised courses through distance learning programmes require further investigation.

ACKNOWLEDGEMENTS

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Table 1: Specific recommendations to improve veterinary diagnosis in southern Africa taking into account (i) the requirements and abilities at the various levels at which diagnosis is required and (ii) current major constraints.

| Requirements | Major current constraints | Specific recommendations |
|---|---|--|
| Level 1: Livestock keeper and CAHW* or non-professionals | | |
| Ability to recognise sick animals and suspect the presence of disease Availability of simple diagnostic checklist Ability to refer cases to level 2 | No formal training programme(s) exist Checklists often are not available | <i>Training:</i> <ul style="list-style-type: none"> Develop and implement training programmes in clinical diagnosis <i>Equipment and facilities:</i> <ul style="list-style-type: none"> Develop and implement clinical diagnostic checklist(s) (e.g. Famaacha) |
| Level 2: Livestock technician (e.g. Veterinary Assistant) or para-professionals | | |
| Ability to recognise sick animals and suspect the presence of disease Equipment to take, store and transfer samples (i.e. basic veterinary sampling kit) Ability to conduct <i>post-mortem</i> examination Sufficient mobility Ability to refer cases to level 3 | Mobility is usually low Knowledge levels vary or require updating Basic veterinary sampling kit is often not available | <i>Training:</i> <ul style="list-style-type: none"> Assess appropriateness of current training programmes and develop and implement continuous career development and refresher courses. Implement appropriate training courses on (re)emerging diseases <i>Equipment and facilities:</i> <ul style="list-style-type: none"> Provide resources to improve mobility Provide basic veterinary sampling kit |
| Level 3: Veterinarian (at district or provincial level) or professionals | | |
| Ability to confirm diagnosis and identify infectious agent(s) Ability to draw up case reports Ability to conduct further sampling when required Sufficient mobility Access to appropriate diagnostic tools (e.g. parasitological and serological) Access to cold chain facilities Ability to refer cases to level 4 | Mobility is usually low Quality and quantity of diagnostic equipment is often insufficient | <i>Training:</i> <ul style="list-style-type: none"> Establish appropriate continuous education programmes at post-graduate level <i>Quality assurance:</i> <ul style="list-style-type: none"> Implement regular inspections by representatives of national laboratories to ensure quality of diagnosis <i>Institutional:</i> <ul style="list-style-type: none"> Conduct research to develop simple diagnostic tools |
| Level 4: National veterinary laboratory | | |
| Ability to confirm diagnosis and identify infectious agent(s) including agents of diseases of national importance Access to specialised diagnostic equipment to detect those agents Ability to act as national reference laboratory Ability to deal with high throughput Access to cold chain facilities Ability to refer cases to level 5 | Diagnostic capacity and capability do not necessarily match national requirements | <i>Training:</i> <ul style="list-style-type: none"> Establish appropriate continuous education programmes at post-graduate level Train staff in use of sophisticated diagnostic tools <i>Equipment and facilities:</i> <ul style="list-style-type: none"> Evaluate current diagnostic tools or combination of tools <i>Quality assurance:</i> <ul style="list-style-type: none"> Comply with international standards (e.g. through accreditation) <i>Institutional:</i> <ul style="list-style-type: none"> Ensure commitment to sustain activities of national veterinary laboratory Conduct cost/benefit analysis to support sustainability |
| Level 5: Regional veterinary laboratory | | |
| Ability to conduct highly specialised diagnostic tests Ability to diagnose(re)emerging diseases | Diagnostic capacity and capability do not necessarily match regional requirements Support for the establishment and maintenance of a pathogen bank Establishment and maintenance of diagnostic networks | <i>Training:</i> <ul style="list-style-type: none"> Establish appropriate educational programmes at post-graduate level Train staff in use of sophisticated diagnostic tools <i>Equipment and facilities:</i> <ul style="list-style-type: none"> Support the sustainability of regional high security laboratories <i>Quality assurance:</i> <ul style="list-style-type: none"> Comply with international standards (e.g. through accreditation) <i>Institutional:</i> <ul style="list-style-type: none"> Ensure commitment to sustain activities of regional veterinary laboratory Conduct cost/benefit analysis to support sustainability |

*CAHW: Community Animal Health Worker, member of community and selected by the community who received basic training in animal disease control.

Table 2: **Specific recommendations to improve the flow of veterinary information in southern Africa taking into account (i) the requirements and abilities at the various levels at which information flow is required and (ii) current major constraints.**

| Requirements | Major current constraints | Specific recommendations |
|---|--|---|
| Level 1: livestock keeper and CAHW* or non professionals | | |
| Good communication skills Ability and willingness to transmit information to level 2 | Ability and willingness to transmit information to level 2 is low | <i>Training:</i> <ul style="list-style-type: none"> • Implement extension activities to improve ability and willingness to report to level 2 <i>Institutional:</i> <ul style="list-style-type: none"> • Integrate trained CAHW in the reporting system (e.g. experiences in SADC: Namibia, Zambia & Mozambique) |
| Level 2: Livestock technician (e.g. Veterinary Assistant) or para-professionals | | |
| Knowledge of catchment area , livestock management, and local customs and culture Ability to interact and communicate with the community Sufficient mobility and access to communication tools (e.g. cell phone) Clear reporting instructions and appropriate tools (checklists, formats and stationary) | Mobility is usually low Knowledge varies | <i>Training:</i> <ul style="list-style-type: none"> • Implement area-specific training in extension skills, including training in local customs and culture • Implement continuous in-service training in livestock management and disease recognition <i>Communication:</i> <ul style="list-style-type: none"> • Network with traditional leaders • Network with livestock keepers/CAHW (level 1) and veterinarians (level 3) • Exploit meetings of the community (e.g. auctions, shows, market, NGO activities) to communicate with and collect information from level 1 <i>Equipment and facilities:</i> <ul style="list-style-type: none"> • Provide resources to improve mobility and communication |
| Level 3a: Veterinary offices at district level or professionals | | |
| Knowledge of catchment area Ability to supervise staff and to appreciate their capacities/capabilities Sufficient mobility and access to communication tools (e.g. cell phone, ...) Clear reporting instructions and appropriate tools (checklists, formats and stationary) Access to system (computerised or not) for storage and retrieval of data | Mobility is usually low The communication facilities are poor Quality assurance is usually not institutionalised | <i>Communication:</i> <ul style="list-style-type: none"> • Improve networking with other district actors (e.g. government, NGO, traditional authorities, private vets) to enhance communication • Network with livestock technicians (level 2) and with veterinarians of provincial offices (level 3b) • Utilise community radio stations for information dissemination <i>Equipment and facilities:</i> <ul style="list-style-type: none"> • Provide resources to improve mobility, communication and data handling <i>Quality assurance:</i> <ul style="list-style-type: none"> • Take responsibility of scheduled supervisory field visits to ensure flow of quality information, improve communication and to motivate staff |
| Level 3b: Veterinary offices at provincial level or professionals | | |
| Ability to supervise staff and to appreciate their capacities/capabilities Sufficient mobility and access to communication tools (e.g. cell phone, ...) Clear reporting instructions and appropriate tools (checklists, formats for reports and) stationary Access to system (computerised or not) for storage and retrieval of data Ability to analyse incoming data | Capacity and capability to analyse data for transfer to lower and upper levels is limited | <i>Training:</i> <ul style="list-style-type: none"> • Implement continuous in-service training in data entry, data analysis and reporting <i>Communication:</i> <ul style="list-style-type: none"> • Improve networking with other provincial actors (government, NGO, traditional authorities, private veterinarians) to enhance communication • Network with veterinarians of district offices (level 3b) and with veterinarians of national offices (level 4) <i>Equipment and facilities:</i> <ul style="list-style-type: none"> • Provide resources to improve mobility, communication and data handling (hardware and software) <i>Quality assurance:</i> <ul style="list-style-type: none"> • Take responsibility of scheduled supervisory field visits to ensure flow of quality information, to improve communication and to motivate staff |
| Level 4: National offices (Central Epidemiology Unit, CEU) | | |
| Allocation of an appropriated mandate to CEU Access to communication equipment (computers, internet, phone and fax, postage, radios) Availability of sufficient trained staff with appropriate skills (e.g. GIS, data analysis, storage and retrieval; reporting, communication; risk analysis; information management) | Outputs of national level depend on the quality of the information provided by the lower levels Information dissemination is restricted by amount of funds available Reporting formats to international organisations differ substantially | <i>Training:</i> <ul style="list-style-type: none"> • Implement appropriate training of staff in the required skills (e.g. Geographic Information Systems [GIS]) and conduct in-service refresher courses • Produce didactic material for extension • Identify training needs and coordinate the development and improvement of training curricula <i>Communication:</i> <ul style="list-style-type: none"> • Enhance national networking with other stakeholders such as universities or private sector (e.g. Livestock Consultation Forum in Zambia and Namibia) • Establish bilateral arrangements for information sharing (on trade and livestock movement control) |

Continued on p. 98

Table 2 (continued)

| Requirements | Major current constraints | Specific recommendations |
|--------------|---------------------------|--|
| | | <p><i>Equipment and facilities:</i></p> <ul style="list-style-type: none"> • Explore and adopt modern communication technologies (e.g. cell phone systems, hand-held computers, palm-tops) • Provide resources for data handling (hardware and software) <p><i>Quality assurance:</i></p> <ul style="list-style-type: none"> • Design standardised formats in collaboration with various input levels (level 2, 3a, and 3b) and give training • Design and implement appropriate plans to ensure quality of data <p><i>Institutional:</i></p> <ul style="list-style-type: none"> • Take responsibility for scheduled supervisory field visits to ensure flow of quality information, to improve communication and to motivate staff • If necessary, the region (e.g. Epidemiology Informatics Sub-Committee and Livestock Technical Committee) could advise international organisations on possible improvements on current reporting • Allocate appropriate authority to CEU |

*CAHW: Community Animal Health Worker, member of community and selected by the community who received basic training in animal disease control.

Table 3: Training requirements in epidemiology, diagnosis and information flow for the various levels involved in veterinary epidemicsurveillance networks in the SADC region.

| Farmer/CAHW Non-professional | Field level | | Central management level | |
|---------------------------------|---|--|--|--|
| | VA Para-professional | Veterinarian Professional | National | SADC |
| Diagnosis | | | | |
| Recognition of clinical signs | Refresher courses e.g. emerging diseases | Continued education e.g. new diagnostic tools | Continued education e.g. quality control, accreditation, diseases of national importance, economics of lab-diagnostics | Continued education e.g. trans-boundary diseases, emerging diseases |
| Epidemiology | | | National and SADC | |
| | Data collection standards Epidemiology of diseases | | Strengthen regional epidemiology training capacities in general and at a national level focus on: <ul style="list-style-type: none"> • Data management and analysis • Risk analysis • Impact assessment • Contingency planning • International trade regulations • Livestock economics | |
| Information flow | | | National | |
| | Extension practices Data entry and reporting | | <ul style="list-style-type: none"> • Didactic extension tools • Information management • Network management | |

substantially to the improvement of the manuscript.

REFERENCES

1. Chikungwa P 2005 The diagnostic capacity of veterinary field staff in the Nkhotakota District of Malawi. *Tropicultura* Special Issue 2005: 17–20
2. Chisembele C 2005 Knowledge and disease management skills of cattle owners on east coast fever and foot and mouth disease in Kazungula and Livinstone districts of Zambia. *Tropicultura* Special Issue 2005: 21–27
3. Derah N, Mokopatsetso M 2005 The control of foot and mouth disease in Botswana and Zimbabwe. *Tropicultura* Special Issue 2005: 3–5
4. FAO 2004 Manual on livestock disease surveillance and information systems. FAO Animal Health Manual No. 8, Food & Agriculture Organization of the United Nations, Rome
5. Mataa L 2005 Reporting livestock disease information in Zambia: constraints and challenges. *Tropicultura* Special Issue 2005: 28–32
6. Mokopatsetso M 2005 Modelling foot and mouth disease risk factors in Botswana. *Tropicultura* Special Issue 2005: 13–16
7. Mokopatsetso M, Derah N 2005 Recent outbreak of foot and mouth disease in Botswana and Zimbabwe. *Tropicultura* Special Issue 2005: 8–12
8. OIE 2007 Animal Disease Data. <http://www.oie.int>
9. Van den Bossche P, Thys E, Berkvens D (eds) 2005 *Epidemicsurveillance for animal diseases in southern Africa*. Belgian Development Cooperation, Brussels
10. Van den Bossche P, Thys E, Elyn R, Marcotty T, Geerts S 2004 The provision of animal health care to smallholders in Africa. an analytical approach. *Revue Scientifique technique de l'office International des Epizooties* 23: 851–861