



Veterinary education in Africa: Current and future perspectives

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ABSTRACT

SWAN, G.E. & KRIEK, N.P.J. 2009. Veterinary education in Africa: Current and future perspectives. *Onderstepoort Journal of Veterinary Research*, 76:105–114

Veterinary education commenced in South Africa in 1920 at the Onderstepoort Veterinary Institute in South Africa in association with the Transvaal University College, now the University of Pretoria. Sir Arnold Theiler, Director of Veterinary Research and Education, was the first Dean. Today there are 46 veterinary training institutions in Africa of which 21 are in sub-Saharan Africa.

Veterinary services are indispensable to the sustained health and wellbeing of animals and humans, and agricultural economies of countries worldwide. Veterinary education, postgraduate training, and research, and adequate numbers of veterinarians, are essential to satisfy the millennium development goals, the objectives of NEPAD and the African Union, and the agreements regulating international trade.

The relevance of the veterinary profession internationally is currently subject to profound scrutiny. Its contributions are assessed against major environmental, demographic, political, disease, technological and economic needs. The scope of veterinary training in future will have to emphasise veterinary public health, food safety, emerging diseases, international trade, bioterrorism, and biomedical research, within the context of a one-health system focusing on the interface between wildlife, domesticated animals, humans, and their environment. Within the context of time available, it would mean reducing the time allocated to training in the field of companion animals.

A brief history and scope of veterinary education; current international trends in veterinary education and provisioning; and some perspectives on future veterinary training and initiatives applicable to Africa are provided.

INTRODUCTION

Veterinary education is shaped by demographic, environmental, disease, technological, political, and economical influences and is required to serve the needs of a country in relation to its environment, animal population, and society in which it operates. The number of veterinary schools present within a country will affect the scope of veterinary training and responsibility of each school. A veterinary training programme and curriculum need constant review and adaptation to keep abreast of trends in both national and international developments and requirements. Currently a curriculum would normal-

ly be revised every 5 years, thus allowing a new programme to be fully implemented every ten years, whilst small and non-critical modifications could be introduced during the interim (Fernandes & Lobo-Vilela 2002). Curricular changes are not necessarily linear extensions of existing programmes but they need to take cognisance of future scenarios affecting the profession over time spans of 10–20 years.

The Faculty of Veterinary Medicine, Cairo University appears to be the oldest faculty in Africa. It was established as a school of veterinary medicine in 1827 in Rasheed in the north west of the Egyptian Delta (www.cu.edu.eg). In 1950 the school became the

Faculty of Veterinary Medicine of the Cairo University. There are presently 46 veterinary schools on the African continent of which 21 are in sub-Saharan Africa (Hailat 2005; Mayen 2006). With the exception of the faculties in Cairo, Egypt (1827), University of Pretoria (1920) and Khartoum, Sudan (1938) all other African veterinary schools were established after 1960.

The earliest reference to veterinary education in South Africa dates back to 1901/02 when the Transvaal Department of Agriculture was formed and it was suggested that a 'Veterinary College for South Africa' be established. An initial attempt was made in 1911 to create a Chair of Veterinary Science for Sir Arnold Theiler. Formal proposals that contained the details of a proposed training programme were thereafter lodged with the State Commission on Higher Education in 1914. It was, however, only in 1919 that a formal invitation was extended to Sir Arnold Theiler to create a Faculty of Veterinary Science.

Sir Arnold Theiler was appointed on 1 April 1920 as the first Dean of the newly established Faculty of Veterinary Science through the intervention of General Jan Smuts. The first seven students were registered in the Faculty of Agriculture of the Transvaal University College (TUC) in 1920 and were later joined by an eighth student. All eight students qualified in 1924 as the first locally trained veterinarians. The Faculty remained under the management of the Onderstepoort Veterinary Institute but for academic purposes was part of the then Transvaal University College (TUC) under aegis of the University of South Africa, which later became the University of Pretoria. All lecturing staff remained in the employ of the Department of Agriculture. Full responsibility for the Faculty of Veterinary Science was transferred to the University of Pretoria only in 1973.

The Faculty of Veterinary Science at the University of Pretoria remained the only facility responsible for veterinary training in South Africa until 1980 when a second faculty was established within the Medical University of Southern Africa (MEDUNSA) with the purpose to increase the ethnic diversity in veterinary training. This faculty admitted its first students in 1982 and produced its first graduates in 1987. In 1999, due to the excessive cost of veterinary training, the MEDUNSA veterinary faculty was amalgamated with the original faculty at the University of Pretoria to form the current new national faculty. The amalgamated faculty continues to utilise the facilities at the Onderstepoort campus of the University of Pretoria.

CURRENT SCOPE OF VETERINARY TRAINING IN AFRICA

Many parts of Africa have large populations of indigenous livestock of low productivity and with animal health problems as major constraints to productivity (Kisauzi, Tsutsumi & Mlangwa 1993). Veterinary training in Africa for many years was focussed on producing veterinarians to address the needs of the livestock sector, and most veterinarians were employed by the State.

The original veterinary faculties in Africa were established as a result of prevailing devastating livestock diseases such as rinderpest, East Coast fever, African horsesickness, and the urgent need for their control. The curricula were at that time, and in many cases are still, primarily focussed on training veterinarians able to recognise and initiate efficient animal disease control, apply effective treatment of diseased animals, enhance animal welfare and safeguarding human health. Most curricula of veterinary faculties in east and southern Africa extend over 5–6 years, are primarily discipline-based and cover the traditional preclinical, paraclinical and clinical subjects in producing a "generalist veterinarian" (FAO Workshop on harmonising the curricula of veterinary faculties in east and southern Africa 2004). There is very little to no provision for electives in these curricula.

In a review undertaken on the adjustment of curricula in veterinary faculties in sub-Saharan Africa, De Deken, Obwolo, Thys & Geerts (2004) reported that due to socio-economic changes there has been an increased privatisation of veterinary services. This has led to the increasing entrance of veterinarians into private practice in the region and has necessitated increased clinical training and the introduction of new practice and business management programmes. However, private veterinary practice, other than in South Africa, is very limited and underdeveloped, and there is still very little need for clinical veterinary specialization in these countries. In contrast, in South Africa, more than 70% of veterinarians registered with the South African Veterinary Council are in private practice. This situation is reflected in its veterinary training programme in which there is extensive emphasis on training in the field of companion animal medicine.

The survey by De Deken *et al.* (2004) also examined how the veterinary curricula adjusted for crucial developments in the veterinary field, such as decentralisation and globalisation, increasing the risk of the spread of transboundary diseases. In addition to adjustments made to provide for privatisation of vet-

erinary delivery systems and private practice, most faculties have also included additional training in food quality control and in wildlife production and management. The importance of wildlife in ecotourism and its increasing relevance in mixed livestock and wildlife ranching in certain countries necessitated its introduction in undergraduate veterinary curricula.

FACTORS AFFECTING THE FUTURE OF VETERINARY EDUCATION

Political

Veterinary education at its highest quality provides training that meets the needs of a particular society to adapt to changing national, regional and international conditions. The recommendations of the Millennium Development Goals (MDG) Africa Steering Group 2008 (www.mdgafrica.com), as well as the Comprehensive Africa Agricultural Development Programme (CAADP) as developed by the New Partnership for Africa's Development (NEPAD) and the African Union, provide a framework for the needs in Africa for the immediate future and beyond. Eradication of extreme poverty and hunger (MDG1), combating HIV/AIDS, malaria and other diseases (MDG6), ensuring environmental sustainability (MDG7) and developing a global partnership for development (MDG8) are the main millennium goals applicable to veterinary education. These goals are fully aligned with the priorities as set by NEPAD and the strategies of the African Union. Agriculture has been identified as central to reducing poverty, hunger and accelerating growth in Africa. The majority of Africa's people live in rural areas associated with agrarian systems that are generally weak and unproductive (NEPAD 2001). The MDG recommendations place a particular focus on smallholder farmers and on women that account for 80 % of the region's farmers. Cooperation with the pharmaceutical industry in providing access to affordable essential drugs, and collaborating with the private sector in making available new technologies are regarded as important targets in MDG8. Infectious diseases seriously affect four of the MDGs, which relate to human health, food supply and economic development (Anon. 2006).

High levels of political instability (www.times-publication.com/risk-assesment/risk-assesment.html) and civil wars (www.africasunnews.com/wars.html) will remain to seriously impact on the delivery of veterinary education in the countries in Africa affected by these scourges.

Transboundary, emerging and re-emerging diseases

Infectious diseases, including viral, bacterial, fungal and parasitic diseases, account for more than 20 % of human deaths and 25 % of morbidity, disproportionately affecting the poor and reducing life expectancy in many sub-Saharan countries (Anon. 2006.) Disease during outbreaks can spread rapidly, causing enormous economic losses, and impact markedly on human health and livelihoods. These effects are most severe in Africa given that in sub-Saharan Africa livestock farming contributes up to 25 % of gross national product across the region, and that 12 of the world's 15 major epidemic diseases of animals occur endemically in Africa.

Currently, new diseases emerge about every eight months and the likelihood is that about 75 % of these are new zoonotic diseases (Willis, Monroe, Potworowski, Halbert, Evans, Smith, Andrews, Spring & Bradbrook 2007). In the past 25 years, 38 new pathogens have emerged of which 75 % have caused disease in animals. About 60 % of all human pathogens are known to have crossed the species barrier. The emergence and re-emergence of diseases are contributed to by global weather changes, and are driven by diseases such as HIV/AIDS as is the case with tuberculosis in humans, the increasing emergence of drug resistance, and when natural ecosystems are stressed (Anon. 2006.) While there is great uncertainty about the future it is assumed that many of the current major human and animal diseases will remain important during the course of the next 10-25 years

Wildlife serves as reservoirs of the pathogens causing infectious diseases and is an important and continuing source of disease for both livestock and humans. Incursions into their natural habitat and trade in meat (bush meat) and in exotic animals for the pet trade are major drivers of the transmission of these pathogens to humans and domesticated animals (Anon. 2006.) Most emerging diseases have originated from animal reservoirs. Transboundary diseases have been classified as one of the eight classes of diseases that are considered particularly important during the next 10-25 years.

Global animal and public health

The delivery of veterinary services is increasingly being accepted as a global public good mainly because of the initiatives of The World Organisation for Animal Health (OIE) (Brückner 2008). This not only places the veterinary profession under public

scrutiny but has created awareness regarding its role in promoting animal health and its linkages to safeguarding human health. This changing paradigm also requires, by operating in a world of shared risks and common opportunities, acknowledgement of the realities of mutual dependence and growing interconnection (International Task Force of Global Public Goods, 2006 Meeting Global Challenges: International Cooperation in the National Interest. Final report, Stockholm, Sweden). In this context, the rate at which diseases now may spread across the globe, the potential risk of bio- or agri-terrorism using zoonotic pathogens, the extensive illegal trade in animals, changes in spread of animal disease due to changes in human demographics and behaviour, and patterns of land-use are noteworthy (Brückner 2008). As a result, food safety and export regulations for animal products are becoming increasingly strict and, additionally, they may be designed as non-tariff trade barriers to protect internal markets of individual countries or blocks of countries.

The international community expects the profession to assume different approaches when dealing with the disease environment such as predicting disease outbreaks and spread by focussing on prevailing climatic conditions, appreciating the impact of disease due to observed events, and to consider potential epidemiological causal links (Brückner 2008). There is an expectation that all health export declarations for live animals and animal products should be scientifically founded.

Veterinary education in Africa cannot ignore these global animal health and public health issues. In this context, the OIE is currently preparing a special issue of the *Scientific and Technical Review* on expanding education of global health and public health within the veterinary curriculum worldwide.

Convergence of animal, human and environmental health

The high prevalence of poverty and starvation, excessive human population growth, presence of devastating human diseases such as HIV/AIDS, tuberculosis and malaria, and the presence of large underdeveloped communities will continue to influence the future direction of veterinary education in Africa. Veterinarians, being trained in comparative medicine, should be well equipped to function at the interface between wildlife, domestic animals and humans.

Large overlap exists in the preclinical training of health care professionals and similar standards in

public health services exist for humans and animals. Recurring threats of zoonotic disease have created the need for convergence of animal and human health training and provisioning. It can be expected that public health agencies in future be staffed with professionals in both human and animal health. Veterinary education in Africa should therefore promote the collaboration of animal and human health to more effectively and competently address public health needs of disease, particularly related to trans-boundary, and emerging and re-emerging zoonotic diseases.

During the next 20 years environmental degradation is likely to continue due to pollution, overproduction, habitat fragmentation, climate change and invasion of alien species. According to the Foresight report on infectious diseases (Anon. 2006), the greatest impact of new diseases would be to undermine global water and geochemical cycles by disrupting key plant and microbial systems that support them. Natural ecosystems will continue to be a major source of wildlife diseases that may threaten agricultural systems and human health.

Technology

There have been major advances in technology leading to widespread use of computer-linked sensors to carry out diagnostics, administer therapies and to perform tele-surgery over great distances. Future technological tools offer powerful capacity for the detection, identification and monitoring (DIM) of infectious diseases (Anon. 2006). Advanced data collection and processing ability could enable emerging diseases to be quickly spotted, providing valuable time to develop vaccines and to prevent its spread. New techniques for identifying and analysing new pathogens assist in the rapid understanding of the effect of newly detected diseases on populations and how they can be controlled before inflicting damage. Faster, smaller and cheaper diagnostic services will open up new possibilities for use by professionals and individuals.

Africa has the greatest burden of disease and probably the lowest level of disease management resources and skills. New devices and DIM approaches could reduce costs and make trade easier by enabling disease-free status of animals and measures to counter terrorism.

Veterinary education should capitalise on new technology to provide distance education and virtual simulations in education. This will facilitate increasing the number of students in certain modules, and

will support continuing education opportunities. Education should promote the integration of technological advances in the delivery of professional services in remote areas, including the provision of diagnostics, therapeutics, bio-sensing, data collection and interpretation, as well as in national and international cooperation.

GLOBAL TRENDS IN VETERINARY EDUCATION

Veterinary science and practice have evolved from the initial focus on horses in the 1800s to livestock through to the 1950s, whereafter emphasis of the profession shifted towards companion animal medicine in many parts of the world (Willis *et al.* 2007). Over the past decade, the emphasis of veterinary practice has shifted from the traditional role of treatment and care of individual animals and the protection of human health to mass therapies, the implementation of plans for eradication of animal diseases, the development of animal nutrition, and the shift from pathological control of abattoir animals to the concept of the abattoir as an epidemiological observatory where the results of farming activities may be verified (Marabelli 2003). Food safety has been placed at the forefront through the tools of hazard analysis and critical control point (HACCP).

The relevance of the veterinary profession has become the subject of profound public scrutiny. Several publications have appeared over the past number of years that envision the future and describe the new challenges facing the profession and which have necessitated adjustment of veterinary education (Pritchard 1988; Willis *et al.* 2007). The initial response to the broadening of the scope and specialisation of veterinary practice was the introduction of various forms of core-elective curricula. The core is completed by all students leading to the development of essential generic veterinary, or day-one, competencies. Tracking (or areas of emphasis within the curricula) was implemented to allow students to acquire greater knowledge and skills in selected areas (species-based). In addition, there has been an adaptation of technology and pedagogic processes that have fostered greater emphasis on problem-solving skills and self-learning abilities of students (Prasse 2007).

Future educational requirements are driven by major environmental, demographic, political, disease, technological and economic needs (Willis *et al.* 2007). Emphasis will increasingly be placed on the contributions made by the profession in the fields of

globalisation of animal and public health, international trade in animals and animal products, food safety, emerging diseases, changes in the relationship between veterinary medicine and the environment, bioterrorism, biomedical research, and changes in the relationship between animals and humans within the context of a one-health approach. A responsive and flexible veterinary education system has been proposed to meet the challenges of the future (Willis *et al.* 2007). Leadership, interpersonal skills, and the ability to participate in teams have become core competencies required by veterinarians working in this new environment.

FUTURE EDUCATIONAL PERSPECTIVES IN AFRICA

Although local events and needs will inevitably continue to shape the scope, type and format of training required, veterinary education in Africa cannot be divorced from global animal and human health events and educational trends. Unique conditions and circumstances that influence and that will potentially determine the future direction and provision of veterinary education in Africa, with a focus on sub-Saharan Africa, are described under the headings below.

Scope

The challenge for veterinary education is to balance the societal needs of the various sectors requiring veterinary services nationally, particularly those of the public and private sectors, as well as taking cognisance of global animal and human health matters. This becomes more difficult when there is only one veterinary faculty, as is often the case in Africa, in a country that has the responsibility for all its veterinary training requirements. It hampers the ability of a faculty to focus its training in specific, specialised areas in an attempt to utilize its capital and human resources more optimally. Ethiopia, Nigeria and Sudan are the only countries in sub-Saharan Africa with more than one faculty.

To address these needs, more attention in future needs to be given to recognising or developing regional centres of competence in specific fields within veterinary schools in the region, similar to those in SADC. It is foreseen that such centres of competence will be limited to fields such as wildlife, exotic species, poultry health and production, pig health and production, and aquaculture and fisheries. These are fields that are very important to most countries but require smaller numbers of veterinarians to be

trained per annum. Students in the region choosing these fields could then be sent to the recognised competent facility for training, thus providing critical mass and concentration of effort. Alternatively, faculty staff competent in these fields could be shared by the different faculties. This will provide the necessary recognition of faculties in the region and provide an opportunity to focus.

Scant information exists about the expected current and future needs of the different sectors of veterinary services in South Africa, and presumably also in other parts of Africa. Such information is essential for the future educational planning of veterinary faculties. In South Africa, a study has recently been undertaken by KMPG under the auspices of the Department of Agriculture, but the results and recommendations are still forthcoming.

Community engagement has recently become a core academic output of the University of Pretoria. In this regard, the faculty is in the process of establishing two community clinics—one located in an urban developing community, including squatter dwellings, and the other in a rural developing community located in an area at the interface between wildlife, domestic animals and humans. Both clinics are intended to provide the full scope of veterinary services, including animal and human health in these communities and to prepare students for an impending one-year compulsory veterinary community service following graduation. Involvement in the community allows opportunities for applied research projects with the aim of uplifting of the community.

Curricular structure and requirements

It is assumed that a similar (as in most parts of the world) standardized, but locally adapted and relevant core programme should in future form the basis of training of all veterinarians throughout sub-Saharan Africa. This programme should provide each veterinarian with general professional skills and attributes, underpinning veterinary scientific knowledge and understanding, as well as prerequisite clinical competencies and skills. Professional attributes such as leadership and interpersonal skills, together with the development of adequate communication abilities, teamwork, an inculcation of ethical responsibilities, and a thorough knowledge of the national legal and statutory requirements and obligations affecting the profession, should form part of the future standard training of all veterinarians. Comparative veterinary medicine, a feature that distinguishes the veterinary profession from all other health professions, must be retained

as an essential outcome of the underpinning veterinary scientific knowledge and prerequisite clinical competencies of all veterinarians. Clinical competencies and skills should focus on those required for general practice and concentrate on preventative medicine as applied to populations of animals rather than the skills of therapeutic medicine. All veterinarians in future should also be skilled in essential laboratory diagnostics, quantitative epidemiology and disease surveillance, and monitoring methodologies.

More advanced training in companion animal clinical studies, animal health and production, regulatory veterinary medicine, wildlife, exotic species and any other required specialist area should form part of elective programmes. Unique differences in elective programmes will exist between countries in the sub-region, depending on socio-economic factors and societal needs. Students either could be placed or selected into a particular track of advanced study, dictated largely by national needs, recruitment strategy and admission policy.

Educational innovation

The existing and ever increasing volume of new veterinary information makes it imperative that future veterinary students are skilled in the use of information and in problem-solving. Students will need to take more responsibility for their own development by providing sufficient opportunity for self-learning in the curriculum and the use of new innovative stimulatory teaching methods and approaches. The use of Information Communication Technology (ICT) and e-learning should become an integral part of the pedagogic mode of educational delivery. Virtual training opportunities within the region should be developed, not only for continuing education purposes but also for distance education, through application of ICT and the use of virtual simulations. This will allow the best use of unique competencies, not only within the region but also on an international level. Training of staff and students in the effective use of ICT and e-learning opportunities and the development of adequate electronic and telematic facilities would be needed to make this possible in sub-Saharan Africa.

Accreditation and harmonisation

According to Edwards (2004), there is societal expectation that all veterinary qualifications are of similar basic competencies and standard. In reality though there is an apparent disparity in the level of veterinary training received, particularly between

developed and developing countries, with higher standards employed by the major accrediting bodies (i.e. those in developed countries). The challenge is to develop and implement a global standard to enable recognition of veterinary competencies from around the world. It is envisaged that in future a country whose veterinary profession (and education) is not recognised internationally and who cannot meet the criteria of the SPS agreement (of the World Trade Organisation), may be excluded from trade.

Some regional blocks of accreditation currently operate around the world, encompassing the major accrediting bodies based in the USA, Europe, United Kingdom and Australasia. In 2002, a meeting of representatives of these bodies examined the possibility of a system of global accreditation. This was followed up with further global veterinary accreditation meetings in 2004 in London, UK and in 2007 in Melbourne, Australia. The South African Veterinary Council (SAVC), responsible for administering the registration of veterinarians and para-veterinarians and for setting the minimum requirements for veterinary training in South Africa, was invited for the first time to send representatives to participate in the meeting in Melbourne. An International Accreditors Working Group (IAWG) made up of representatives of all major accrediting bodies, as well as representatives of the SAVC, nominated at the meeting in Melbourne, met in Chicago in October 2007 to formulate recommendations for a proposed joint site visit at Murdoch University, Division of Veterinary and Biomedical Sciences in 2009. A member of the SAVC will also, for the first time, form part of the visitation team, as an observer.

Wider participation in the global accreditation initiatives within Africa should occur. The formation of a regional accreditation body in future, that could take this responsibility for faculties in southern and eastern Africa or possibly even for sub-Saharan Africa, is foreseen. In the meantime, the representative of the SAVC participating in the current initiatives could serve this purpose.

The existing experience of the SAVC in the licensure of veterinarians and para-veterinarians, setting of minimum standards for undergraduate and postgraduate veterinary specialist training, accrediting and monitoring the quality of veterinary training in South Africa, should be recognised and used as an opportunity by other veterinary faculties in sub-Saharan Africa. Sharing of this experience can serve as an interim arrangement with the purpose of instituting the proposed regional accreditation body with-

in the next 5 years. This accreditation body will then take the responsibility of setting minimum standards of veterinary training and for the accreditation of veterinary faculties in the region. The licensure of veterinarians and ongoing monitoring of the quality of education will remain the responsibility of the local regulatory council or authority (such as the SAVC) of each of the countries.

It is unrealistic and unlikely that all faculties in Africa will be able to meet the full scope of envisaged global accreditation requirements, due to mainly socio-economic constraints and political priorities. The high level and extent of veterinary clinical training in companion animals which is common in the developed world is also not required in most parts of Africa. However, a level of agreement on core veterinary training, as well as on veterinary activities that affect global animal and human health and that are required to ensure free trade in animal and animal products, could be considered. This will allow veterinary faculties in parts of Africa to focus on the relevant veterinary needs of the country rather than being required to comply with the full scope of veterinary practice to be recognised internationally. Future recognition of different levels or fields of veterinary training and possibly area-specific licensure of veterinarians would need to be considered by the international and national authorities, respectively.

Regional recognition as well as recognition by international bodies such as the OIE and FAO, of faculties in the region with specific competence in veterinary fields that are not adequately covered in the veterinary curricula of some faculties could provide an opportunity for students to acquire the necessary broader training required at an international level. The excellent clinical facilities and veterinary academic hospital of international standard that exist in South Africa could, for example, be recognised as a regional centre for clinical training, particularly in companion animals.

An FAO project to investigate harmonising the curricula of veterinary faculties in east and southern Africa was undertaken in 2004/05. Veterinary faculties from Ethiopia, Kenya, Mozambique, South Africa, Tanzania, Uganda and Zimbabwe participated in the project. The project in our opinion indicated that full harmonisation of curricula between the different countries was unlikely due to socio-political differences and differences in the scope of veterinary training required between countries. However, it is proposed that standardisation or harmonisation of at least the core programme required for all veterinarians could be considered for the region. This

could be facilitated, accredited and monitored through the appointment of a regional accreditation body.

Postgraduate training

Veterinary education cannot be conducted effectively in the absence of a strong postgraduate and veterinary research programme. This is also a requirement of all the major accrediting bodies. A very limited capacity for postgraduate training exists in most African schools due to inadequate financial resources, facilities, and difficulty in recruiting and retaining academic staff. Stimulation and development of postgraduate training and research in the region is therefore imperative. A regional MSc programme that had been planned between SADC veterinary faculties (Mozambique, South Africa, Tanzania, Zambia and Zimbabwe) (De Deken *et al.* 2004) was finally not implemented, mainly due to unsustainable financial resources by these universities.

To strengthen postgraduate training, regional centres of competence in postgraduate training need to be developed and recognised by the region and by international organisations, e.g. the OIE and FAO. It is foreseen that postgraduate programmes or modules be developed and funded through international collaboration and partnerships. To ensure success and sustainability of such programmes it would be imperative that they are academically evaluated and quality-assured at an international standard.

An extensive range of postgraduate programmes is currently offered at the Faculty of Veterinary Science in South Africa (Table 1).

Many students from Africa already register in a variety of these programmes. The MMedVet programme, the only type of its kind in Africa, could serve as a regional resource for specialist clinical training in the region.

A primarily web-based MSc (Veterinary Tropical Diseases) degree programme offered by the Department of Veterinary Tropical Diseases in the Faculty of Veterinary Science in South Africa is an example of a programme that has been developed through regional and international collaboration and partnerships and that has been subject to international academic evaluation. The programme is structured in such a way that the learner can achieve a qualification in a specific field of study (career path) by selecting appropriate elective modules. This degree programme deals with all the high impact diseases listed by the OIE and other important infectious and parasitic diseases of livestock and wildlife of global importance. It is therefore of great value not only to learners from the region but also to those from the developed world. In the developed world, many of the high-impact diseases have been eradicated, often at great cost, but still pose a distinct threat because of increased international trade in animals and their products.

TABLE 1 Postgraduate programmes

Degree	Programmes	Duration (years)
BVSc (Hons)	Combination of 3–4 modules	2–3
MMedVet*	Anaesthesiology; Bovine Medicine; Cattle Herd Health; Clinical Laboratory Diagnostics; Diagnostic Imaging; Equine Medicine; Equine Surgery; Laboratory Animal Science; Ophthalmology; Pathology; Pharmacology; Pig Herd Health; Poultry Diseases; Small Animal Medicine; Small Animal Surgery; Small Stock Herd Health; Reproduction; Toxicology; Veterinary Ethology; Veterinary Public Health; Wildlife Diseases	4–6
Taught Masters**	Veterinary Industrial Pharmacology; Veterinary Tropical Diseases	1–2
Research Masters***	Anatomy and Physiology; Companion Animal Studies; Paraclinical Sciences; Production Animal Studies; Veterinary Tropical Diseases	1–2
PhD	Anatomy and Physiology; Companion Animal Studies; Paraclinical Sciences; Production Animal Studies; Veterinary Tropical Diseases	3–5

* Allows automatic registration as a specialist in South Africa

** Consists of coursework and a dissertation. The programme in Veterinary Tropical Diseases is primarily web-based and consists of a number of career paths (laboratory-orientated career path, veterinary field services and general practice)

*** Consists of a dissertation only

A masters and PhD degree programme in phyto-medicine offered by the Department of Paraclinical Science, Faculty of Veterinary Science in South Africa is a very extensive programme that also attracts large numbers of students from all over Africa. The programme deals with identifying, isolation, chemical elucidation, and clinical testing of extracts from plants used for ethnoveterinary medicine. It would be a very worthy regional programme.

One other postgraduate research programme that also warrants regional recognition is a NUFU-funded PhD programme on environmental toxicology and zoonotic diseases. It is a South-South-North collaborative programme between veterinary faculties in Mozambique, Tanzania, South Africa, Zambia and Zimbabwe, representing the South-South partners, the Norwegian School of Veterinary Science and the Norwegian Veterinary Institute in Oslo, Norway as the Northern partners. This programme was initiated in 2002 and has registered ten PhD students over this period with three of these successfully completing their studies. The NUFU funding for this programme runs out in 2009 after which it will have to become self-sustainable. Such programmes are urgently required and should be promoted within Africa. Those created should be retained as far as possible and not be allowed to disintegrate.

CONCLUSION

It is now a crucial time for the veterinary profession and for veterinary education. Failure to respond to a changing world and its needs will have dire consequences for the future of the profession and its position in, and acceptance by, society at large. Africa should and cannot isolate itself from international trends in veterinary education prompted by changing international expectations pertaining to the contribution made to society by the veterinary profession. There is a need for the development of a vision for future veterinary needs in Africa to guide veterinary training in sub-Saharan Africa (through a similar foresight study as was undertaken by AAVMC) (Willis *et al.* 2007). Collaboration in veterinary training within sub-Saharan Africa must be sought for both under- and postgraduate training programmes. It is imperative that the African faculties participate in global accreditation initiatives.

Developing a curriculum within the context of time and resource limitations, given the broad scope and complexity of veterinary activities, is going to be a major challenge and may be impossible within the context of the current constructs. This is an even

greater challenge given the general consensus that it is impossible to train veterinarians currently to address the complex needs of the various sectors of society that need veterinary inputs. Cognizance should be taken of the following:

- To remain relevant education must prepare veterinarians for future needs
- It is important that training must be relevant to societal and political needs
- There is a changing emphasis on global animal and public health issues. It is expected that firm recommendations in this regard will be forthcoming from the OIE Workshop of Deans scheduled for August 2009
- A firm decision to broaden the scope and context of veterinary science education is fundamental in preparing the profession to navigate the future transition and to enable it to strengthen its position in society

RECOMMENDATIONS

- Africa should not dissociate itself from global trends as they relate to veterinary services
- Veterinary training must be relevant to local societal needs, political expectation and environmental changes
- Adequate training in sub-Saharan Africa can only succeed if there are regional collaboration and partnerships
- Participation in global accreditation initiatives is imperative for the veterinary profession in Africa
- A foresight study to envision the future of veterinary education in Africa should be implemented as soon as it is possible
- We will have to demonstrate leadership beyond that which is usual and conventional to achieve this goal not just in South Africa but throughout Africa
- It is our responsibility to resurrect the 'Spirit of Onderstepoort' of Sir Arnold Theiler defined as: *"...that ideal of service, that conscientiousness of endeavour, that pride in a task, that confidence of success in the face of difficulties..."*

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