

Integrating global animal health, public health and tropical animal health issues into the veterinary curriculum: a South African/African perspective

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Summary

The globalisation of trade and food, the increased volume and speed of international travel, climate change, and the related escalation of emerging and re-emerging infectious diseases mean that countries are now more interconnected and interdependent than ever before. Africa is beleaguered by a range of endemic infectious and parasitic tropical diseases which, due to its diverse wildlife populations and indigenous livestock, can serve as a reservoir of high-impact or transboundary diseases and play a role in the emergence of disease, particularly at the wildlife, domestic animal and human interfaces. It is therefore essential to integrate animal and public health issues into the veterinary curriculum.

Veterinary training in most parts of sub-Saharan Africa has focused on producing veterinarians to serve the livestock sector although socio-economic changes and privatisation of Veterinary Services have caused curriculum adjustments, as have globalisation and the increased risk of the spread of transboundary diseases. In South Africa, undergraduate veterinary training is more clinically oriented than in other regions. Animal and public health issues are covered in the curriculum, although their global relevance is not emphasised.

The authors describe the undergraduate veterinary curriculum and summarise post-graduate programmes in South Africa. They also discuss a more comprehensive core-elective approach to the current curriculum and the need to adapt to new challenges facing the profession. Finally, they examine the potential use of innovative technology in undergraduate and post-graduate training and professional development, the importance of regional and international collaboration and the accreditation and recognition of veterinary training.

Keywords

Africa – Curriculum – Education – Emerging and re-emerging diseases – Global animal health – Global public health – One World, One Health – Public health – South Africa – Transboundary diseases.

Introduction

The need to incorporate global animal and public health issues into veterinary education was highlighted at the 27th World Veterinary Congress in Tunis, Tunisia, in 2002 and has been reported by many authors (2, 3, 7, 11, 15). Several international events, such as the terrorist

attack on the United States of America (USA) on 11 September 2001, and recent outbreaks of diseases such as avian influenza, bovine spongiform encephalopathy (BSE), foot and mouth disease and bluetongue, which have had a global impact, illustrate the interconnectivity and interdependence of countries. Collaboration in public health has been described as a new global imperative (8).

Protecting the health of animals and people throughout the world is essential in protecting the health of any one country, due to:

- the increasing volume and speed of international travel
- globalisation of the food supply
- increasing trade in animals and animal products
- the threat of bio- or agroterrorism on global security
- the escalation of emerging and re-emerging infectious diseases caused by global climate change
- the more intensive interface of wildlife, domestic animals and humans
- increasing urbanisation
- the increased access to and distribution of information.

Veterinarians contribute to global animal and public health in the areas of:

- food security and safety (including protecting against the development of antimicrobial resistance)
- prevention and control of emerging and transboundary diseases (including zoonoses)
- disease surveillance
- global health security
- environmental health
- basic and applied medical research (2, 11, 15).

There is unprecedented opportunity for veterinary engagement and leadership in the area of global health issues, as well as increasing responsibility, due to the current public awareness of and focus on food safety, the high visibility and memory of recent epidemics of high-impact diseases (e.g. avian influenza, bluetongue, foot and mouth disease and BSE), and concerns over the environment, biodiversity and biosecurity (11, 12). The essential criteria or characteristics of a global veterinarian have been described by Brown *et al.* (2) (Table I).

Global issues affecting animal and human health are as relevant in Africa as in any other developed and developing country, although the priorities may differ, not least among individual countries in Africa. Russell (14) reported that, based on presentations made at the 27th World Veterinary Congress in Tunis in 2002, a dichotomy exists between developing and developed countries. He concluded that developing countries remain focused on inadequate food supply, whereas developed countries are more concerned about newly emerging food-borne pathogens. The global spread of transboundary diseases and emerging pathogens not only represents a direct threat to human populations, in both developed and developing countries, but also to livestock sectors and therefore to food security. For the purposes of this article, references to transboundary, emerging, re-emerging, and high-impact diseases will

concentrate on veterinary educational perspectives on tropical animal health.

Table I

A list of the essential criteria and characteristics of a global veterinarian

Compiled by Brown *et al.* (2)

List of criteria and characteristics of a global veterinarian

Intercultural communication abilities
Knowledge of disease surveillance technologies, including diagnostic tests
Familiarity with transboundary diseases
Familiarity with infectious zoonotic diseases and bio-threat agents of concern
Knowledge of effective prevention and control strategies for animal and human health priority diseases
Understanding of world agricultural systems
Understanding of world trade and international health regulations
Educated perspectives on trade and policy
Awareness of international organisations
Comprehension of globalisation of the food supply
Ability to work effectively as part of a multidisciplinary team
Interpersonal skills and flexibility

General remarks on veterinary education in Africa

Veterinary education in Africa dates back to 1827, with the establishment of a school of veterinary medicine in the north-west of the Egyptian Delta (www.cu.edu.eg). There are presently 46 veterinary schools on the African continent, including 21 in sub-Saharan Africa. With the exception of the faculties in Cairo, Egypt (1827); Pretoria, South Africa (1920); and Khartoum, Sudan (1938), all African veterinary schools were established after 1960. The original veterinary faculties in Africa were established as a result of prevailing devastating livestock diseases such as rinderpest, East Coast fever and African horse sickness, and the urgent need for their control.

Veterinary education in Africa has been modelled after British, French, Portuguese, Belgian, North American and Italian systems (13). Training in most schools has concentrated on producing veterinarians to serve the livestock sector, with most veterinarians originally being employed by the state (9). The curricula were, and, in many cases, still are, primarily focused on training a veterinarian who is able to:

- recognise disease and initiate efficient animal disease control
- apply effective treatment to diseased animals
- enhance animal welfare
- safeguard human health.

Most veterinary curricula in east and southern Africa extend over five to six years; are primarily discipline-based, covering the basic traditional pre-clinical, para-clinical and clinical subjects, and produce a 'generalist veterinarian' (6).

Adjustments of curricula in veterinary faculties in sub-Saharan Africa have been made primarily because of socio-economic reasons and the increased privatisation of Veterinary Services (4). Veterinary curricula have also been amended to accommodate crucial developments in certain veterinary fields, such as:

- international animal health
- veterinary public health
- food safety
- the spread of high-impact and transboundary diseases.

In addition, changes have been made to provide for additional training in food quality control and wildlife production and management. However, continuing curricular review and structural reforms are constrained by political inaptitude, the current low level of funding and inadequate investment in most sub-Saharan faculties.

The capacity for post-graduate training in most African schools is also limited, due to the lack of available financial resources and facilities, and the difficulty in recruiting and retaining academic staff. A regional Master of Science (MSc) programme that had been planned between veterinary faculties in countries in the South African Development Community (SADC) (Mozambique, South Africa, Tanzania, Zambia and Zimbabwe) (4) was, finally, not implemented, due mainly to a lack of sustainable financial commitments from these universities.

Veterinary training in South Africa

Veterinary training in South Africa was established in 1920, at what is today known as the Onderstepoort Veterinary Institute (OVI), and remained under the management of the OVI until 1973, when it was fully incorporated into the University of Pretoria. This faculty was 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). In 1999, the MEDUNSA veterinary faculty was amalgamated with the original faculty at the University of Pretoria to form the current faculty.

The amalgamated faculty continues to use the facilities at the Onderstepoort campus of the University of Pretoria. It is a medium-sized faculty, consisting of:

- five academic departments
- a modern veterinary academic hospital
- a teaching animal unit
- two research centres
- well-developed support systems
- student accommodation
- a total of 113 academic and 241 support staff.

In addition to undergraduate veterinary training, the faculty offers a two-year veterinary nursing diploma and a wide range of post-graduate programmes (Table II), as well as continuing development opportunities. The faculty presently trains 530 veterinary students, 78 veterinary

Table II
Post-graduate programmes in the Faculty of Veterinary Science of the University of Pretoria, South Africa

Degree	Programmes	Duration
BVSc (Hons)	Combination of 3-4 modules	2-3 years
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 years
Taught Master's**	Veterinary industrial pharmacology; Veterinary tropical diseases	1-2 years
Research Master's***	Anatomy and physiology; Companion-animal studies; Para-clinical sciences; Production-animal studies; Veterinary tropical diseases	1-2 years
PhD	Anatomy and physiology; Companion-animal studies; Para-clinical sciences; Production-animal studies; Veterinary tropical diseases	3-5 years

* Allows automatic registration as a specialist in South Africa
 ** Consists of course work and a dissertation. The programme in veterinary tropical diseases is primarily web-based and consists of a number of career paths (laboratory-oriented career path, veterinary field services and general practice)
 *** Consists of a dissertation only
 BVSc: Bachelor of Veterinary Science
 MMedVet: Master's in Veterinary Medicine
 PhD: Doctor of Philosophy

nurses, 23 veterinary Honours students, 166 MSc students and 55 Doctor of Philosophy (PhD) students, and admits 135 veterinary students and 45 veterinary nursing students to its undergraduate programmes each year.

The format of undergraduate veterinary training in South Africa has always comprised a general first year in basic sciences, followed by a number of years of specific veterinary training, aimed at producing a generalist or omni-competent veterinarian. The programme changed in duration over time from five to five-and-a-half years (in 1976) to six years (from 1996 to 1997). During the latter change, a matrix of discipline and species approaches was also introduced.

A major structural change was implemented in 2003, with the introduction of a pre-requisite three-year Bachelor of Science (BSc) degree in veterinary biology, followed by a four-year Bachelor of Veterinary Science (BVSc) degree. In this system, the majority of the animal science components, veterinary physiology and some veterinary anatomy, together with farm-animal behaviour and animal handling and welfare, are dealt with in the pre-requisite programme. The four years of veterinary training are essentially the same as the last four years of the six-year programme. Experiential training covering a full year has been a hallmark of the training programme since 1976. A restructuring of the curriculum to provide for a shortened, single degree structure, with a core-elective emphasis, is currently under way.

At the inception of veterinary training in South Africa, the undergraduate veterinary curriculum focused primarily on producing veterinarians for state Veterinary Services and research. It was only in the mid-1950s that training was redirected towards private veterinary practice, where it has remained until today. All aspects of animal health in companion and production animals and, to a lesser extent, in wildlife, are covered through the curriculum, which deals with:

- the aetiology and life cycle of parasites
- the epidemiology, pathogenesis, clinical signs, pathology, diagnosis and differentiated diagnosis, treatment, control and prevention of (in the main) locally important parasitic, infectious and nutritional diseases
- toxicoses
- animal welfare
- animal production.

Diseases of wildlife and aspects of management of wildlife and exotic species are predominantly dealt with as elective modules. Students are exposed to experiential training in laboratory, clinical, field and population health work. Veterinary drug control and the prudent use of antimicrobial drugs is part of their pharmacology training.

Public health, including zoonoses, food safety, quality assurance, epidemiology, laboratory animal practice, animal welfare and veterinary extension, is mostly taught in the penultimate year of study. The final-year curriculum is still primarily based on the traditional training in meat inspection and milk safety, sample collection and analysis, and the relevant legal requirements. This involves a total of three weeks of clinical rotations at abattoirs, dairy farms, milk-processing plants and the veterinary public health laboratory at the faculty. The learning outcomes are focused on the concept of the Hazard Analysis and Critical Control Point (HACCP) system and a 'stable-to-table' food safety approach. The final year also includes elements of food processing, international criteria for chemical and drug residues and environmental safety.

Community engagement has become a core academic output of the University of Pretoria since 2007. In this regard, the Faculty of Veterinary Science 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 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 year of compulsory veterinary community service after graduation. Involvement in the community allows opportunities for applied research projects at post-graduate level and the testing of new information communication technologies, such as mobile devices, with the aim of uplifting the community and assisting in providing veterinary support.

Perspectives on global health

The delivery of Veterinary Services is increasingly being accepted as a global public good, mainly through the initiatives of the World Organisation for Animal Health (OIE).

This not only places the veterinary profession under public scrutiny for its role in promoting animal health and safeguarding human health, but also requires it to recognise, since this is a world of shared risks and common opportunities, the realities of mutual dependence and growing interconnectivity. Although veterinary training in most faculties in Africa, including South Africa, has been adapted to deal with some aspects of globalisation, global health education *per se* does not formally form part of the curriculum.

Veterinary education of the highest quality provides training that meets the needs of a particular society and remains relevant to changing national, regional and

international expectations. The recommendations of the Millennium Development Goals (MDG) in Africa Steering Group 2008 (10), as well as the Comprehensive Africa Agricultural Development Programme, as developed by the New Partnership for Africa's Development and the African Union, provide a framework for the needs of veterinary training in Africa for the immediate future and beyond. The principal millennium goals applicable to veterinary education are:

- the eradication of extreme poverty and hunger (MDG1)
- combating human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS), malaria and other diseases (MDG6)
- ensuring environmental sustainability (MDG7)
- developing a global partnership for development (MDG8).

Agriculture has been identified as central to reducing poverty and hunger and to accelerating growth in Africa.

Educational perspectives that encompass the millennium goals and deal with global health issues are considered below. The authors propose that general global health issues should be included as part of the core programme of veterinary training. In addition, it is believed that more advanced and specialised training should become part of the elective undergraduate programme while being dealt with in greater detail in post-graduate training and research. Although it may appear that world health issues are not relevant to companion animal practice, several examples have been reported in which small-animal veterinary practices, including exotic animal practices, have been instrumental in identifying the introduction of a foreign disease into a country (15).

Transboundary, emerging and re-emerging diseases

Wildlife serves as a reservoir of infectious and parasitic diseases for both livestock and humans, due to the geographical overlapping of animals, people and vectors and the trade in meat and exotic animals for food and as companion animals (1, 11). Most emerging human diseases have originated from animal reservoirs. The global spread of these emerging pathogens, including throughout Africa, is facilitated by:

- climate change
- population growth
- expanding urbanisation and crowding
- increased movement of both people and animals, due to international travel and trade, civil war, famines and other human-made or natural disasters.

Diseases are re-emerging for similar reasons, but also as the result of antimicrobial resistance.

Disease outbreaks can spread rapidly, causing enormous losses to human health and livelihoods. Parasitic and infectious diseases (including viral, bacterial and fungal) account for more than 20% of human deaths and 25% of morbidity, disproportionately affecting the poor and reducing life expectancy in some sub-Saharan African countries (1). In sub-Saharan Africa, livestock farming contributes up to 25% of the gross national product across the region, with 12 of the 15 major epidemic animal diseases in the world being prevalent in Africa. Consequently, animal diseases can cause substantial socio-economic losses and constraints in Africa. These diseases also represent important transboundary animal disease threats, particularly with the creation of transfrontier wildlife conservation areas in various parts of Africa (Fig. 1).

Bio- and agroterrorism are aimed at provoking economic, social and political destabilisation and chaos and, ultimately, at undermining confidence in legitimate governments (15). The endemic infectious diseases of Africa are a potential source of most of the major zoonotic bio-terror agents. Although many of the important endemic, emerging and re-emerging diseases are dealt with in the current undergraduate veterinary curricula of sub-Saharan Africa, their importance in the context of global animal and human health is not generally emphasised.

Global health issues are more successfully integrated into post-graduate programmes. A primarily web-based MSc degree programme in veterinary tropical diseases is offered by the Department of Veterinary Tropical Diseases in the Faculty of Veterinary Science in South Africa. The



Fig. 1
Existing and planned transfrontier conservation areas in sub-Saharan Africa

programme is structured so that the student can achieve a qualification in a specific field of study (a career path) by selecting appropriate elective modules. The following career paths are catered for (see Table II):

- a) laboratory-oriented careers in microbiology or parasitology
- b) veterinary field services
- c) general practice in:
 - wildlife
 - mixed cattle and wildlife
 - mixed companion animals and equids
 - mixed production animals.

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 that are of global importance. It is therefore of great value, not only to learners from developing countries, where these diseases often form the greatest barrier to socio-economic development, 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 nevertheless still pose a distinct threat, because of the increased international trade in animals and their products.

Public health

Food security and safety, together with the control of zoonotic diseases, traditionally form the main pillars of veterinary involvement and veterinary education in public health in South Africa, as stated above. This includes the HACCP system, a systematic scientific approach to the identification, evaluation and control of the various steps in food production and processing, used to prevent food-borne illnesses and ensure food safety. The spread of food-borne disease has been made worse by the globalisation of the food supply and intensified food production industries in developing countries. It is envisaged that these subjects will remain part of the core curriculum in the new veterinary undergraduate programme in South Africa.

The need for an international veterinary public health strategy, involving appropriate veterinary education, has been greatly strengthened by the following developments:

- the globalisation of trade and food
- the increase in the volume of international travel and value of tourism
- environmental degradation and loss of biodiversity
- the need to contain the development of antimicrobial resistance

- pandemics arising from animal reservoirs
- the potential for the use of zoonotic agents by bioterrorists.

Veterinary training in global public health issues is currently only offered as part of a specialist Master's programme, i.e. the MMedVet (Veterinary Public Health) in South Africa. This course includes:

- basic comprehension of the globalisation of the food supply
- an understanding of world agricultural systems
- an understanding of world trade and international health regulations
- awareness of the international agencies involved in food safety
- awareness of the use of risk analysis procedures
- competency in disaster and emergency management procedures, such as the Food and Agriculture Organization of the United Nations (FAO) tactical management of transboundary diseases.

It is proposed that an elective in veterinary public health be developed as part of the new undergraduate curriculum in South Africa, which would include some of these global features. A web-based programme in veterinary public health, using appropriate distance-learning technology, is needed to provide training opportunities and continuing education to veterinarians and para-veterinary professionals involved in the public health field, both regionally and nationally.

Convergence of animal, human and environmental health

Much overlap exists in the pre-clinical training of health care professionals, with similar standards in public health services for humans and animals. Recurring threats of zoonotic disease have created the need for a convergence of animal and human health training and provision. Veterinary education in Africa should promote the collaboration of animal and human health professionals, to more effectively address the public health needs caused by disease, particularly the emerging and re-emerging zoonotic diseases and those that occur at the human–animal interface. There is also a growing recognition by the public and the public health community at large that human and animal disease surveillance systems should be integrated as much as possible, to provide more effective disease prevention and control (11). This is the primary objective of a current initiative by a

consortium of research and academic institutions in the SADC to develop a Southern African Centre for Infectious Diseases Surveillance. Its goals are:

- to improve regional capacity to detect, identify and monitor infectious diseases of humans, animals and plants, and their interactions
- to support the ‘One World, One Health’ approach
- to promote intersectional collaboration
- to strengthen the research capacity of institutions.

Perspectives on leadership, interpersonal and teaching skills

Veterinary education in global matters involves preparing students to interact successfully with people from different cultures and backgrounds, work as part of a multidisciplinary team, and acquire the required leadership and interpersonal skills (7). This is best achieved through opportunities to work with and lead people at a national, regional and international level. Regional and international experience can be provided through staff and student exchange programmes. Memoranda of understanding with leading regional and international veterinary training institutions could form the basis of such exchange programmes. The University of Pretoria, and its veterinary faculty in South Africa, currently has a number of such agreements with a range of universities, both regionally and internationally, allowing ample opportunity for South-South-North and South-North collaboration. Such memoranda need to be actively managed and monitored to achieve the desired bilateral objectives in veterinary education and research.

In South Africa, the existing undergraduate veterinary programme, which prohibits formal student exchanges, due to logistical constraints, is currently under review. One of the objectives of the new programme is to provide the opportunity for students to acquire global exposure through exchange programmes.

At the post-graduate level, it is imperative to develop a training strategy to support capacity building for scientists, so that they can initiate, contribute to and address the health research agendas of their own communities, as well as those at regional and international levels. This training should not only focus on technical, interpersonal and leadership skills but also on the other ‘softer academic skills’, such as project and financial management, grantmanship, managing change and the institutional management of partnerships and collaboration networks.

Information communication technology (ICT) creates new opportunities for information to be more freely shared throughout the world and for educational information to be presented in a modern teaching format. These new technologies, when applied in a blended teaching mode, also enhance the learning environment and experiences of both undergraduate and post-graduate students, as well as of those who enrol for continuing professional development. It is essential that academic staff and students be trained to use ICT that can be applied to e-learning.

Accreditation and recognition of veterinary training

According to Edwards (5), society expects all veterinary qualifications to be of an equivalent standard and that all graduates will achieve similar basic competencies. However, in reality, there seem to be significant disparities in the levels of veterinary training received in different regions. These disparities are particularly evident between developed and developing countries, with higher standards being employed by the major accrediting bodies. The challenge will be 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 is not recognised internationally and which, as a result, cannot meet the criteria of the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures (the SPS Agreement) (16), may face potential trade barriers.

Some regional blocks of accreditation currently operate around the world, encompassing the major accrediting bodies based in the USA, Europe, the United Kingdom (UK) and Australasia. In 2002, representatives from those bodies met to examine the possibility of a system of global accreditation. This was followed by further global veterinary accreditation meetings in 2004 in the UK (London) and, in 2007, in Australia (Melbourne). The South African Veterinary Council (SAVC), which is responsible for registering veterinarians and para-veterinarians and setting the minimum requirements for veterinary training in South Africa, was invited to send representatives to participate in the meeting in Melbourne. An International Accreditors’ Working Group, made up of representatives of all major accrediting bodies, including the SAVC, met in Chicago in October 2007 to develop recommendations for a proposed joint site visit to Murdoch University, the Division of Veterinary and Biomedical Sciences (Perth, Australia), in 2009.

A successful review of veterinary training at the Faculty of Veterinary Science, University of Pretoria, was conducted

on the basis of a self-evaluation report, prepared by the faculty, and a visit from a team appointed by the SAVC in May 2006. The self-evaluation was similar in design to that used by the European Association of Establishments for Veterinary Education, while the visiting team included external representatives from Africa, the Royal College of Veterinary Surgeons and the Australasian Veterinary Boards Council. The quality of veterinary training in South Africa is further monitored on an annual basis by the SAVC through the appointment of subject monitors, who scrutinise the content of and examinations in subjects selected by the SAVC. External examiners are also appointed by the University of Pretoria to oversee the quality of all examinations. To the knowledge of the authors, external examination is the only form of external review used by most other veterinary schools in sub-Saharan Africa.

The experience of the SAVC in licensing veterinarians and para-veterinarians, setting minimum standards for undergraduate and post-graduate veterinary specialist training, and accrediting and monitoring the quality of veterinary training in South Africa should be recognised and seized upon as an opportunity by other veterinary faculties in the SADC region (possibly throughout sub-Saharan Africa). Sharing this experience can serve as an interim arrangement while interested bodies collaborate on the establishment of a regional accreditation body, e.g. for southern and eastern Africa, within the next five years. This accreditation body would then take up the responsibilities of setting minimum standards of veterinary training and accrediting veterinary faculties in the region. The licensure of veterinarians and continued monitoring of the quality of education would remain the responsibility of the local regulatory council or authority, such as the SAVC.

It is undeniable that there are issues with veterinary training in Africa, principally the apparent disparities in the levels of undergraduate training received in various veterinary programmes within Africa, as well as in comparison with the training gained in developed countries, set against the expectation of society that all veterinary qualifications should be of equivalent value and ensure the same basic competencies. These issues will place the continent in a precarious position if a lower level of veterinary training is used as a potential trade barrier in future. It is unrealistic for the international community to expect that all faculties in Africa will be able to meet the full scope of envisaged global accreditation requirements, mainly as a result of socio-economic constraints and political priorities. This also applies to the Inter-state School for Veterinary Science and Medicine in Dakar. Moreover, the high level of veterinary clinical training in companion-animal medicine, which is common in the developed world, is not required in most parts of Africa. For these reasons, there is an urgent need to recognise and

develop regional centres of competence in veterinary fields that are not adequately covered or required in the veterinary curricula of most African countries. This will provide an opportunity for African veterinary students to acquire the broader training required at an international level. The excellent clinical facilities in South Africa, along with the veterinary academic hospital, which is of an international standard, could, for example, be recognised as a regional centre for clinical training, particularly in companion-animal treatment.

Meeting the needs of the full spectrum of undergraduate veterinary training becomes more difficult when there is only one veterinary faculty, which is responsible for all the veterinary training requirements of that country. It hampers the ability of that faculty to focus its training on particular specialised areas, in an attempt to use its capital and human resources more prudently. Ethiopia, Nigeria and Sudan are the only countries in sub-Saharan Africa with more than one faculty. In future, therefore, more attention needs to be given to developing new or existing veterinary facilities as regional centres of competence in specialised fields, such as:

- wildlife
- exotic species
- poultry health and production
- pig health and production
- aquaculture and fisheries.

While these fields are very important to most countries, they do not require large numbers of veterinarians to be trained each year. This system could also include centres of competence in specialised areas of public health and transboundary diseases that are unique to a particular country. Students in the region who select 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 system would give faculties in the region an opportunity to specialise and be recognised by international bodies, such as the OIE and FAO. Regional centres of veterinary training within sub-Saharan Africa should also be developed to promote collaboration and interdependence, particularly in respect of global issues.

Regional centres of competence in post-graduate training can similarly be developed and recognised. However, it is envisaged that post-graduate programmes or modules will primarily be developed through international collaboration and partnerships. In such cases, it is imperative that these programmes be evaluated for their quality and that quality is assured at an international standard.

Conclusion

The acceptance of Veterinary Services as a global public good places the whole veterinary profession under public scrutiny for its role in promoting animal health and its responsibility to safeguard human health. Since the profession operates in a world of shared risks and common opportunities, the realities of mutual dependence and growing interconnectivity must be recognised. General, advanced and specialised training of veterinarians in global animal and public health issues in Africa is therefore essential. Training veterinarians to practise in a global environment requires a wide range of specialised knowledge, technical proficiency, intercultural

communication abilities and interpersonal and leadership skills. To achieve these objectives, the authors propose:

- the use of innovative educational technology and teaching approaches
- the investigation of remote veterinary service systems, such as telemedicine
- the creation of opportunities for continuing education
- recognition of regional training centres
- increasing regional and global co-operation and partnerships in veterinary undergraduate and post-graduate training.



L'intégration de la santé animale mondiale, de la santé publique et de la santé animale tropicale dans les programmes d'enseignement vétérinaire : la situation en Afrique et en Afrique du Sud

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Résumé

La mondialisation des échanges et de la production alimentaire, l'augmentation et l'accélération des déplacements internationaux, le changement climatique et la multiplication concomitante des maladies infectieuses émergentes et ré-émergentes font que les pays sont aujourd'hui bien plus liés les uns aux autres et interdépendants que par le passé. L'Afrique est frappée par un large éventail de maladies tropicales endémiques, infectieuses et parasitaires ; en raison de la diversité de ses populations d'animaux sauvages et des espèces autochtones d'animaux domestiques, ces maladies peuvent constituer une source importante de maladies transfrontalières aux conséquences extrêmement graves et jouer un rôle dans l'émergence de maladies nouvelles, particulièrement à l'interface entre la faune sauvage, les animaux domestiques et l'homme. C'est la raison pour laquelle il est devenu impératif d'intégrer la santé animale mondiale et la santé publique dans les programmes d'enseignement vétérinaire.

Dans la plupart des pays d'Afrique sub-saharienne, l'enseignement vétérinaire s'est longtemps limité à qualifier des vétérinaires destinés à exercer leurs compétences dans le secteur de l'élevage ; plus récemment, les évolutions socio-économiques et la privatisation des Services vétérinaires, ainsi que la mondialisation et le risque accru de propagation de maladies transfrontalières ont conduit à réajuster les programmes d'enseignement. En Afrique du Sud, la formation initiale en médecine vétérinaire est davantage axée sur la clinique que dans d'autres régions du continent. Le programme d'enseignement aborde les principales questions de santé animale et de santé publique, sans s'attarder néanmoins sur leur importance à l'échelle mondiale.

Les auteurs décrivent le programme d'enseignement initial en médecine vétérinaire ainsi que les formations de post-doctorat en Afrique du Sud. Ils évoquent également la possibilité de donner plus de place aux filières optionnelles dans le programme actuel, la nécessité de procéder à des adaptations afin de relever les nouveaux défis qui se posent à la profession ainsi que la question de l'agrément et de la reconnaissance des formations vétérinaires. Enfin, ils examinent les nouvelles perspectives que les innovations technologiques peuvent apporter à l'enseignement initial et postdoctoral et à la formation continue, et soulignent l'importance de la collaboration régionale et internationale.

Mots-clés

Afrique – Afrique du Sud – Enseignement – Maladie transfrontalière – Maladies émergentes et ré-émergentes – Programme d'enseignement – Santé animale mondiale – Santé publique – Santé publique mondiale – Un monde, une seule santé.



Integración en el plan de estudios veterinarios de temas de dimensión mundial relativos a la sanidad animal, la salud pública y la salud de los animales tropicales. El punto de vista de Sudáfrica/África

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Resumen

La mundialización del comercio y la alimentación, la intensificación y aceleración de los viajes internacionales, el cambio climático y la consiguiente escalada de enfermedades infecciosas emergentes y reemergentes son otros tantos factores que hacen que los países estén hoy en día más interconectados que nunca. África se ve asolada por una serie de enfermedades infecciosas y parasitarias tropicales endémicas que, dadas las diversas poblaciones de fauna salvaje y ganado autóctono que alberga, son susceptibles de actuar como reservorio de patologías transfronterizas o muy dañinas y de influir en la aparición de enfermedades, especialmente en las interfaces entre fauna salvaje, animales domésticos y seres humanos. Por ello es fundamental integrar las cuestiones de salud pública y animal en los planes de estudios veterinarios.

En buena parte del África subsahariana, la enseñanza de la veterinaria se ha venido centrando en la formación de profesionales destinados a trabajar en el sector pecuario, aunque los cambios socioeconómicos y la privatización de los servicios veterinarios, así como la mundialización y el aumento del riesgo de propagación de enfermedades transfronterizas, han provocado ajustes en los planes de estudios. En Sudáfrica, la formación de los estudiantes está más orientada que en otras regiones al ejercicio de la veterinaria clínica. En los planes de estudios se tratan temas de salud pública y sanidad animal, pero sin hacer hincapié en la importancia que revisten a escala mundial.

Los autores describen el plan de estudios de la licenciatura de veterinaria y resumen los programas de estudios de tercer ciclo existentes en Sudáfrica. Se refieren asimismo a una concepción del actual plan de estudios más orientada a la elección de materias centrales, a la necesidad de adaptarse a los nuevos problemas que afronta la profesión y a la convalidación y homologación de los estudios veterinarios. Por último, examinan las posibilidades de utilización de tecnología innovadora en los estudios de licenciatura y de tercer ciclo y en programas de perfeccionamiento profesional, así como la importancia de la colaboración a escala regional e internacional.

Palabras clave

África – Educación – Enfermedades emergentes y reemergentes – Enfermedades transfronterizas – Plan de estudios – Salud pública – Salud pública mundial – Sanidad animal mundial – Sudáfrica – Un solo mundo, una sola salud.



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