

Current status and challenges for globalisation of veterinary medical education for the 'One Health' programme

M. Abdus Samad

Department of Medicine, Faculty of Veterinary Sciences, Bangladesh Agricultural University,
Mymensingh-2202, Bangladesh
E-mail: vetmedbd@yahoo.com

Summary

A global review of veterinary medical education (VME) programmes shows that, of 194 countries, 111 (57%) have 597 veterinary medical academic institutions (VMAs) with 15 different names, which offer veterinary degrees with 54 different titles. The highest number of universities ($n = 148$; 25%), in 27 (14%) countries, award a veterinary medical degree (Doctor of Veterinary Medicine [DVM]), followed by the science degree (Bachelor of Veterinary Science [BVSc]) awarded by 28 (5%) universities in 9 (5%) countries. In addition to three original Universities of Veterinary Medicine, 23 veterinary-related universities have been established with titles such as 'Veterinary, Animal and Fishery Sciences', which do not reflect the VME programmes. The award of Bachelor of Science (BSc) degrees in Animal Husbandry (AH), Poultry Science and Dairy Technology created confusion and increased competition with veterinary graduates for positions in the dairy and poultry industries. Some countries, including Japan and Australia, have changed from the British single degree system to the American dual degree system.

The American Veterinary Medical Association Council on Education has classified the 597 VMAs into 'accredited' ($n = 49$; 8.2%), 'listed' ($n = 468$; 78.4%) and 'unlisted' ($n = 80$; 13.4%) categories. The diversity of nomenclature of VMAs, degrees, curricula and training status of veterinary graduates may affect the globalisation of VME according to the 'One Health' concept. Veterinary medical professionals and international organisations must think creatively about the future of global VME, especially with regard to the standardisation of the nomenclature of institutions, degrees, professional associations and core curricula, to contribute effectively to biomedical sciences and One Health at the national and global levels.

Keywords

Biomedical science – Dual degree – Medical degree – Nomenclature of institutions and degrees – One Health – Science degree – University ranking – Veterinary education.

Introduction

The world's first veterinary school was founded in Lyon, France, in 1761 and, accordingly, 2011 marked the 250th anniversary of veterinary medical education (VME) and the veterinary profession. The rapidly changing international environment leading to the globalisation of VME and worldwide intense competition for veterinary graduates, academics and resources has made it necessary to equip veterinary medical academic institutions (VMAs) to produce more skilled and competitive veterinary graduates. However, VME, including the nomenclature of the academic institutions and the degrees awarded, with the

curriculum, duration and training facilities, varies greatly among countries. It appears that some VMAs offer a degree that enables the recipient to practise veterinary medicine only in their home country but does not permit the graduate to even sit for a licensure examination in another nation. Moreover, the 'One Health' concept requires collaborative efforts among multiple disciplines working locally, nationally and globally to attain optimal health for humans, animals and the environment. The history of the earliest recognition, decline and renaissance of veterinary medicine, with a brief history pertaining to the Indian sub-continent, has been described (1, 2, 3, 4) but published reports on the global status of VME and VMAs are very limited. The World Organisation for Animal Health (OIE)

has stated that there is an urgent need, particularly in the developing world, to strengthen Veterinary Services with competent veterinary medical graduates, in line with international standards (5, 6, 7). However, in the last two decades, there has been a rapid increase in the number of VMAs, but not necessarily in the quality of the curricula used, in the developing world. Considering these facts, an attempt has been made in this paper to review and assess the nomenclature of the veterinary institutions and their degrees worldwide, with their national and world-ranking status, to resolve the confusion regarding the appropriate titles. A report comparing the VME programmes of South Asian Association for Regional Cooperation (SAARC) countries and the United States of America (USA) has recently been published (8). This paper describes a global assessment of the nomenclature of the VMAs, the degrees awarded, and their associations with biomedical science (BMS) and the One Health concept.

Materials and methods

To assess the current status of VME and the veterinary profession globally, a review was made of the nomenclature used by VMAs, the degrees awarded and their accreditation status, with regard to the application of BMS and One Health perspectives. Accordingly, all relevant literature and the websites of the relevant universities, international organisations (e.g. the World Veterinary Association [WVA] and the OIE); Veterinary Medical Associations (e.g. the Japan Veterinary Medical Association [JVMA] and the American Veterinary Medical Association [AVMA]); veterinary councils (e.g. the AVMA Council on Education [AVMA COE] and the Veterinary Council of India [VCI]); Wikipedia; and the ranking web of universities were reviewed (3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18). In addition, reports and information were collected via e-mail from Bangladeshi students studying for a Doctor of Philosophy (PhD) in different foreign universities. The results were analysed to investigate the possible association of the nomenclature used by the VMAs and their degrees with their developmental status and accreditation.

Results

This review recorded a total of 597 VMAs globally, with 15 different nomenclatures (Table I). The VMAs (schools, colleges, faculties or universities) are considered tertiary educational institutions, or are part of such institutions, which are involved in the education of veterinary students. The VMAs should not be confused with the Departments or Institutes of Animal Sciences, which usually offer a pre-veterinary curriculum for a Bachelor of Science (BSc, BS) degree and provide graduates who move on to veterinary

medical education. The VMAI and degree terminology can be confusing, because many veterinary institutions have used the 'Veterinary Science' title with School ($n = 10$), Faculty ($n = 69$), College ($n = 12$) or Department ($n = 4$), rather than 'College' or 'Faculty' of 'Veterinary Medicine', and some veterinary institutions, particularly those in China, Japan, Bangladesh and the USA, use the term 'Department' in addition to School, College or Faculty (Table I).

There are approximately 54 different types of nomenclature used for the veterinary medical degrees awarded by the 597 academic institutions (Tables I and II). It appears from Table II that the veterinary academic institutions (VAIs) of 39 (72%) countries offer different names for a single veterinary degree, in accordance with their local language and national law, whereas VAIs of other countries offer veterinary degrees with nomenclature from countries such as the United Kingdom (UK) and Australia. However, the highest number of VAIs ($n = 148$), in 27 countries, offer a veterinary medical degree (Doctor of Veterinary Medicine [DVM]), followed by the science degree (Bachelor of Veterinary Science [BVSc]) awarded by 28 VAIs in 9 countries (Tables I, II, III and IV). There is also a difference in whether VMAs award a single (BVSc/DVM) or a dual degree (BSc/BS + DVM) and in the duration of veterinary education, which varies from five to eight years.

Veterinary-related universities

Approximately 26 veterinary-related universities have been established in ten countries throughout the world (Table V). The first university with a full veterinary title was established in Austria (University of Veterinary Medicine, Vienna) in 1765, the second in Germany in 1778 (University of Veterinary Medicine, Hanover), the third in the Slovak Republic in 1992 (University of Veterinary Medicine, Kosice), and this was followed by the University of Veterinary Sciences, Yezin, Myanmar, in 1999. Most of the recently founded veterinary universities in the Indian sub-continent have mixed titles, for example: 'Veterinary and Animal Sciences University', in Bangladesh, India and Pakistan; 'Animal and Fishery Sciences University', in India; and 'Veterinary, Animal and Fishery Sciences University', in India (Table V). It appears that the nomenclature of these universities, in using terms such as 'animals', 'veterinary', 'veterinary science' and 'veterinary medicine', involves repetition, and the degree titles offered are not commensurate with the nomenclature of the academic institution.

Pre-veterinary medicine Bachelor's degree programmes

Most Bachelor's degree programmes in animal science/animal husbandry provide students with a basic understanding of agribusiness, livestock culture and the

Table I**Country-wise nomenclature of veterinary medical academic institutions with the veterinary degrees awarded**

Degree abbreviations are explained in Table II

Source: References 3, 8, 9, 10, 11, 14, 15 and relevant institutional websites

SN	Country/region	VCF	FVS	FVM	CVS	CVM	SVS	SVM	DVS	DVM	VA/I	UV	C	Total	Degree
1	Afghanistan	-/-	4	-	-	-	-	-	-	-	-	-	-	4	BS
2	Albania	-/-	-	1	-	-	-	-	-	-	-	-	-	1	MV
3	Algeria	-/-	-	-	-	-	1	-	1	-	0/3	-	-	5	DV
4	Angola	-/-	-	1	-	-	-	-	-	-	-	-	-	1	LMV
5	Argentina	-/-	9	-	-	-	-	-	-	-	-	-	2	11	MV, DCV
6	Armenia	-/-	-	-	-	-	-	-	-	-	-	-	2	2	-
7	Australia	-/-	1	-	-	-	1	-	-	-	-	-	5	7	Tables III, IV & VI
8	Austria	-/-	-	-	-	-	-	-	-	-	-	1	-	1	T
9	Azerbaijan	-/-	1	-	-	-	-	-	-	-	1/0	-	-	2	-
10	Bangladesh	-/-	1	1	-	-	-	-	-	-	-	-	7	9	DVM, BSc VS & AH
11	Belarus	-/-	-	1	-	-	-	-	-	-	1/0	-	-	2	-
12	Belgium	-/-	2	1	-	-	-	-	-	-	1/0	-	-	4	DMV, DVM
13	Bolivia	-/-	2	-	-	-	-	-	-	-	-	-	1	3	MV
14	Bosnia and Herzegovina	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
15	Brazil	-/5	2	7	-	1	-	5	-	3	0/3	-	5	31/200	MV
16	Bulgaria	-/-	-	2	-	-	-	-	-	-	-	-	-	2	VL
17	Canada	2/-	-	2	-	1	-	-	-	-	-	-	-	5	DVM, DMV
18	Cayman Islands	-/-	-	-	-	-	-	1	-	-	-	-	-	1	DVM
19	Chile	-/-	1	3	-	-	-	1	-	-	-	-	2	7	MV
20	China	-/-	-	-	-	9	-	-	-	1	-	-	7	17/50	BVSc, BVM
21	Cambodia	-/-	-	-	-	-	-	-	-	-	-	-	1	1	IASV
22	Colombia	-/-	-	2	3	1	-	-	-	-	-	-	9	15	MVZ
23	Costa Rica	-/-	-	-	-	-	-	2	-	-	-	-	-	2	DVM
24	Croatia	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
25	Czech Republic	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
26	Cuba	-/-	-	2	-	-	-	1	-	-	-	-	-	3	DMV, DVM
27	Denmark	-/-	-	1	-	-	-	-	-	-	-	-	-	1	V, BSc
28	Dominican Republic	-/-	1	-	-	-	-	1	-	-	-	-	-	2	DMV, MVD
29	Ecuador	-/-	2	2	-	-	-	-	-	-	-	-	6	10	DMV
30	Egypt	-/-	-	14	-	-	-	-	-	-	-	-	-	14	BVSc
31	Estonia	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
32	Ethiopia	-/-	-	1	-	1	-	-	-	-	-	-	-	2	DVM
33	Finland	-/-	-	1	-	-	-	-	-	-	-	-	-	1	LVM
34	France	-/-	-	-	-	-	-	4	-	-	-	-	-	4	DEDV, DMV
35	Germany	-/-	-	4	-	-	-	-	-	-	-	1	-	5	T, DVM
36	Ghana	-/-	-	-	-	-	-	1	-	-	-	-	-	1	Vet. Med.
37	Greece	-/-	-	2	-	-	-	-	-	-	-	-	-	2	DK, DVM
38	Grenada	-/-	-	-	-	-	-	1	-	-	-	-	-	1	DVM

Table I (cont.)

SN	Country/region	VCF	FVS	FVM	CVS	CVM	SVS	SVM	DVS	DVM	VA/I	UV	C	Total	Degree
83	Slovakia	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
84	Slovenia	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVM
85	Somalia	-/-	-	-	-	-	1	-	-	-	-	-	1	2	-
86	South Africa	-/-	2	-	-	-	-	-	-	-	-	-	-	2	BVSc
87	Republic of Korea	-/-	-	-	-	10	-	-	-	-	-	-	-	10	DVM
88	Spain	-/-	11	-	-	-	-	-	-	-	-	-	-	11	DMV, DVM
89	Sri Lanka	-/-	-	-	-	-	-	-	-	-	-	-	1	1	BVSc
90	Sudan	-/-	-	6	-	1	-	-	-	-	-	-	-	7	BVSc
91	Sweden	-/-	-	1	-	-	-	-	-	-	-	-	-	1	LV
92	Switzerland	-/-	-	2	-	-	-	-	-	-	-	-	-	2	DMV, DVM
93	Syria	-/-	-	1	-	-	-	-	-	-	-	-	-	1	DVMS, BVSc
94	Taipei China	-/-	-	-	-	-	-	-	2	-	-	-	2	4	BS, BVM
95	Tanzania	-/-	-	1	-	-	-	-	-	-	-	-	-	1	BSc VetMed
96	Thailand	-/-	7	2	-	-	-	-	-	-	-	-	1	10	DVM
97	Trinidad and Tobago	-/-	-	1	-	-	-	-	-	-	-	-	1	2	DVM
98	Tunisia	-/-	-	-	-	-	-	1	-	-	-	-	-	1	DMV
99	Turkey	-/-	-	19	-	-	-	-	-	-	-	-	-	19	VH
100	Uganda	-/-	-	1	-	-	-	1	-	-	-	-	-	2	BVM
101	Ukraine	-/-	7	-	-	-	-	-	-	-	-	-	-	7	SVM
102	United Kingdom	-/-	1	-	-	-	-	3*	2	-	1	-	1	8	Tables III, VI, VII
103	United States of America	-/-	-	-	-	25	-	4	-	-	-	-	1	30	DVM, VMD
104	Uruguay	-/-	-	-	-	-	1	-	-	-	-	-	-	1	DMV
105	Venezuela	-/-	4	1	-	-	1	-	-	-	-	-	-	6	MV
106	Vietnam	-/-	-	-	-	-	-	-	-	-	-	-	2	2	VE
107	West Indies	-/-	-	-	-	-	-	3*	-	-	-	-	-	3	DVM
108	Yemen	-/-	-	-	-	-	-	-	-	-	-	-	2	2	-
109	Zaire	-/-	-	-	-	-	-	-	-	-	-	-	-	-	DMV
110	Zambia	-/-	1	-	-	-	-	1	-	-	-	-	-	2	BVSc, BVM
111	Zimbabwe	-/-	1	-	-	-	-	-	-	-	-	-	-	1	BVSc
Total		9/5	69	186	12	54	10	42	4	13	38	3	152	597	54
(%)		(2)	(12)	(31)	(2)	(9)	(2)	(7)	(1)	(2)	(6)	(<1)	(25)	(100)	

Overall categories of nomenclature used a. Science (n = 95; 16%) b. Medicine (n = 295; 50%) c. Composite (n = 152; 25%) d. Other (n = 55; 9%)

Note: 1/3, 17/50 & 31/200 = No. of veterinary schools from website sources/No. of veterinary schools suggested by the reviewer of this article
 - not available
 C: Composite – Animal Husbandry, Animal Science, Veterinary Medicine and others (1)
 CVM: College of Veterinary Medicine (2)
 CVS: College of Veterinary Science
 DVM: Department of Veterinary Medicine (4)
 DVS: Department of Veterinary Science (5)
 FVM: Faculty of Veterinary Medicine (6)
 FVS: Faculty of Veterinary Science (7)
 SN: serial number
 SVM: School of Veterinary Medicine (8)
 SVS: School of Veterinary Science (9)
 UV: Veterinary University (University of Veterinary Science [14] & University of Veterinary Medicine [15])
 VA/I: Veterinary Academy (10)/Institute (11)
 VCF: Veterinary College Faculty
 * School of Veterinary Studies

Table II
Veterinary medical degrees granted in different countries throughout the world

Source: References 3, 8, 9, 11 and relevant university websites

SN	Degree title abbreviation	Full degree title	No. of countries that award this degree	Awarding country
01	BS/BSc	Bachelor of Science in Veterinary Medicine	1	Philippines (Virgin Milagros University)/Hungary, Mongolia
02	BA VetMB	Bachelor of Arts, Bachelor of Veterinary Medicine	1	UK (Cambridge)
03	BASc	Bachelor of Agricultural Science	1	China
04	BScVM	Bachelor of Science in Veterinary Medicine	1	Serbia and Montenegro
05	BSc VetMed	Bachelor of Science in Veterinary Medicine	1	Tanzania
06	BSc VS & AH	Bachelor of Veterinary Science & Animal Husbandry	1	Bangladesh (SBAU, Dhaka)
07	BVetMed	Bachelor of Veterinary Medicine	1	UK (RVC, University of London)
08	BVM & AR	Bachelor of Veterinary Medicine and Animal Resources	1	Saudi Arabia
09	BVM & S	Bachelor of Veterinary Medicine & Surgery	1	UK (University of Edinburgh)
10	BVMedSci	Bachelor of Veterinary Medical Sciences	1	UK (University of Nottingham)
11	BVM BVS	Bachelor of Veterinary Medicine Bachelor of Veterinary Surgery	1	UK (University of Nottingham)
12	CMV	Candidates Medicinae Veterinariae	1	Norway
13	D	Dierenarts	1	Netherlands
14	DCV	Doctor en Ciencias Veterinarias	1	Argentina
15	DEDV	Diplôme d'État de Docteur Vétérinaire	1	France
16	DH	Doktor Hewan	1	Indonesia
17	DK	Diploma of Ktiniatrou	1	Greece
18	DMV	Dottore in Medicina Veterinaria	1	Italy
19	DVE	Docteur Vétérinaire d'État	1	Senegal
20	DMV	Diplôme Fédéral de Médecine Vétérinaire	1	Switzerland
21	DMV	Doctor Medic Veterina	1	Romania
22	DVMS	Diploma in Veterinary Medical Sciences	1	Syria
23	DVMZ	Doctor Veterinary Medicine & Zootechnics	1	Cuba
24	IASV	Ingénieur Agricole Spécialité Vétérinaire	1	Cambodia
25	LV	Licenciado en Veterinaria	1	Spain
26	LV	Legitimerad en Veterinaer	1	Sweden
27	LVM	Licentiate in Veterinary Medicine	1	Finland, Mozambique
28	LW	Lekarz Weterynarii	1	Poland
29	MV	Mjek Veteriner	1	Albania
30	MVB	Bachelor of Veterinary Medicine	1	Ireland
31	MVD	Médico Veterinario Zootecnista	1	Dominican Republic
32	SVM	Specialist Veterinarnej Medicini	1	Ukraine
33	V, BSc	Veterinaereksamen, Bachelor of Science	1	Denmark
34	VE	Veterinary Engineer	1	Vietnam
35	VH	Veteriner Hekim	1	Turkey
36	Vet. Med.	Veterinary Medicine	1	Ghana
37	VL	Veterinaren Lekar	1	Bulgaria
38	VMD	Veterinariae Medicinae Doctoris	1	USA (University of Pennsylvania)
39	VV	Veterinarnyi Vrac	1	Russia
40	BS	Bachelor of Science	2	Afghanistan, Saudi Arabia, Taipei China
41	BVSc & AH	Bachelor of Veterinary Science and Animal Husbandry	2	India, Nepal

Table II (cont.)

SN	Degree title abbreviation	Full degree title	No. of countries that award this degree	Awarding country	
42	BVMS	Bachelor of Veterinary Medicine & Surgery	2	Iraq, Libya, UK (University of Glasgow)	
43	DV	Docteur Vétérinaire	2	Algeria, Morocco	
44	LMV	Licenciado em Medicina Veterinaria	2	Angola, Portugal, Mozambique	
45	T	Tieraerzt	2	Austria, Germany	
46	V	Veterinario	2	Argentina, Brazil	
47	MVZ	Médico Veterinario Zootecnista	3	Colombia, Guatemala, Mexico	
48	DMV	Docteur en Médecine Vétérinaire	4	Belgium, Canada, Panama, Tunisia, Zaire	
49	DMV	Doctor en Medicina Veterinaria	5	Cuba, Dominican Republic, Ecuador, Paraguay, Spain, Uruguay	
50	DVM**	Doktor Veterinarske Medicine	5	Bosnia and Herzegovina, Croatia, former Yugoslav Republic of Macedonia, Serbia, Slovenia	
51	MV	Médico Veterinario	6	Argentina, Bolivia, Brazil, Chile, Peru, Venezuela	
52	BVM	Bachelor of Veterinary Medicine	8	Armenia, China, Jordan, Kenya, Libya, Taipei China, Tanzania, Uganda, Zambia	
53	BVSc	Bachelor of Veterinary Science	9	China, Spain, Syria, Zambia & see Table III	
54	DVM**	Doctor of Veterinary Medicine	27	Belgium, Cuba, Germany, Greece, Italy, Netherlands, Poland, Portugal, Romania, Switzerland, Trinidad and Tobago & see Table IV	
RVC:	Royal Veterinary College	UK:	United Kingdom	**	differences not evaluated
SBAU:	Sher-e-Bangla Agricultural University	USA:	United States of America		
SN:	serial number	*	details not available		

preparation of animals for food production purposes, and a four-year curriculum leading to a BS or BSc degree in animal science at a college or university. The BS in animal science is a science-based programme stressing two areas of emphasis: an animal science major and a pre-veterinary medicine major. Accordingly, some animal science graduates continue their education to earn a DVM degree, and others to earn a Master of Science (MS/MSc) or PhD degree.

The BS/BSc degree in animal science leading to the DVM degree programme is available at the College of Veterinary Medicine at different universities in the USA, Canada, Australia and other developed countries (Table VI). An online Bachelor's degree in animal science is also offered by 122 schools in the USA, and a total of 2,217,810 students are enrolled, among whom 6,289 graduate each year (2016 estimate). Veterinary science degrees often have pre-professional programmes designed to be completed in four years, such as animal science, that prepare students for entry into professional schools of veterinary medicine. The award of a Bachelor's degree in veterinary science alone is not sufficient for entry into the veterinary profession. To become a licensed veterinarian in such countries, one must earn a DVM from an accredited college of veterinary medicine.

Dual degree programmes

A double-degree programme, sometimes called a combined degree, composite degree, conjoint degree, dual degree or

simultaneous degree programme, requires a student to work for two different university degrees in parallel, either at the same institution or at different institutions, completing them in less time than it would take to earn them separately. The two degrees may be in the same subject area or in two different subjects. Some dual degree programmes in different universities are presented in Table VI.

In the UK, with seven VMAI, veterinary education is generally a five-year course, except at the University of Cambridge, which follows a six-year course and awards a Bachelor of Arts (BA) after three years, followed by the Bachelor of Veterinary Medicine (VetMB) after six years (Table VI). Recently, the University of Nottingham introduced a five-year veterinary course with a dual degree programme: successful students are awarded the Bachelor of Veterinary Medical Sciences (BVMEDSci) degree at the end of the third year and the Bachelor of Veterinary Medicine/Bachelor of Veterinary Surgery (BVMBVS) degree at the end of their fifth year. Veterinary graduates in the UK require membership of the Royal College of Veterinary Surgeons (MRCVS) in order to practise.

Currently, there are 30 accredited veterinary academic institutions in the USA, of which 25 are named 'College of Veterinary Medicine', four 'School of Veterinary Medicine' and one 'Department of Animal, Dairy and Veterinary Sciences', which award the DVM degree (Tables I and IV). However, graduation from a BS (four-year) qualification or prerequisite course is required for admission to all

Table III**Current status of universities awarding Bachelor of Veterinary Science (BVSc) degrees**

Source: References 3, 8, 9, 11, 14 and websites of relevant universities

SN	Country/ region	School/College/Faculty	University	Degree (Est. year)
01	Australia	School of Animal & Veterinary Science	Charles Sturt University	BVSc (2005)
		School of Veterinary & Biomedical Science	James Cook University	BVSc (2006)
		School of Veterinary Science	University of Queensland	BVSc (1936)
02	Egypt	Faculty of Veterinary Medicine, Medicine	Cairo University	BVSc (1946)
		Faculty of Veterinary Medicine	Suez Canal University	BVSc (1976)
		Faculty of Veterinary Medicine	Zagazig University	BVSc (1974)
		Faculty of Veterinary Medicine	Minia University	BVSc (1976)
		Faculty of Veterinary Medicine	Alexandria University	BVSc (1938)
		Faculty of Veterinary Medicine	Assiut University	BVSc (1957)
		Faculty of Veterinary Medicine	Benha University	BVSc (1976)
		Faculty of Veterinary Medicine	Beni-Suef University	BVSc (2005)
		Faculty of Veterinary Medicine	Damanhour University	BVSc (2010)
		Faculty of Veterinary Medicine	Kafr El-Sheikh University	BVSc (2009)
		Faculty of Veterinary Medicine	Mansoura University	BVSc (1972)
		Faculty of Veterinary Medicine	Menoufia University	BVSc (1976)
		Faculty of Veterinary Medicine	South Valley University	BVSc (1958)
Faculty of Veterinary Medicine	Sohag University	BVSc (2006)		
03	Myanmar	Faculty of Veterinary Medicine	University of Veterinary Science	BVSc (1957)
04	New Zealand	Faculty of Veterinary Science	Massey University	BVSc (1963)
05	South Africa	Faculty of Veterinary Science	University of Pretoria	BVSc (1920)
06	Sri Lanka	Faculty of Animal Science & Veterinary Medicine	University of Peradeniya	BVSc (1947)
07	Sudan	College of Veterinary Medicine	Sudan University of Science & Technology	BVSc (1950)
		Faculty of Veterinary Medicine	University of Gezira	BVSc (1975)
		Faculty of Veterinary Medicine	University of Nyala	BVSc (1994)
		Faculty of Veterinary Medicine	University of Al Butana	BVSc (-)
		Faculty of Veterinary Medicine	University of Bahri	BVSc (-)
		Faculty of Veterinary Medicine	University of West Kordofan	BVSc (1997)
		Faculty of Veterinary Medicine	University of Khartoum	BVSc (1959)
08	UK	School of Veterinary Science	University of Bristol	BVSc (1949)
		School of Veterinary Science	University of Liverpool	BVSc (1904)
09	Zimbabwe	Faculty of Veterinary Sciences	University of Zimbabwe	BVSc (1952)

- not available

SN: serial number

UK: United Kingdom

30 universities for the DVM (four-year) degree programme. Accordingly, the BSs in Animal Science programme is designed for those who wish to obtain higher degrees (MS, PhD) and for those who pursue a dual degree (BS + DVM) programme in the USA.

Seven universities offer veterinary degree programmes in Australia, of which four (University of Melbourne, University of Sydney, Murdoch University and University of Adelaide) have recently introduced a BSc + DVM programme (Table VI). It therefore appears that these Australian

universities have changed from the British science degree (BVSc) system to the American system of a dual BSc + DVM programme (Table VI).

In the Indian sub-continent, the University of Agriculture in Faisalabad has approved conversion of its four-year DVM course into a composite five-year course and has introduced a special course for those holding the BSc AH (Animal Husbandry) degree to allow them to obtain the composite DVM degree. In addition, the University of Veterinary and Animal Sciences in Lahore, Pakistan, awards

Table IV**Current status of universities awarding the Doctor of Veterinary Medicine (DVM) degree, by country**

Source: References 3, 8, 9 and websites of relevant universities

SN	Country/region	School/College/Faculty	University	Degree (est. year)
01	Australia	Faculty of Veterinary & Agric. Sciences	University of Melbourne	BSc + DVM (2011)
		Faculty of Veterinary Science	University of Sydney	BSc + DVM (2015)
		School of Veterinary & Life Sciences	Murdoch University	BSc + DVM (2016)
		School of Animal & Veterinary Sciences	University of Adelaide	BSc + DVM (2013)
02	Bangladesh	Dept of AH & Veterinary Science	Rajshahi University	DVM (2004)
		Faculty of Veterinary Science	Bangladesh Agricultural University	DVM (1961)
		Faculty of Animal Science & Veterinary Medicine	Patuakhali Science & Technology University	DVM (2001)
		Faculty of Veterinary Medicine & Animal Science	BSMR Agricultural University	DVM (2008)
		Faculty of Veterinary & Animal Science	HMD Science & Technology University	DVM (2001)
		Faculty of Veterinary & Animal Science	Sylhet Agricultural University	DVM (1996)
		Faculty of Veterinary Medicine	Chittagong Veterinary & Animal Science University	DVM (1996)
03	Bosnia and Herzegovina	Faculty of Veterinary Medicine	University of Sarajevo	DVM (1949)
04	Canada	Faculty of Veterinary Medicine	University of Calgary	DVM (2008)
		Faculté de Médecine Vétérinaire	Université de Montréal	DMV (1969)
		The Western College of Veterinary Medicine	University of Saskatchewan	DVM (1963)
		The Ontario Veterinary College	University of Guelph	DVM (1965)
		The Atlantic Veterinary College	University of Prince Edward Island	DVM (1986)
05	Cayman Islands	School of Veterinary Medicine	St Matthew's University	DVM (2005)
06	Costa Rica	School of Veterinary Medicine	National University	DVM (1973)
		Escuela de Medicina y Cirugia	Universidad Veritas	DVM (n/a)
		Veterinaria 'San Francisco de Asis'		
07	Croatia	Faculty of Veterinary Medicine	University of Zagreb	DVM (1919)
08	Czech Republic	Faculty of Veterinary Medicine	Uni. of Veterinary & Pharmaceutical Sciences, Brno	DVM (1918)
09	Estonia	Institute of Veterinary Medicine & Animal Science	Estonian University of Life Sciences	DVM (2005)
10	Ethiopia	Faculty of Veterinary Medicine	Addis Ababa University	DVM (1979)
		College of Agriculture & Veterinary Medicine	Jimma University	DVM (2003)
		Faculty of Veterinary Medicine	Ethiopia Haramaya University	DVM (2003)
11	Hungary	Faculty of Veterinary Science	Szent Istvan University	DVM (2000)
		Faculty of Veterinary Medicine	Mekelle University	DVM (2003)
12	Iran	Faculty of Veterinary Medicine	University of Tehran	DVM (1945)
		Faculty of Veterinary Medicine	Ferdowsi University of Mashhad	DVM (1991)
		Faculty of Veterinary Medicine	Shiraz University	DVM (1969)
		College of Veterinary Medicine	University of Tabriz	DVM (1988)
		Faculty of Veterinary Medicine	Urmia University	DVM (1975)
		Faculty of Veterinary Medicine	Shahid Chamran University	DVM (1973)
		Faculty of Veterinary Medicine	Razi University	DVM (1953)
		Faculty of Veterinary Medicine	University of Semnan	DVM (1994)
		Faculty of Veterinary Medicine	University of Shahrekord	DVM (2005)
		Faculty of Veterinary Medicine	Islamic Azad University (ten branches)	DVM (1982)
13	Israel	Koret School of Veterinary Medicine	Hebrew University of Jerusalem	DVM (1985)
14	Japan	Graduate School of Veterinary Medicine	Hokkaido University	DVM (1984)
		–	Obihiro University of Agric. & Veterinary Medicine	DVM (1984)
		Department of Veterinary Medicine, Faculty of Agriculture (FA)	Iwate University	DVM (1991)

Table IV (cont.)

SN	Country/region	School/College/Faculty	University	Degree (est. year)
		Department of Veterinary Medicine, FA	Tokyo University	DVM (1984)
		Department of Veterinary Medicine, FA	Tokyo University of Agric. & Tech.	DVM (1984)
		Department of Veterinary Medicine, Faculty of Applied Biol. Science	Gifu University	DVM (1949)
		Department of Veterinary Medicine, FA	Tottori University	DVM (1999)
		School of Veterinary Medicine, FA	Yamaguchi University	DVM (1984)
		Department of Veterinary Medicine, FA	University of Miyazaki	DVM (2003)
		Department of Veterinary Medicine, FA	Kagoshima University	DVM (2011)
		Department of Veterinary Science, School of Env. Sci.	Osaka Prefecture Uni.	DVM (2005)
		School of Veterinary Medicine	Rakuno Gakuen University	DVM (1984)
		School of Veterinary Med. & Animal Science	Kitasato University	DVM (1997)
		Faculty of Veterinary Medicine	Nippon Veterinary & Life Sciences University	DVM (2006)
		Department of Veterinary Medicine, College of Bioresource Science	Nihon University	DVM (1984)
		School of Veterinary Medicine	Azabu University	DVM (1984)
15	Latvia	Faculty of Veterinary Medicine	Latvia University of Agriculture	DVM (1939)
16	Lithuania	Faculty of Veterinary Medicine	Lithuanian University of Health Sciences	VS, DVM (2010)
17	Former Yugoslav Republic of Macedonia	Faculty of Veterinary Medicine	Ss Cyril & Methodius Uni. in Skopje	DVM (2009)
18	Malaysia	Faculty of Veterinary Medicine	Putra University	DVM (1973)
		Faculty of Veterinary Medicine	Kelantan University	DVM (2009)
19	Nigeria	Faculty of Veterinary Medicine	The University of Ibadan	DVM (1961)
		Faculty of Veterinary Medicine	The University of Nigeria, Nsuka	DVM (1970)
		College of Veterinary Medicine	Federal Uni of Agriculture, Abeokuta	DVM (2002)
		Faculty of Veterinary Medicine	The Ahmadu Bello University, Zaria	DVM (1964)
		Faculty of Veterinary Medicine	The Usmanu Danfodiyo University	DVM (1975)
		College of Veterinary Medicine	Michael Okpara Uni. of Agriculture	DVM (2006)
		Faculty of Veterinary Medicine	University of Ilorin, Kwara	DVM (2009)
		Faculty of Veterinary Medicine	University of Abuja	DVM (1990)
		Faculty of Veterinary Medicine	University of Maiduguri, Borno	DVM (1981)
		School of Veterinary Medicine	Osmanu Danfodiyo University, Sokoto	DVM (1975)
20	Pakistan	College of Veterinary & Animal Sciences	The Islamia University of Bahawalpur	DVM (2001)
		Faculty of Veterinary Sciences, Multan	Bahauddin Zakariya University	DVM (2006)
		College of Veterinary Sciences, Layyah	Bahauddin Zakariya University	DVM (2011)
		Faculty of AH and Veterinary Sciences	NWFP Agricultural University, Peshawar	DVM (2003)
		College of Veterinary Sciences, Lahore	University of Veterinary and Animal Sciences	DVM (1971)
		Faculty of Veterinary and Animal Sciences	Uni. of Arid Agriculture, Rawalpindi	DVM (2006)
		Faculty of AH and Veterinary Sciences	Sind Agriculture University, Tandojam	DVM (1971)
		Gomal College of Veterinary Sciences	Gomal University, Dera Ismail Khan	DVM (2001)
		Baqai Veterinary College	Baqai Medical University	DVM (2012)
		Faculty of Veterinary and Animal Sciences	Lasbela Uni. of Agric., Water & Marine Science	DVM (2007)
		Faculty of Veterinary Sciences	University of Agriculture, Faisalabad	DVM (1961)
		Riphah College of Vet Sciences	Riphah International University (Private)	DVM (2012)
		College of AH and Veterinary Science	Abdul Wali Khan University, Mardan	DVM (2014)
		Faculty of Veterinary Sciences	SBB International Uni. of Veterinary & Animal Science	DVM (2012)
21	Philippines	Institute of Veterinary Medicine	Tarlac College of Agriculture	DVM (1974)
		Institute of Veterinary Medicine	Camarines Sur State Agricultural College	DVM (1974)
		College of Veterinary Medicine	University of Philippines at Los Baños	DVM (1910)
		College of Veterinary Medicine	Benguet State University	DVM (1982)

Table IV (cont.)

SN	Country/region	School/College/Faculty	University	Degree (est. year)
		College of Veterinary Science & Medicine , FA	Central Luzon State University	DVM (1978)
		College of Veterinary Medicine	University of Southern Mindanao	DVM (2009)
		College of Veterinary Medicine	Central Mindanao University	DVM (1975)
		Institute of Veterinary Medicine	DMM Memorial State University	DVM (1981)
		College of Veterinary Medicine & Biomedical Science	Cavite State University	DVM (1997)
		College of Veterinary Medicine	Pampanga State Agricultural University	DVM (1975)
		College of Veterinary Medicine	Southwestern University	DVM (1976)
		School of Veterinary Medicine	Aklan State University	DVM (2001)
		College of Veterinary Medicine	Visayas State University	DVM (2007)
		School of Veterinary Medicine	Isabella State University	DVM (1978)
		College of Veterinary Medicine	Cagayan State University	DVM (1978)
		College of Veterinary Medicine & Agric. Sciences	De La Salle Araneta University	DVM (2002)
		College of Veterinary Medicine	Virgen Milagrosa University Foundation	DVM (2003)
		Agriculture and Industrial Technology	Central Bicol State Uni. of Agriculture	DVM (2009)
		College of Veterinary Medicine	University of Eastern Philippines	DVM (1964)
		College of Veterinary Medicine	University of Southeastern Philippines	DVM (1978)
		College of Veterinary Medicine	Nueva Vizcaya State University	DVM (2005)
		Institute of Veterinary Medicine	Don Mariano Marcos Memorial State Uni.	DVM (1981)
		College of Veterinary Medicine	Capiz State University – Dumarao & Main	DVM (1980)
		College of Veterinary Medicine	Cebu Technological University – Barili	DVM (2011)
		Dr Yanga's College of Veterinary Medicine		DVM (n/a)
22	Serbia	Faculty of Veterinary Medicine	University of Belgrade	DVM (1936)
23	Slovenia	Faculty of Veterinary Medicine	University of Ljubljana	DVM (1998)
24	Republic of Korea	College of Veterinary Medicine	Seoul National University	DVM (1946)
		College of Veterinary Medicine	Kyungpook National University	DVM (1988)
		College of Veterinary Medicine	Kangwon National University	DVM (2006)
		College of Veterinary Medicine	Chonbuk National University	DVM (1988)
		College of Veterinary Medicine	Gyeongsang National University	DVM (1989)
		College of Veterinary Medicine	Konkuk University	DVM (1985)
		College of Veterinary Medicine	Chonnam National University	DVM (1952)
		College of Veterinary Medicine	Jelu National University	DVM (1952)
		College of Veterinary Medicine	Chungbuk National University	DVM (1977)
		College of Veterinary Medicine	Kyungpook University	DVM (1988)
25	Thailand	Faculty of Veterinary Science	Chiang Mai University	DVM (1994)
		Faculty of Veterinary Science	Mahidol University	DVM (1997)
		Faculty of Veterinary Science	Chulalongkom University	DVM (1967)
		Faculty of Veterinary Medicine	Khon Kaen University	DVM (1986)
		Faculty of Veterinary Medicine	Kaselsart University	DVM (1954)
		Faculty of Veterinary Medicine & Animal Science	Mahasarakham University	DVM (1994)
		Faculty of Veterinary Medicine	Mahanakom University of Technology	DVM (1992)
		Faculty of Veterinary Science	Rajamangala University of Technology	DVM (2008)
26	United States of America	College of Veterinary Medicine	Cornell University	DVM (1871)
		School of Veterinary Medicine	University of California, Davis	DVM (1948)
		College of Veterinary Medicine & Biomedical Science	Texas A & M University	DVM (1916)

Table IV (cont.)

SN	Country/region	School/College/Faculty	University	Degree (est. year)	
		College of Veterinary Medicine	University of Florida	DVM (1976)	
		College of Veterinary Medicine	Purdue University	DVM (1963)	
		College of Veterinary Medicine	University of Minnesota	DVM (1947)	
		College of Veterinary Medicine	Ohio State University	DVM (1915)	
		School of Veterinary Medicine	University of Wisconsin	DVM (1983)	
		College of Veterinary Medicine	North Carolina State University	DVM (1981)	
		College of Veterinary Medicine	University of Missouri	DVM (1946)	
		College of Veterinary Medicine	Iowa State University	DVM (1879)	
		College of Veterinary Medicine	Oregon State University	DVM (1979)	
		College of Veterinary Medicine	University of Georgia	DVM (1946)	
		College of Veterinary Medicine	Michigan State University	DVM (1910)	
		School of Veterinary Medicine	Tufts University	DVM (1978)	
		College of Veterinary Medicine	Washington State University	DVM (1909)	
		College of Veterinary Medicine	University of Tennessee	DVM (1976)	
		College of Veterinary Medicine	Colorado State University	DVM (1949)	
		College of Veterinary Medicine	University of Illinois at Urbana-Champaign	DVM (1948)	
		College of Veterinary Medicine	Louisiana State University	DVM (1973)	
		Dept of Animal, Dairy & Veterinary Science	Utah State University*	DVM (1977)	
		College of Veterinary Medicine	Oklahoma State University	DVM (1948)	
		College of Veterinary Medicine	Auburn University	DVM (1907)	
		College of Veterinary Medicine	Kansas State University	DVM (1905)	
		College of Veterinary Medicine	Mississippi State University	DVM (1977)	
		School of Veterinary Medicine	Tuskegee University	DVM (1944)	
		College of Veterinary Medicine	University of Maryland	DVM (1978)	
		College of Veterinary Medicine	Western University of Health Sciences	DVM (1998)	
		College of Veterinary Medicine	Lincoln Memorial University	DVM (2012)	
		College of Veterinary Medicine	Midwestern University	DVM (2014)	
27	West Indies	School of Veterinary Medicine	Ross University, St Kitts and Nevis	DVM (1982)	
		School of Veterinary Medicine	St Matthew's University, Cayman Islands	DVM (2005)	
		School of Veterinary Medicine	University of the West Indies, St Augustine, Jamaica	DVM (1988)	
A & M:	Agricultural and Mechanical	Env. Sci.:	Environmental Science	Uni.:	University
AH:	Animal Husbandry	Est. year:	year established	Vet.:	Veterinary
Agric.:	Agricultural	FA:	Faculty of Agriculture	–	not available
BSc.:	Bachelor of Science	HMD:	Hajee Mohammad Danesh	*DVM programme with Washington State University (WSU);	
Biol.:	Biological	n/a:	not applicable	students study for the first two years at Utah State University	
BSMR:	Bangabandhu Sheikh Mujibur Rahman	NWFP:	North-West Frontier Province	and the last two at WSU – they graduate and obtain their	
Dept:	Department	SBB:	Shaheed Benazir Bhutto	DVM degrees from WSU	
DMM:	Don Mariano Marcos	Tech.:	Technology		

the DVM degree to candidates holding a BSc AH (Hons) degree, which is considered to be a pre-veterinary medicine qualification (Table VI).

The Bachelor's degree programme in veterinary science (BVSc) was first introduced at the Madras Veterinary College in 1936, followed by other veterinary colleges in India and Pakistan. However, currently all 41 public colleges of veterinary science and animal husbandry in India have introduced a common composite BVSc & AH degree with

a uniform curriculum and syllabus (Table VI). The names of the veterinary educational institutions and their degrees are related to science and animal husbandry titles; they may require graduates to upgrade as appropriate to a veterinary medical professional degree.

Veterinary medicine and biomedical sciences

Biomedical science (BMS) combines the fields of biology and medicine, with a focus on studying how to maintain

Table V
Status and nomenclature of veterinary-related universities with their awarded degrees
 Source: References 3, 8, 9, 11, 16 and websites of the listed universities

SN	Country	Name of university (n = 26)	Year established	Degree	Status	NR	WR
01	Austria	University of Veterinary Medicine, Vienna	1765	T (Tierarzt)	N	14	1,456
02	Bangladesh	Chittagong Veterinary and Animal Sciences University	2006	DVM	N	30	8,734
03	Czech Republic	University of Veterinary and Pharmaceutical Sciences, Brno	1918	DVM	N	18	2,056
04	Germany	University of Veterinary Medicine, Hanover	1778	T (Tierarzt) BSc Biology	N	69	1,414
05	India	Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana	2005	BVSc & AH BSc*	N	200	5,246
		Tamil Nadu Veterinary and Animal Sciences University	1989	BVSc & AH BSc*			6,552
		Karnataka Veterinary, Animal and Fisheries Sciences University	2005	BVSc & AH BSc*			8,415
		Lala Lajpat Rai University of Veterinary and Animal Sciences	2010	BVSc & AH BSc*			9,256
		Kerala Veterinary and Animal Sciences University	2010	BVSc & AH BSc*			9,807
		Maharashtra Animal and Fishery Sciences University	2000	BVSc & AH BSc*			9,969
		West Bengal University of Animal and Fishery Sciences	1995	BVSc & AH BSc*	N		13,068
		UP Pt Deen Dayal Upadhyaya Pashu Chikitsa Vishwavidyalaya	2001	BVSc & AH BSc*	N		16,025
		Rajasthan University of Veterinary and Animal Sciences	2010	BVSc & AH *			16,441
		Madhya Pradesh Pashu Chikitsa Vigyan Vishva Vidyalyaya	2010	BVSc & AH	N		17,443
		Sri Venkateswara Veterinary University	2005	BVSc & AH		–	–
		Chhattisgarh Kamdhenu Vishwavidyalaya	2012	BVSc & AH		–	–
06	Japan	Obihiro University of Agriculture and Veterinary Medicine	1949	BVSc			2,108
			1984	DVM			4,241
		Nippon Veterinary and Life Science University	1881	BVSc			
			1984	DVM			
07	Myanmar	University of Veterinary Science, Yezin	1999	BVSc			
08	Pakistan	University of Veterinary and Animal Sciences, Lahore	2002	DVM** BSc*			23,355 4,303
		SBB University of Veterinary & Animal Sciences, Sakrand	2013	DVM			22,905
09	Romania	Banat UAS & VM, Timisoara	1869	DMV			7,530
		UAS & VM, Cluj-Napoca		DMV			2,707
		UAS & VM, Bucharest		DMV			5,451
		UAS & VM, Ion Ionescu de la Brad		DMV			8,819
10	Slovakia	University of Veterinary Medicine, Kosice	1992	DVM			6,118
Note:	For full degree titles, see Table II	UAS & VM: University of Agricultural Sciences and Veterinary Medicine		*			Poultry Science/Dairy Technology Curriculum developed for BSc AH (Hons) graduates
N:	normal			**			
NR:	national ranking	UP Pt: Uttar Pradesh Pandit					
SBB:	Shaheed Benazir Bhutto	WR: world ranking					
SN:	serial number						

and promote health in humans and animals by providing knowledge of pre-clinical subjects. Biomedical science knowledge plays an important role in developing clinical, diagnostic and therapeutic reasoning skills for the application of clinical skills, in supporting evidence-based veterinary practice and life-long learning and in advancing biomedical knowledge and comparative medicine.

Biomedical scientists conduct research in a laboratory setting, often using living organisms, especially laboratory animals, as models while conducting experiments. Biomedical scientists employ a variety of laboratory techniques, including *i)* molecular and biochemical techniques, *ii)* imaging techniques, *iii)* genetic engineering, *iv)* electrophysiological techniques, and *v)* bioinformatics

Table VI**Current status of institutions with composite or dual degree systems; some have updated and renamed veterinary degrees**

Source: References 8, 15 and websites of the relevant universities

SN	Country	School/College/Faculty	University	Original degree		Current degree	
				Name	Year	Name	Year
01	Australia	Faculty of Veterinary & Agricultural Sciences	University of Melbourne	BVSc	1909	BSc + DVM	2011
		Faculty of Veterinary Science	University of Sydney	BVSc	1910	BSc + DVM	2015
		School of Veterinary & Life Sciences	Murdoch University	BVMS	1975	BSc + DVM	2016
		School of Animal & Veterinary Science	University of Adelaide	BSc AS	2008	BSc + DVM	2013
02	Bangladesh	Faculty of Veterinary Science	Bangladesh Agricultural University	BSc (VS & AH)	1957	DVM	1961
		Faculty of Animal Husbandry				BSc AH (Hons) ^(e)	
03	United Kingdom	Department of Veterinary Medicine	University of Cambridge	BA + VetMB	1949	BA + VetMB	1949
		School of Veterinary Medicine & Science	University of Nottingham	BVMedSci + BVM BVS			2006
04	Canada	Colleges of Veterinary Medicine	5 Universities	–	–	BS + DVM ^(b)	1965
05	France	École nationale vétérinaire d'Alfort	–	DEDV		DEDV + DVM ^(c)	–
06	Japan	School/Department/Faculty	16 Universities	BVSc	1880	DVM + MS ^(d)	1984
07	India*	Madras Veterinary College	TANUVAS	BVSc	1936	BVSc & AH	1989
08	Pakistan	Punjab Veterinary College	Punjab University	BVSc	1942	BSc (AH)	1954
		College of Veterinary Science, Lahore				DVM	1971
		Faculty of Veterinary Science	University of Veterinary & Animal Sciences	DVM	2002	DVM + AH**	2003
09	United States of America	College of Veterinary Medicine	Cornell University	BVM	1870	BS + DVM ^(e)	1871

Note: For full degree titles, see Table II
 – not available

a) Unique example of veterinary education

b) Currently all five DVM-awarding universities in Canada require a minimum two-year Bachelor's degree for admission to the six-year DVM course

c) Currently, the DEDV is a five-year course; after the fifth year the student submits a thesis on veterinary practice and receives the title of DVM in France

d) The veterinary curriculum lasts six years; completion of the six-year veterinary course and passing the national examination confers a Master's degree (JVMA)

e) Currently all 30 DVM-awarding universities in the United States of America require a pre-veterinary medical Bachelor's degree or a set of prerequisite courses for admission to the four-year DVM course

SN: serial number

TANUVAS: Tamil Nadu Veterinary and Animal Sciences University

* Currently all 41 veterinary academic institutions in India have established BVSc & AH degrees

** DVM + AH: the DVM degree is awarded to candidates holding a BSc AH (Hons) degree

and computational biology. According to the needs of the appropriate veterinary medical degree, many universities throughout the world have developed BMS degrees in VME. A review has revealed that Bachelor's degrees in BMS are offered by many universities, but Malaysia, the UK, Australia, Canada and the USA are the major countries offering such programmes. In addition, most of the schools and colleges of veterinary medicine in the USA have a Department of Biomedical Sciences, and some institutions have been named Colleges of Veterinary Medicine and Biomedical Sciences.

Accreditation of veterinary academic institutions

Accreditation is a process of validation in which academic institutions of higher learning are evaluated. The standards

of accreditation are set by a peer-review board whose members include faculty from various accredited colleges and universities. The most widely accepted VMAI accrediting body internationally is the AVMA COE. This review recorded approximately 597 VMAs in the world, of which only 49 are accredited by the AVMA COE (Table VII).

Discussion

The chronological development of VME and the veterinary profession appears to have been from 'zoology' to 'animal husbandry' to 'animal science' to 'veterinary science' to 'veterinary medicine' to 'veterinary medicine and biomedical science' to the 'One Health' concept. Accordingly, an attempt has been made to investigate the justification of the

Table VII**Veterinary academic institutions (n = 49) accredited by the American Veterinary Medical Association Council on Education**

Source: References 12, 13 and websites of relevant universities

SN	Country/region	VMAI		School/College/Faculty	University	Degree
		TN	TNA			
01	Australia	7	4	School of Veterinary & Life Sciences	Murdoch University	BSc + DVM
				Faculty of Veterinary Sciences	University of Sydney	BSc + DVM
				Faculty of Veterinary & Agricultural Sciences	University of Melbourne	BSc + DVM
				School of Veterinary Science	University of Queensland	BVSc
02	Canada	5	5	See Table IV	See Table IV	BS + DVM
03	France	4	0	Écoles Nationale, Veterinaire	–	DVM*
				École Nationale des Services Vétérinaires	–	DEDV*
04	Ireland	1	1	School of Agriculture, Food Science & Veterinary Medicine	University College Dublin	MVB
05	Mexico	27	1	Facultad de Medicina Veterinaria y Zootecnia	Universidad Nacional Autonoma de Mexico	MVZ
06	Netherlands	1	1	Faculty of Veterinary Medicine	State University of Utrecht	D
07	New Zealand	1	1	Institute of Veterinary, Animal and Biomedical Sciences	Massey University	BVSc
08	United Kingdom	8	3	The Royal Veterinary College	University of London	BVetMed
				Faculty of Veterinary Medicine	University of Glasgow	BVMS
				Royal Dick School of Veterinary Studies	University of Edinburgh	BVM & S
09	United States of America	30	30	See Table IV	See Table IV	BS + DVM/ DMV**
10	West Indies	3	2	School of Veterinary Medicine	Ross University, St Kitts and Nevis	BS + DVM
				School of Veterinary Medicine	St. George's University, Grenada	BS + DVM

Note: For full degree titles, see Table II

TN: total number

TNA: total number accredited

VMAI: Veterinary medical academic institution

* Currently, the DEDV is a five-year course; after the fifth year, the student submits a thesis on veterinary practice and receives the title of DVM in France

** 29 veterinary colleges in the United States of America award the DVM; only the University of Pennsylvania offers the VMD degree

different nomenclature used by VMAIs, their degrees and their academic programmes.

According to the OIE, the term 'veterinarian' refers to 'a person registered or licensed by the relevant veterinary statutory body of a country to practise veterinary medicine/science in that country' (19). A classical definition of a veterinarian is a person who is qualified to practise veterinary medicine, and by this most people think of clinical practices related to the prevention, cure or alleviation of pain and the treatment of injuries and disease in animals, especially domestic animals. However, the contemporary roles of veterinary graduates go far beyond these visible tasks. Veterinarians have played significant and contributory roles in animal and human health and welfare, including work in:

- public health: emerging infectious diseases and existing and emerging zoonotic diseases; physical, social and mental health (human–animal interactions)
- environmental health: vector and pathogen control

- ensuring an adequate, nutritious, safe food supply: food animal medicine, food inspection (food quality, food safety, food security), disease prevention, regulatory medicine

- biomedical research: laboratory animal medicine, human disease research and its potential application to non-human species, the development of drugs and pharmaceuticals

- biodiversity and conservation: wildlife health and medicine, species conservation.

The recommended core competencies for all veterinary medical students to achieve by graduation include:

- multi-species knowledge with clinical competencies
- One Health competency related to the intersection of animal, human and environmental health
- the development of professional competencies.

Formal veterinary education began in 1761 in Lyon, France, and, since then, in the 194 countries in the world (20),

including the 180 OIE Member Countries (21), approximately 597 academic institutions have emerged in 111 (57%) countries that award veterinary degrees with 54 different titles. However, in developing countries, the quality of veterinary education is failing to meet the requirements for delivering highly competent Veterinary Services (22). This has highlighted the need for veterinary education to be strengthened, with particular emphasis on establishing minimum competencies and harmonising key curriculum elements to facilitate international mobility of veterinary graduates. The OIE has developed guidelines for a model core veterinary curriculum. It is strongly recommended that the guidelines be consulted by VEEs in OIE Member Countries when developing a veterinary medical curriculum. The OIE guidelines on the veterinary education core curriculum represent a basis to which national needs and circumstances may be added (7).

The nomenclature of the veterinary degrees and their institutions varies greatly among countries and even from one university to another within a country. However, there are associations and organisations that promote the development of veterinary education and enhance cooperation among VEEs especially in Europe (the European Association of Establishments of Veterinary Education [EAEVE]) and North America (the American Association of Veterinary Medical Colleges [AAVMC]), but such activities are not observed in SAARC countries (23). An attempt has been made to correlate the nomenclature of the veterinary degrees and institutions with standard definitions of veterinary medical terminology.

The word 'veterinary' comes from the Latin *veterinae*, meaning 'working animals', and there is a possible Roman origin of the name *veterinarius* for a caretaker of animals (1). The term 'veterinarian' was first used in print by Thomas Browne in 1646 (24). In modern terms, veterinarians exist to serve the public by: *i*) protecting food animal production, *ii*) monitoring food quality and safety, *iii*) controlling zoonoses and *iv*) preserving the environment and biodiversity (25).

Worldwide variation in the nomenclature of veterinary degrees, the curricula and training status has necessitated comparative evaluation of veterinary graduates. Although there is no restriction on veterinary graduates pursuing higher studies in any veterinary institute in the world, problems exist with registration to practise in foreign countries. However, an attempt is being made to investigate the justification for such wide discrimination based on the nomenclature of veterinary degrees and institutions with single, composite and dual degree programmes.

The word 'animal' comes from the Latin word *animalis*, which means 'having breath'. In everyday colloquial usage the word incorrectly excludes humans, that is, 'animal' is

often used to refer only to non-human members of the kingdom *Animalia*. Animals are divided into various sub-groups, some of which are: vertebrates (birds, mammals, amphibians, reptiles and fish) and non-vertebrates (molluscs, arthropods, annelids, sponges and jellyfish). Sometimes, only closer relatives of humans such as mammals and other vertebrates are referred to by the term 'animal' in colloquial use (18).

Science (from the Latin *scientia*, meaning 'knowledge') is a systematic enterprise that builds and organises knowledge in the form of testable explanations and predictions. The definition of science is knowledge attained through study or practice. Therefore, science refers to a system of acquiring knowledge (18).

Animal science applies various biological, physical and social sciences to the problems associated with livestock production (18). Animal science is concerned with the science and business of producing domestic livestock species, including but not limited to beef cattle, dairy cattle, horses, poultry, sheep, goats and pigs. Animal science is also concerned with foods of animal origin: meat, dairy foods and eggs (18).

'Livestock' is a term used to refer to domesticated animals and poultry raised in an agricultural setting to produce commodities such as food, fibre, fertiliser and labour (18).

Animal husbandry is the branch of agriculture concerned with the domestication, production, care and breeding of domestic animals. In many parts of the world, people are essentially practising animal husbandry through being farmers, ranchers or sheep herders, or simply by taking care of large groups of livestock. Animal husbandry refers to the care and management of livestock, with the main responsibilities including:

- keeping the animal's living area hygienic
- preparing meals and feeding animals
- monitoring animal health and administering medicines
- overseeing animal training, breeding and butchering
- shearing wool or milking
- managing facilities and staff.

The academic contribution was first made as 'husbandmen' (animal farmers) in animal husbandry then as scientists to the livestock industry. The 60 years of transition from animal husbandry to animal science clearly ended in the USA in 1961, when the American Society of Animal Science was established (18). A number of Colleges or Faculties of Animal Husbandry were founded in the same year, awarding a BSc AH (Hons) degree, in East (now Bangladesh) and West (now Pakistan) Pakistan and India under the projects

funded by the United States Agency for International Development (USAID). However, India and Pakistan have re-established their composite degree in animal husbandry and veterinary science, whereas it remains bifurcated in Bangladesh (26).

Veterinary science is the system of acquiring knowledge about animals. However, veterinary science is also the subject which deals with the health and well-being of animals. Some countries and universities use 'veterinary science' as an equivalent term to 'veterinary medicine', which encompasses everything from preventive care to psychological analysis to complex surgical procedures (27).

Veterinary medicine (a branch of medicine) is the science and art that deals with the maintenance of health in animals and the prevention, alleviation and treatment of disease and injury in animals, and especially domestic animals. The 'art' in this context is the process of doing the work through the use of scientific concepts (8, 18). Technology is the practical application of knowledge (science), especially in a particular area such as veterinary medical clinical practice (18).

There is great confusion in the nomenclature of veterinary-related educational institutions and degrees all over the world. The VMAIs are named departments (a division of a school or college or faculty dealing with a particular field of knowledge e.g. Department of Microbiology); schools (a professional school is a part of a university); institutes (a school that works as a part or under contract to a state-organised educational establishment); academies (an educational organisation, normally private, that may or may not hold state recognition); colleges/faculties (a division within a university) and even universities (an institution of higher education and research which grants academic degrees in a variety of subjects). There are logical reasons to offer degrees with a science title (e.g. BVSc) from a faculty/college of veterinary science, and degrees with a medicine title (e.g. DVM) from a faculty/college of veterinary medicine. However, there is no justification for offering a medicine degree (DVM) from an institution with a science title because the two terms differ; the distinction being between pure science and science with art. The nomenclature of medicine (science with art)-related degrees and institutions is more justifiable in the veterinary medical profession than the nomenclature of science (acquiring knowledge)-related degrees and institutions.

The nomenclature used by veterinary-related universities throughout the world is very confusing. The title 'University of Veterinary Medicine' was used in 1778 in Hanover, 1975 in Vienna and 1992 in Slovakia, but the nomenclature of veterinary universities was later modified according to regional and institutional interests, without considering the scientific definition and scope of the

discipline. Some examples include 'Veterinary and Animal Sciences University' (Bangladesh, India, Pakistan), 'Animal and Fisheries Sciences University' (India) and 'Veterinary, Animal and Fisheries Sciences University' (India). Although all the veterinary degrees (BVSc, BVSc & AH, DVM, etc.) awarded by the different universities throughout the world are considered equivalent in some respects, there remains great variation in the nomenclature of these degrees.

A number of agricultural universities were established in India and Pakistan, beginning in 1960; these universities were headed by vice-chancellors without veterinary training. The deterioration of VMEs and the veterinary profession under the system of agricultural universities led to the establishment of separate universities for veterinary and animal sciences, and so far approximately 12 such universities have been established in India, 2 in Pakistan and 1 in Bangladesh. However, in addition to major degree programmes (BVSc & AH and DVM), these newly established universities have also introduced BSc degrees in poultry science and in dairy technology that have created confusion and increased competition between veterinary and non-veterinary graduates in the poultry and dairy industries. A similar problem has been created in Bangladesh by the award of two so-called equivalent degrees (BSc AH; DVM) in a technical profession.

Animal science is described as the 'study of the biology of animals that are under the control of humankind'; historically, animal science was called animal husbandry and the animals studied were livestock. A BS in animal science is offered at a number of colleges and universities in the USA, which allows graduates to follow a choice of careers:

- sales and management positions with feed and pharmaceutical companies
- managers of various farm companies
- laboratory technicians
- managing the care and well-being of zoological park collections (18)
- continued study to achieve a veterinary medical degree (DVM).

The University of Agricultural Sciences and Veterinary Medicine, Romania, under the Faculty of Animal Science and Biotechnology, offers two degrees, i) animal science (four years) and ii) biotechnologies in veterinary sciences (four years), whereas the Faculty of Veterinary Medicine offers a degree in veterinary medicine (six years) (28, 29). Recently, Van Hall Larenstein University of Applied Sciences, in the Netherlands, began to offer a Bachelor of Husbandry (para-veterinary degree) with the specifications of: i) applied animal science, ii) equine business and economics, iii) equine, leisure and sports and iv) international livestock management (30).

In addition, an online Bachelor's degree in animal science (the degree title is not available) has been introduced by North Carolina State University, USA, as a pre-veterinary course or to lay the groundwork for future graduate study in animal physiology, nutrition or genetics (31).

In the Indian sub-continent, under the USAID programme during the 1960s, the veterinary and animal husbandry composite degree programme (BSc Vet. Sci. & AH in Pakistan; BVSc in India) was bifurcated into two separate degrees (DVM and BSc AH). This bifurcation of so-called equivalent degrees was corrected in India to form the BVSc & AH programme, and more recently (2013) in Pakistan with the introduction of a dual degree (BSc AH + DVM) programme (32, 33, 34). The separate degrees still exist at the Bangladesh Agricultural University as equivalent degrees, DVM and BSc AH (35). In addition, the Patuakhali Science and Technology University in Bangladesh has begun to offer a BSc AH (Hons) degree along with the existing composite curricula (animal husbandry and veterinary medicine) DVM degree (36).

The dual degree programme was first introduced in 1871 at Cornell University, with four years required for a Bachelor of Veterinary Science (BVS) degree and an additional two years for a DVM degree (37). Later, the dual degree programme in the USA developed into BS (four years) + DVM (four years), to impart the knowledge and skills necessary for the diagnosis, treatment and prevention of disease and production problems in companion animals, farm animals, wildlife and laboratory animals (38). Recently, some countries have changed their (British-style) BVSc degree to an American-style DVM degree; for example, in 1984 the four-year BVSc degree programme in Japan was changed to a six-year DVM programme (15) and the dual degree BSc + DVM programme has recently been introduced in Australia (3). In the UK, the University of Nottingham has introduced a dual degree programme, awarding the BVMedSci + BVM BVS, which has appeared as a new addition to VME (39). France has also introduced a dual degree programme, DEDV + DVM; the DEDV is a five-year course and, after the fifth year, students submit a thesis on veterinary practice that earns them the DVM degree (40).

Bachelor's degrees in BMS and One Health, in the public health field, are offered by various academic institutions throughout the world (3). Biomedical science is a crucial endeavour in the modern world, with new medical discoveries and breakthroughs in disease management being achieved through research performed by biomedical scientists (41). The BMS degree is offered by different universities in Africa, Asia, Europe, Oceania and North America. However, Malaysia, the UK, Australia, Canada and the USA offer BSc/BS degrees in BMS (3). The BMS curriculum is usually designed to produce graduates with extensive knowledge, technical skills and expertise

to function in a variety of BMS professions, including as technicians and supervisors in biotechnology, biosafety, the pharmaceutical industry and biomedical research laboratories, as employees in governmental and regulatory agencies, and as faculty members in undergraduate teaching programmes (3).

Worldwide, nearly 75% of all emerging human infectious diseases in the past three decades have originated in non-human animals. Accordingly, different international organisations concerned with One Health have been founded globally, including:

- the One Health Commission (OHC), founded in 2010, with its headquarters in Kansas City; in 2014, it moved to North Carolina, USA
- the One Health Initiative Autonomous '*pro bono*' Team (2006–2007)
- the One Health Platform Foundation in Belgium.

According to the OHC definition, 'One Health is the collaborative effort of multiple health science professions, together with their related disciplines locally, nationally and globally to attain optimal health for people, domestic animals, wildlife, plants and our environment' (42). The AVMA defines One Health as 'the integrative effort of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals and the environment' (43).

There are different nomenclatures for the Bachelor's degree in both the medical (e.g. Bachelor of Medicine, Bachelor of Surgery [MBBS], Doctor of Medicine [MD]) and veterinary medical (e.g. BVSc, BVSc & AH, DVM) sciences, which are considered to be the core disciplines of One Health. However, these degrees are traditionally focused on health and disease in either humans or animals, and not on diseases that affect both humans and animals. It was assumed that graduates of the DVM + Master of Public Health (MPH) and similar postgraduate degrees in veterinary public health would be able to solve public health problems but the reality is very different, especially in the developing world. Recently, with the re-emergence of the One Health concept, some universities have initiated a Master's degree in One Health, with differing nomenclature (44, 45, 46, 47, 48, 49, 50, 51, 52). Similarly, some universities have also initiated Bachelor's (53, 54) and Master's (55, 56) degrees in food safety, and there is a dual degree programme, the DVM + MS in food safety (57), which is comparable to the DVM + MPH with a collaborative curriculum related to the One Health concept. In addition, many national and international One Health conferences are held globally that encourage collaboration with multidisciplinary institutions to promote effective policy development related to human, animal and environmental health. However, the progress of this collaborative approach is very limited and its activities

are confined to seminars and conferences. Therefore, there is a need to initiate a Bachelor's degree in One Health that should include food safety and zoonotic diseases within a multidisciplinary curriculum that would focus on both human and animal diseases, and especially on preventive medicine to prevent and control diseases in humans, animals and the ecosystem.

In Bangladesh, the Institute of Epidemiology and Disease Control and Research (IEDCR), the Ministry of Health and Family Welfare and the Epidemiology Unit, Department of Livestock Services have organised more than eight One Health conferences since 2008. Finally, 12 recommendations for strengthening the One Health approach have been made, but they are related only to developing coordination, not the development of a workforce (58). Therefore, the One Health approach is still limited to conference recommendations for a multidisciplinary approach. However, veterinarians have a responsibility to use their knowledge and influence in collaboration with other professionals to advance the health and welfare of animals, people in their communities and the environment, both locally and globally (59).

Veterinary graduates in nearly every country are required to be licensed prior to practising within the profession. Most countries require a non-national who holds a veterinary degree to pass a separate licensure exam for foreign graduates prior to practising veterinary medicine. In the USA, the Educational Commission for Foreign Veterinary Graduates (ECFVG) administers a four-step examination which is accepted by all American state and territorial veterinary licensing boards, the US Federal Government and the District of Columbia (60). In Europe, the European Parliament, which has some jurisdiction over the Member States of the European Union (EU), issued a directive on 30 September 2005 which provides for EU-wide standards for veterinary medical education and mutual recognition of veterinary degrees among Member States meeting these standards (61). As mentioned above, veterinary graduates from developed countries need to sit a licensure examination to obtain a licence to practise, whereas in developing countries, such as Bangladesh, there is no provision for a licensure exam and graduates simply apply to the Veterinary Council or equivalent to obtain a licence to practise.

The World Veterinary Association (WVA) was founded in 1959 and currently acts as a federation of over 80 veterinary medical associations, representing over 500,000 veterinarians across the world on six continents (62). The WVA is a professional and scientific organisation, serving the veterinary profession and the general public, with recognised roles and objectives (63). It works to promote animal health and welfare and public health globally through the One Health concept, and organises conferences. The WVA and World Medical Association (WMA) jointly organised the first

conference on One Health in Madrid, Spain, in 2015, on the theme of 'Strengthening collaboration between medical and veterinary medical doctors' and the second conference is scheduled to be held in November 2016 in Japan with the theme: 'Moving forward from One Health concept to One Health approach'. The veterinary medical profession expects the WVA to take an active role in minimising the discrimination related to the nomenclature of degrees and institutions. An OIE guideline is available for a VME 'core curriculum model' but not for the nomenclature of veterinary degrees, institutions and other essential factors that would reduce the wide gap between developing and developed countries in VME. Therefore, the global VME policy-makers must recognise the competencies required for veterinary graduates to fulfil national and international requirements.

Accreditation is usually defined as a status that shows the public that a VMAI has met and is maintaining high standards set by an accrediting agency. If a college is awarded accreditation this means that the institution meets certain standards of educational quality. There are at least four accreditation councils and boards actively working to achieve the accreditation of VMAIs throughout the world. These are:

- the American Veterinary Medical Association Council on Education (AVMA COE)
- the Australian Veterinary Board Council (AVBC)
- the European Association of Establishments for Veterinary Education (EAEVE)
- the Royal College of Veterinary Surgeons (RCVS), London, UK (64).

A comparison of the accreditation functions, policies and procedures of the AVMA COE, AVBC and RCVS is available online (64). The RCVS has a statutory duty to set and monitor the standards of veterinary degrees for registration purposes, and runs the statutory examination for membership for overseas veterinarians wishing to practise in the UK (64). The EAEVE was founded in 1988 and was initially based in Maisons-Alfort, France. Later, the administrative office was moved to Brussels, Belgium, and since 2007 the seat of the EAEVE and its offices have been in Vienna, Austria. In 2015, out of 110 VEEs in Europe, 96 were members of the EAEVE (65).

The main criteria used for assessment (the Standard of Accreditation) by the AVBC and AVMA COE are:

- organisation
- finances
- physical facilities and equipment
- library and learning resources
- animals and related resources
- admission and students

- curriculum
- clinical resources and clinical learning and teaching
- academic and support staff
- postgraduate training and continuing education
- research programmes
- outcome assessment (64).

The most widely accepted VMAI accrediting body internationally is the AVMA COE. Out of the 49 accredited VMAI reported by the AVMA COE, six are in Europe, five in Oceania and 38 in North America, which indicates that there is no accredited VMAI in Africa, Asia or South America (12, 13). According to the requirements for accreditation, the first, related to organisation (standard 1), is that the chief executive officer or dean of the institution must be a veterinary graduate (66), whereas in Bangladesh the chief executive, vice-chancellor and dean of the veterinary faculty and university are appointed as non-veterinary graduates.

Conclusions

Globalisation of VMEP is needed for veterinarians to work together and collaborate in global society. It appears from this review that, out of 194 countries, approximately 111 (57%) have established 597 VMAs with 15 different nomenclatures, and that they offer veterinary degrees with 54 different titles. In addition to the differences in the nomenclature of the academic institutions, degrees and training facilities, there are also significant disparities in the curricula, which vary greatly from country to country and even from university to university within a country. As a result, the quality and recognition of VME and veterinary graduates vary widely and many are not recognised

globally: only 49 VMAs are accredited by the AVMA COE worldwide. Therefore, a standard nomenclature for VMAs, degrees, core curricula and training facilities is required, as described by the AVMA COE, to meet international societal need. This review also shows that the dual degree (BS + DVM) programme produces quality veterinary medical graduates and will also help to prevent bifurcation of the veterinary profession in the developing world. The separate but equivalent status of the two different degrees (BSc AH; DVM) in VME awarded in Bangladesh is in contrast to the composite and dual degree programmes followed in other countries.

Veterinary students should be trained in BMS and in the One Health concept. It is suggested that the OIE may take the global lead in this, because it has the support of the World Trade Organization and its 180 Member Countries. In addition, the international organisations associated with the One Health programme, including the OIE, the World Health Organization and the Food and Agriculture Organization of the United Nations, should put pressure on the authorities, leaders and universities concerned to follow the international standard and produce veterinary medical graduates through a dual degree (BS, DVM) programme, following the standard 'core curriculum' and standard nomenclature for the institutions and degrees. Moreover, the Bologna process, which is a collective effort of public authorities, universities, teachers and students, together with stakeholder associations, employers, quality assurance agencies, international organisations and institutions, should work together to standardise VME at the global level. ■

Situation actuelle de l'enseignement de la médecine vétérinaire et défis de sa mondialisation dans le cadre du programme « Une seule santé »

M. Abdus Samad

Résumé

Il ressort d'une étude sur les programmes d'enseignement de la médecine vétérinaire dans le monde que cet enseignement est dispensé dans 111 pays sur les 194 étudiés (soit 57 %), par 597 établissements d'enseignement vétérinaire qui ont 15 dénominations différentes et délivrent 54 diplômes différents. La catégorie la plus importante (25 %) est celle des 148 facultés de médecine vétérinaire réparties dans 27 pays (14 %), qui délivrent un diplôme de médecine vétérinaire de niveau doctorat (DVM) ; viennent ensuite les 28 universités (5 %) réparties dans 9 pays délivrant un diplôme scientifique de niveau licence (BVSc).

Outre les trois facultés de médecine vétérinaire historiques, 23 autres facultés ont été créées dans le domaine vétérinaire, qui délivrent des diplômes en « sciences vétérinaires, animales et halieutiques », ce qui ne correspond pas au contenu d'un programme d'enseignement de la médecine vétérinaire.

La création de diplômes scientifiques de niveau licence (BSc) en zootechnie, sciences avicoles ou technologie des productions laitières a créé une confusion et exacerbé la concurrence avec les vétérinaires diplômés pour les postes du secteur laitier ou avicole. Certains pays, dont le Japon et l'Australie ont abandonné le système britannique d'un diplôme unique et adopté le système américain du double diplôme.

Le Conseil d'éducation de l'Association américaine des médecins vétérinaires a mis en place un classement des 597 établissements d'enseignement de la médecine vétérinaire dans le monde, suivant qu'ils sont accrédités ($n=49$; 8,2 %), listés ($n = 468$; 78,4 %) ou non listés ($n = 80$; 13,4 %). La diversité des intitulés des titres et diplômes, des programmes d'enseignement et des niveaux de qualification en médecine vétérinaire risque d'affecter la mondialisation de cet enseignement dans une perspective « Une seule santé ». Les organisations professionnelles et internationales dédiées à la médecine vétérinaire doivent réfléchir de manière créative à l'avenir de son enseignement dans le monde, en particulier à la harmonisation de la nomenclature des institutions, des titres et diplômes, des associations professionnelles et des programmes de formation initiale, afin de contribuer au développement des sciences médicales et du concept Une seule santé à l'échelle nationale et mondiale.

Mots-clés

Classement des universités – Diplôme de médecine – Diplôme double – Diplôme scientifique – Enseignement de la médecine vétérinaire – Nomenclature des institutions et des diplômes – Sciences biomédicales – Une seule santé.



Situación actual y dificultades para mundializar la enseñanza de la medicina veterinaria al servicio del programa de «Una sola salud»

M. Abdus Samad

Resumen

Del estudio mundial de los programas de enseñanza de medicina veterinaria se desprende que, de un total de 194 países, en 111 (57%) hay 597 establecimientos de enseñanza de medicina veterinaria con 15 denominaciones distintas, que dispensan 54 titulaciones diferentes en veterinaria. La mayor parte de las universidades ($n = 148$; 25%), sitas en 27 (14%) países, otorgan títulos en medicina veterinaria. Siguen las titulaciones científicas que dispensan 28 (5%) universidades de 9 (5%) países. Además de tres facultades originales de medicina veterinaria, se han creado 23 facultades relacionadas de uno u otro modo con la veterinaria cuyos programas de estudios, con títulos como «Ciencia veterinaria, animal y pesquera», no se corresponden con los programas de enseñanza de medicina veterinaria. La concesión de títulos de licenciatura en «Zootecnia», «Ciencia avícola» o «Tecnología de la producción lechera» suscitó confusión e incrementó la competencia con los titulados en veterinaria por los puestos de trabajo en los sectores lechero y avícola. Algunos países, como el Japón y Australia, han sustituido el sistema británico de titulaciones únicas por el sistema americano de titulaciones duales.

El Consejo sobre Enseñanza de la Asociación Americana de Medicina Veterinaria ha clasificado los 597 establecimientos de enseñanza de medicina veterinaria en tres categorías: «homologados» ($n = 49$; 8,2%), «referenciados» ($n = 468$; 78,4%) y «no referenciados» ($n = 80$; 13,4%). La heterogeneidad reinante en la nomenclatura de establecimientos de enseñanza, titulaciones, planes de estudios y nivel de formación de los titulados en veterinaria puede obstaculizar la mundialización de la enseñanza de la medicina veterinaria con arreglo al concepto de «Una sola salud». Para contribuir eficazmente a las ciencias biomédicas y a la aplicación de los principios de «Una sola salud» a escala nacional y mundial, los profesionales de la medicina veterinaria y las organizaciones internacionales competentes deben reflexionar creativamente sobre el futuro de la enseñanza de la medicina veterinaria en el mundo, sobre todo por lo que respecta a la normalización de la nomenclatura de establecimientos, titulaciones, colegios profesionales y planes troncales de estudios.

Palabras clave

Ciencia biomédica – Clasificación de universidades – Enseñanza de la veterinaria – Nomenclatura de establecimientos y titulaciones – Titulación científica – Titulación dual – Titulación médica – Una sola salud.



References

- Samad M.A. & Ahmed M.U. (2003). – History and scope of veterinary medicine. *Bangl. J. Vet. Med.*, **1** (1), 1–8. Available at: www.banglajol.info/index.php/bjvm (accessed on 10 September 2016).
- Rahman S.A. (2004). – The history of veterinary education in India. *J. Vet. Med. Educ.*, **31** (1), 55–61. doi:10.3138/jvme.31.1.55.
- Samad M.A. (2016). – Veterinary medical education and profession: past, present and future with especial emphasis to biomedical sciences and one health concept in Bangladesh. *BD Vet. Med. Rec.*, **2** (1), 1–28. Available at: www.researchgate.net/publication/301349085_Veterinary_Medical_Education_and_Profession_Past_Present_and_Future_with_Especial_Emphasis_to_Biomedical_Sciences_and_One_Health_Concept_in_Bangladesh (accessed on 16 November 2017).
- Gardiner A. & Rhind S. (2013). – Taking a history on veterinary education. *Vet. Rec.*, **173** (16), 388–393. doi:10.1136/vr.f6273.
- World Organisation for Animal Health (OIE) (2009). – Evolving veterinary education for a safer world: recommendations. Final Version_13_11_2009. Available at: www.oie.int/doc/ged/D6709.PDF (accessed on 8 May 2017).
- World Organisation for Animal Health (OIE) (2013). – OIE global conference on veterinary education and the role of the veterinary statutory body. Available at: <http://doc.oie.int:8080/dyn/portal/index.seam?page=alo&alold=31986&fond=&cid=914> (accessed on 29 August 2016).
- World Organisation for Animal Health (OIE) (2013). – Veterinary education core curriculum OIE guidelines. Available at: www.oie.int/Veterinary_Education_Core_Curriculum.pdf (accessed on 29 August 2016).
- Samad M.A. (2014). – Comparison of veterinary medical education programs between SAARC countries and the United States. *J. Nature Sci. Sus. Tech.*, **8** (4), 495–520. Available at: www.novapublishers.com/catalog/product_info.php? (accessed on 10 September 2016).
- World Veterinary Association (WVA) (2016). – Universities, institutions, colleges and schools awarding veterinary degrees. Available at: www.worldvet.org/education.php?view=overview&cat=schools (accessed on 30 August 2016).
- American Veterinary Medical Association (AVMA) (2016). – AVMA listed veterinary colleges of the world. Available at: www.avma.org/ProfessionalDevelopment/Education/Foreign/Documents/ecfvgl2.pdf (accessed on 30 August 2016).
- American Veterinary Medical Association (AVMA) (2015). – Veterinary medical degrees granted throughout the world. ECFVG policies and procedures – AVMA listed veterinary colleges of the world. Available at: www.avma.org/ProfessionalDevelopment/Education/Foreign/Pages/ECFVG-world-colleges-degrees.aspx (accessed on 30 August 2016).

12. American Veterinary Medical Association (AVMA) (2016). – Accredited colleges of veterinary medicine. Available at: www.avma.org/ProfessionalDevelopment/Education/Accreditation/Colleges/Documents/colleges_accredited.pdf (accessed on 8 May 2017).
13. American Veterinary Medical Association (AVMA) (2016). – Accredited veterinary colleges. Available at: www.avma.org/ProfessionalDevelopment/Education/Accreditation/Colleges/Pages/colleges-accredited_results.aspx (accessed on 8 May 2017).
14. Wikipedia (2016). – List of schools of veterinary medicine. Available at: https://en.wikipedia.org/wiki/List_of_schools_of_veterinary_medicine (accessed on 10 September 2016).
15. Japan Veterinary Medical Association (JVMA) (2013). – Overview of veterinary medicine in Japan. Available at: nichiju.lin.gr.jp/eng/Medicine_in_japan2013.pdf (accessed on 8 May 2017).
16. Anon. (2016). – Ranking Web of universities. Available at: www.webometrics.info/en/world (accessed on 10 September 2016).
17. Samad M.A. (2015). – Issues and prospects of strategic planning for higher education especially in veterinary medical education in Bangladesh. *BD Vet. Med. Rec.*, **1** (2), 59–80. Available at: www.bvmr-fvs.org (accessed on 10 September 2016).
18. Samad M.A. (2015). – Challenges and prospects of academic quality assurance for DVM degree program in Bangladesh. *BD Vet. Med. Rec.*, **1** (1), 1–19. Available at: www.bvmr-fvs.org (accessed on 10 September 2016).
19. World Organisation for Animal Health (OIE) (2010). – Glossary. Terrestrial Animal Health Code. OIE, Paris. Available at: web.oie.int/eng/normes/mcode/en-glossaire.pdf (accessed on 8 May 2017).
20. Anon. (2014). – The number of countries in the world. Available at: <http://geography.about.com/cs/countries/a/numbercountries.htm> (accessed on 30 August 2016).
21. World Organisation for Animal Health (OIE) (2016). – The 180 OIE members. Available at: www.oie.int/index.php?L=3&rid=103 (accessed on 30 August 2016).
22. World Organisation for Animal Health (OIE) (2014). – Veterinary education. Available at: www.oie.int/en/support-to-oie-members/veterinary-education/ (accessed on 16 November 2017).
23. Jorna T. (2006). – European veterinary education: an FVE perspective. *J. Vet. Med. Educ.*, **33** (2), 161–164. doi:10.3138/jvme.33.2.161.
24. Wikipedia (2014). – Veterinary physician. Available at: https://en.wikipedia.org/wiki/Veterinary_physician (accessed on 30 August 2016).
25. Baker H.J. (2011). – 250 years of veterinary service to animal and human health. *J. Vet. Med. Educ.*, **38** (3), 209. doi:10.3138/jvme.38.3.209.
26. Samad M.A. & Islam M.T. (2016). – Comparative evaluation of the different organizations of Bangladesh and India provided internship training to the 13th internship batch of DVM students of Bangladesh Agricultural University. *BD Vet. Med. Rec.*, **2** (1), 37–42. Available at: www.bvmr-fvs.org (accessed on 10 September 2016).
27. Anon. (2016). – Best online degrees in veterinary science. Available at: www.onlinecollege.org/bachelors/veterinary-science (accessed on 30 August 2016).
28. Anon. (2015). – World Association for the History of Veterinary Medicine. Available at: <http://wahvm.org/> (accessed on 30 August 2016).
29. Anon. (2016). – University of Agricultural Sciences and Veterinary Medicine of Iasi, Romania. Available at: www.uaiasi.ro/index.php?lang=en (accessed on 10 September 2016).
30. Anon. (2017). – Bachelor of Animal Husbandry (BSc). Van Hall Larenstein, University of Applied Sciences. Available at: [www.bachelorstudies.com/Bachelor-of-Animal-Husbandry-\(BSc\)/Netherlands/VHL-University-of-Applied-Sciences/](http://www.bachelorstudies.com/Bachelor-of-Animal-Husbandry-(BSc)/Netherlands/VHL-University-of-Applied-Sciences/) (accessed on 8 May 2017).
31. Anon. (2017). – Online animal science degree program overviews. Available at: study.com/articles/Online_Animal_Science_Degree_Program_Overviews.html (accessed on 8 May 2017).
32. Anon. (2003). – Lahore: Faisalabad varsity's DVM degree upgraded. Available at: www.dawn.com/news/118548/Lahore-faisalabd-varsity-s-dvm-degree-upgraded (accessed on 30 August 2016).
33. Eduvision (2016). – 17 institutions are offering DVM Veterinary medicine in Pakistan. Available at: www.eduvision.edu.pk/institutions-offering-veterinary-medicine-with-field-medical-sciences-at-bachelor-level-in-pakistan-page-1 (accessed on 30 August 2016).
34. Farhatullah (2013). – Schemes of studies. The University of Agriculture, Peshawar, Pakistan. Available at: www.aup.edu.pk/schemes-studies.php (accessed on 30 August 2016).
35. Anon. (2014). – Animal husbandry. Bangladesh Agricultural University. Available at: www.bau.edu.bd/pages/view_2/NDg= (accessed on 8 May 2017).
36. Anon. (2016). – B.Sc. AH (Hons). Undergraduate programme. Patuakhali Science and Technology University. Available at: www.pstu.ac.bd/site/main/academic/undergraduteprogram (accessed on 10 September 2016).
37. Anon. (2016). – Our history: history and timeline. College of Veterinary Medicine, Cornell University. Available at: www2.vet.cornell.edu/about-us/our-history (accessed on 30 August 2016).

38. Association of American Veterinary Medical Colleges (AAVMC) (2017). – The future of veterinary medicine. Available at: www.aavmc.org (accessed on 8 May 2017).
39. Cobb K.A., Brown G.A., Hammond R.H. & Mossop L.H. (2015). – Alumni-based evaluation of a novel veterinary curriculum: are Nottingham graduates prepared for clinical practice? *Vet. Rec. Open*, **2** (2), e000116. doi:10.1136/vetreco-2015-000116.
40. Anon. (2015). – EnvA – École nationale vétérinaire d'Alfort. Available at: www.vet-alfort.fr/web/en/4/3-enva-overview.php (accessed on 10 September 2016).
41. Warren A.L. & Donnon T. (2013). – Optimizing biomedical science learning in a veterinary curriculum: a review. *J. Vet. Med. Educ.*, **40** (3), 210–222. doi:10.3138/jvme.0812-070R.
42. One Health Commission (OHC) (2016). – What is One Health? Available at: www.onehealthcommission.org/en/why_one_health/What_is_one_health/ (accessed on 12 September 2016).
43. American Veterinary Medical Association (AVMA) (2017). – One Health – what is One Health? Available at: www.avma.org/KB/Resources/Reference/Pages/One-Health94.aspx (accessed on 8 May 2017).
44. Anon. (2016). – MSc in One Health. The Royal (Dick) School of Veterinary Studies, University of Edinburgh. Available at: www.ed.ac.uk/vet/studying/postgraduate/taught-programmes/one-health (accessed on 12 September 2016).
45. Anon. (2016). – MSc One Health degree. School of Veterinary Medicine, Ross University. Available at: <http://veterinary.rossu.edu/postgraduate/msc-one-health.html> (accessed on 16 November 2017).
46. Anon. (2016). – Master of Science (One Health). Massey University, New Zealand. Available at: www.massey.ac.nz/massey/learning/programme-course/programme.cfm?major_code=2928&prog_id=92431 (accessed on 12 September 2016).
47. Anon. (2016). – MSc One Health (Infectious Diseases). London School of Hygiene and Tropical Medicine. Available at: www.lshmt.ac.uk/study/masters/onehealth.html (accessed on 12 September 2016).
48. Anon. (2016). – MSc in Animal/Human/Ecosystem Health. University of Pretoria. Available at: www.up.ac.za/msc-animal-human-ecosystem-health (accessed on 12 September 2016).
49. Anon. (2016). – MSc in Global Health Science. University of Oxford. Available at: www.ox.ac.uk/admissions/graduate/courses/msc-global-health-science (accessed on 12 September 2016).
50. Anon. (2016). – MSc in Global Health. Department of Social Policy, London School of Economics and Political Sciences. Available at: www.lse.ac.uk/socialPolicy/Study/masters/mscGlobalHealth.aspx (accessed on 12 September 2016).
51. Anon. (2016). – Master of Health Science (MHS) One Health. Department of Environmental and Global Health, College of Public Health and Health Professions, University of Florida. Available at: egh.php.ufl.edu/degree-programs/masters-programs/mhs-one-health/ (accessed on 8 May 2017).
52. Anon. (2016). – Official Master's Degree in Zoonoses and One Health. Universitat Autònoma de Barcelona. Available at: www.uab.cat/web/estudiar/official-master-s-degrees/general-information/zoonosis-and-one-health-1096480962610.html?param1=1345694246010 (accessed on 9 May 2017).
53. Anon. (2016). – Bachelor of Science (Honours) in Food Safety and Technology. Hong Kong Polytechnic University. Available at: www.educationpost.com.hk/courses/hong-kong-polytechnic-university/bachelor-science-honours-food-safety-technology (accessed on 9 May 2017).
54. Anon. (2016). – The curriculum design of veterinary food safety study program (full-time). Lithuanian University of Health Sciences. Available at: www.lsmuni.lt/media/dynamic/files/4117/luhs_veterinaryfoodsafety.pdf (accessed on 12 September 2016).
55. Anon. (2017). – MSc Food Safety. Wageningen University. Available at: www.masterstudies.com/MSc-Food-Safety/Netherlandswageningen-UnV/ (accessed on 9 May 2017).
56. Anon. (2016). – MSc Food Safety. Manchester Metropolitan University, United Kingdom. Available at: www2.mmu.ac.uk/food-and-nutrition/courses/postgraduate-courses/food-safety/ (accessed on 12 September 2016).
57. Anon. (2016). – Dual degree programs. The DVM–Master of Science in Food Safety. College of Veterinary Medicine, Michigan State University. Available at: <https://cvm.msu.edu/future-students/dual-degrees> (accessed on 12 September 2016).
58. Rahman M. & Debnath N.C. (2015). – Abstract Book. 8th One Health Bangladesh Conference. Transforming One Health agenda to One Health movement. Available at: www.fao.org/bangladesh/news/detail-event/-/en/c/283696/ (accessed on 9 May 2017).
59. Osburn B.I., Betts J., Granstrom D.E., Green E.M., Krehbiel J.D., Lawrence J., McCrystle D., Reed W.M. & Thomas R.M. (2014). – Roadmap for veterinary medical education in the 21st century: responsive, collaborative, flexible. Available at: www.aavmc.org/data/files/navmec/navmec_roadmapreport_web_booklet.pdf (accessed on 30 August 2016).
60. American Veterinary Medical Association (AVMA) (2016). – Educational Commission for Foreign Veterinary Graduates. Available at: www.avma.org/ProfessionalDevelopment/Education/Foreign/Pages/default.aspx (accessed on 30 August 2016).

61. Vaarten J. (2009). – OIE conference: Evolving veterinary education for a safer world. Federation of Veterinarians of Europe. FVE/doc/09/060. Available at: www.fve.org/news/position_papers/education/060_oie_education_conference_october_2009_presentation_jvaarten.pdf (accessed on 10 September 2016).
62. Pandelas C.F. (2008). – International veterinary organizations – roles and objectives. *Luc. Stin. Med. Vet.*, **XLI**, 38–41. Available at: www.usab-tm.ro/vol8MV/7_vol8.pdf (accessed on 30 August 2016).
63. Harris J.M. (2009). – Veterinary education: meeting society's needs. *J. Vet. Med. Educ.*, **36** (3), 247–248. doi:10.3138/jvme.36.3.247.
64. Anon. (2016). – Accreditation system for veterinary schools by Australian Veterinary Board Council (AVBC), American Veterinary Medical Association (AVMA) and Royal College of Veterinary Sciences (RCVS). Available at: www.ugc.edu.hk/eng/doc/ugc/publication/report/vstfreport/accreditation.pdf (accessed on 30 August 2016).
65. European Association of Establishments for Veterinary Education (EAEVE) (2016). – The Association: foundation, mission and objectives. Available at: www.eaeve.org/about-eaeve/mission-and-objectives.html (accessed on 30 August 2016).
66. American Veterinary Medical Association (AVMA) (2016). – Accreditation: policies and procedures of the AVMA Council on Education, May 2016, 148 pp. Available at: www.avma.org/Professional/Development/Education/Accreditation/Colleges/Documents/coe_pp.pdf (accessed on 9 May 2017).
-

