

## AN ABSTRACT OF THE THESIS OF

Kiersten K. Forsyth for the degree of Honors Baccalaureate of Science in Animal Sciences presented on May 23, 2013. Title: Comparison of Veterinary Curriculum between Veterinary Schools in the United States, English Speaking Countries (non-United States), and Non-English Speaking Countries.

Abstract Approved:

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Michelle Kutzler

Veterinary medicine impacts everyone in the world to some degree and veterinary medicine is taught in some format in every country across the globe. However, veterinary education differs between countries due to the environmental and cultural variations. The purpose of this study was to investigate how veterinarians are trained in twelve developed countries with regard to: (1) the proportion of small and large animal medicine and surgery in the curriculum, (2) the use of online courses, (3) preparation for further post-graduate education, and (4) the percentage of public health in the veterinary curriculum. Online questionnaires were created and distributed via email to all the colleges of veterinary medicine in the United States, selected English speaking countries outside the United States, and non-English speaking countries. Of those sent out, only 4 were received back with sufficient information from veterinary colleges within the United States, 4 from English speaking countries outside the United States, and 5 from non-English speaking countries. There were very little differences found between veterinary colleges in the United States, other English-speaking countries, and non-English-speaking countries. Veterinary colleges in English speaking countries outside the United States had a higher percentage of the curriculum dedicated to large animal medicine and surgery than veterinary colleges in the United States and non-English

speaking countries. Veterinary colleges in the United States had a greater percentages of curriculum as electives compared to percentage of required curriculum in large animal medicine and surgery than other English speaking countries outside of the United States and non-English speaking countries ( $P=0.0304$ ).

Keywords: veterinary education, public health education, small animal medicine, online veterinary education, post-graduate veterinary education opportunities

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Comparison of Veterinary Curriculum between Veterinary Schools in the United States,  
English Speaking Countries (non-United States), and Non-English Speaking  
Countries

by

Kiersten K. Forsyth

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## **Hypotheses**

1. All developed countries require both large animal as well as small animal medicine and surgery as part of their veterinary curricula.
2. Online courses are not frequently utilized as part of the veterinary curricula in any developed countries regardless of language spoken.
3. All developed countries offer and encourage veterinary post-graduate education and training opportunities for their students.
4. Public health education is an important aspect of the veterinary curricula for all developed countries, and as such, is required for all students.

## **Objectives**

The purpose of this study was to compare the veterinary education between United States, English speaking countries outside the United States, and non-English speaking countries regarding: (1) the amount of small animal medicine and surgery in the curriculum, (2) the use of online courses in the curriculum, (3) preparation for further post-graduate education, and (4) the amount of public health in the curriculum.

## **Introduction**

Veterinary medicine curriculum is taught in some format in every country across the globe. There are more than 500 veterinary colleges, of which about 10% are accredited by the Association of American Veterinary Medical Colleges (AAVMC) [1, 2]. The educational curriculum varies widely between colleges and countries because of the diversity of the cultures and environment.

Veterinary schools were founded for similar reasons. Historically, veterinary medicine has been strongly influenced by agriculture and regulated by the government. Ancient records show that herbal medicine has been used to treat animal diseases in China since at least 476 BC [3]. In 1904, veterinary colleges were established in China to teach Western veterinary medicine for farm animals [3]. Only recently has a curriculum for small animals been added [3].

In Turkey, records of veterinary medicine education date back to the Ottoman era where the practice was passed on in a master/apprentice fashion [4]. It wasn't until 1842 that Turkish veterinary schools were established to fulfill a need for military veterinarians. Those veterinarians were needed to attend to an epidemic of disease in army animals, not to work with animals owned by the public [4]. In 1927, Turkish veterinary medicine was reformed to meet other standards across the world as well as to solve the country's agricultural problems [4].

In Great Britain, the emphasis of early veterinary education was on equine medicine and surgery [5]. The majority of graduates went into the military or private practice which was dominated by equine interests at the time [5]. Public health became

an important part of the British curriculum at the beginning of the twentieth century as veterinarians moved away from their positions in agriculture and within the military to aid in food inspection and hygiene [5].

### *Education in Small Companion Animal Medicine*

Following the initial influence of agriculture and prevalence of large animal medicine and surgery, small companion animals have also become a major part of veterinary medicine in most developed countries. Small animals used as pets or working as therapy and guidance animals are treated differently than agricultural animals. According to an American Veterinary Medical Association (AVMA) 2006 survey of companion animal ownership in the United States, 6 out of 10 households owned at least one pet [6]. Because of the importance people have placed on companion animals and their prevalence in society, many current veterinary school graduates are choosing to work in a small animal practice rather than in a large animal practice. This is true in many parts of the world [7]. For example, in Japan, 36.7% of veterinarians worked in small animal practice compared to only 11.7% who worked in large animal practice in 2006 [8]. However, this is not true of every country. For many African veterinary schools, veterinarian education focuses on efficient treatment and control of livestock animal disease [9]. Due to the historic importance of livestock and the recent influence small animals have had, we hypothesize that all developed countries require both large animal as well as small animal medicine and surgery as part of their veterinary curricula.

### *Online Education*

Many changes regarding veterinary curricula have taken place over time, and so have methods for educating. When first introduced, online courses were limited to email and posting to bulletin boards, but now there is greater interaction using web collaboration software [10]. Many veterinary professionals participate in online communities for professional continuing education [11]. Students are encouraged to participate in online communities to receive up-to-date information and advice, as well as share their expertise with others [12]. Online education allows for students from all corners of the world to learn using materials prepared by experts from specific fields of study, with all materials globally accessible [10]. Lectures, courses, and even full degree programs are becoming available online [13]. Such learning has become an important element in education; however, this is not distributed evenly among countries, institutions, or educational disciplines [14].

While online databases and courses are currently offered in the area of veterinary medicine, many of these are only offered in a few languages determined by the area of origin of the programs. The Network of Veterinary Information and Communication technologies in Education (NOVICE), a collaborative project between five European veterinary schools aiming to develop a web-based professional network for veterinarians, veterinary students, and veterinary educators to support lifelong learning, is an example of one online community available in Europe [12]. The online, graduate-level, interactive course in animal welfare assessment offered at Michigan State University is an example of available online courses offered to supplement the veterinary curriculum [10]. Some of the barriers to the success of these programs as well as some of their

benefits are listed in Table 1. These advances in technology are able to augment learning and ideally make information more readily available to veterinary students and veterinary professionals around the world. Despite the prevalence of online courses in other educational fields, we hypothesize online courses are not frequently utilized as part of the veterinary curricula in any developed countries regardless of language spoken.

### *Post-Graduate Education*

Advances have arisen to enhance education not only through the use of technology but also through the specialization of veterinary fields. According to the European Board for Veterinary Specialization, there are 20 different recognized organizations which grant specialization as of 2005 (Table 2) [15]. The AVMA American Board of Veterinary Specialties recognizes 22 veterinary specialty organizations that provide veterinarians post-graduate education for specialization (Table 3) [16]. Although many primary care practitioners are expanding their services and developing greater expertise in specialties such as dentistry, internal medicine, radiology, and surgery, 27% of veterinarians say they refer 6 to 10 cases per month [17]. Veterinary specialization requires post-graduate training. An increase in specialization equates to an increase in post-graduate education. In fact, 65% of the senior students at one veterinary school plan on participating in future residencies [18]. Not every college offers post-graduate opportunities for their students and not all specialties are included in those offered at each veterinary school. Post-graduate education provides additional opportunities to graduates, and therefore we think it is likely that developed countries

may offer and encourage post-graduate education and specialized training opportunities in the veterinary field.

### *Public Health Education*

In developing countries, veterinary education tends to focus on clinical training and specialization of individual medicine (as in the North American and European models) or focus on a general training with more emphasis on population medicine for animal production and public health [19]. Public health education is becoming a more important part of veterinary medicine worldwide. With respect to emerging infectious diseases, of the 1400 pathogens affecting humans today, 800 originated in animal hosts [19].

The World Health Organization defined veterinary public health as “the sum of all contributions to the complete physical, mental, and social well-being of humans through an understanding and application of veterinary science” [20]. This includes zoonosis, food safety, environmental studies, and epidemiology, all of which make the study of human diseases and veterinary medicine inseparable [21]. The need for veterinary public health increases with the growing concerns for food hygiene and inspection [5]. One of the most frequently requested tasks for veterinarians is to guarantee the safety of food produced for human consumption [19]. In 2006, 25.4% of veterinarians in Japan were civil servants engaged mainly in public health services [7]. Unlike in Japan, there is a shortage of veterinarians serving in the areas of public health and food safety in the United States [22].



Table 1: Positive and negative aspects of NOVICE and the online animal welfare course at Michigan State University

	Online Programs	
	NOVICE (Network of Veterinary Information and Communication technologies in Education)	Online Animal Welfare Course at Michigan State University
Barriers to Success	Limited technical knowledge and ability of veterinarians and veterinary students	Online courses tend to be less involved or interactive for students
	Unknown quality of information of the internet	Only available to those who register, must be taken online
	Professionalism and confidentiality regarding patient cases	Not many faculty teach Animal Welfare
Combating the Barriers	Available online technical support	Students presented with hypothetical situations and comparative exercises that require interactive responses
	Site limited to veterinarians, veterinary educationalists, and veterinary students	Students from around the globe are able to register, rather than only students physically attending the University
	Provides users with information regarding online professionalism	Collaboration between experts from multiple locations is possible
Benefits of Program	Convenient access to up-to-date information	Communication and interaction available between students
	Unintentional learning through participation	Information on a rarely covered topic is available to students worldwide
	Professional networking	Students receive graduate level credit for completing course

Table 2. EBVS recognized specialty colleges [21]

<b>European Board for Veterinary Specialisation Recognized Colleges</b>	
<u>Specialty Organizations</u>	<u>Abbreviations</u>
European College of Avian Medicine and Surgery	ECAMS
European College of Animal Reproduction	ECAR
European College of Bovine Health Management	ECBHM
European College of Equine Internal Medicine	ECEIM
European College of Laboratory Animal Medicine	ECLAM
European College of Porcine Health Management	ECPHM
European College of Anaesthesiology	ECVA
European College of Veterinary Behavioral Medicine - Companion Animals	ECVBM-CA
European College of Veterinary Comparative Nutrition	ECVCN
European College of Veterinary Dermatology	ECVD
European College of Veterinary Diagnostic Imaging	ECVDI
European College of Veterinary Internal Medicine - Companion Animals	ECVIM-CA
European College of Veterinary Neurology	ECVN
European College of Veterinary Ophthalmology	ECVO
European College of Veterinary Pathology	ECVP
European College of Veterinary Public Health	ECVPH
European College of Veterinary Pharmacology and Toxicology	ECVPT
European College of Veterinary Surgery	ECVS
European Veterinary Dentistry College	EVDC
European Veterinary Parasitology College	EVPC

Table 3. AVMA fully recognized specialties and specialty organizations\* [22]

<b>American Veterinary Medical Association Recognized Specialties</b>	
<u>Specialty Organizations</u>	<u>Specialties</u>
American Board of Veterinary Practitioners	Avian Practice
	Beef Cattle Practice
	Canine and Feline Practice
	Canine Practice
	Dairy Practice
	Equine Practice
	Feline Practice
	Food Animal Practice
	Swine Health Management
American Board of Veterinary Toxicology	Toxicology
American College of Laboratory Animal Medicine	Laboratory Animal Medicine
American College of Poultry Veterinarians	Poultry
American College of Theriogenologists	Reproductive Medicine
American College of Veterinary Anesthesiologists	Anesthesiology
American College of Veterinary Behaviorists	Behavior
American College of Veterinary Clinical Pharmacology	Pharmacology
American College of Veterinary Dermatology	Dermatology
American College of Veterinary Internal Medicine	Cardiology
	Internal Medicine
	Neurology
	Oncology
American College of Veterinary Microbiologists	Bacteriology/Mycology
	Immunology
	Microbiology
	Parasitology
	Virology
American College of Veterinary Nutrition	Nutrition
American College of Veterinary Ophthalmologists	Ophthalmology
American College of Veterinary Pathologists	Pathology
American College of Veterinary Preventive Medicine	Epidemiology
American College of Veterinary Radiology	Radiation Oncology
	Radiology
American College of Veterinary Surgeons	Surgery
American College of Zoological Medicine	Zoological Medicine
American College of Veterinary Emergency & Critical Care	Critical Care
American Veterinary Dental College	Dentistry

\* Those with provisional recognition have not been included.

A partnership between physicians and veterinarians has formed through the One Health Initiative, started in 2007 by the One Health Initiative Task Force [23]. The One Health Initiative represents global health with more than 40 organizations and more than 500 prominent scientists, physicians, and veterinarians endorsing it worldwide [24]. One of the main goals of the One Health Initiative is to integrate the educational systems between medical schools, veterinary schools, and schools of public health to improve cross-disciplinary communication and increase understanding of zoonosis [23].

Veterinary schools need to teach public health as a stand-alone topic taught by veterinary public health faculty. Twenty-two United States veterinary schools have advanced post-graduate training available in public health, epidemiology, or preventative medicine and of those US schools only four offered a dual Doctorate of Veterinary Medicine/Master of Public Health Degree in 2003 [22]. Because veterinary public health is major topic in veterinary medicine, we hypothesize public health education is an important aspect of the veterinary curricula for all developed countries, and as such is required for all students.

## Methods

This study was conducted as a comparison between veterinary colleges from developed countries around the globe. An online survey was created and distributed via email request to take an online survey to colleges of veterinary medicine in twelve developed countries (six English speaking countries including the United States and six non-English speaking countries) (see *Survey Distribution* section below).

SurveyMonkey.com was the website used for conducting this survey. Test surveys were created and distributed to random subjects not affiliated with this study to familiarize the authors with the format of the website before the creation of the survey. The study protocol was reviewed and approved by the institutional review board of Oregon State University.

### *Survey Development*

Survey questions were designed to request information on the content of the curricula. Curricular content topics were derived from background information provided by communication with veterinarians and from a literature review. The survey consisted of a total of thirty questions. However, an individual respondent would only be presented with 22 or 23 questions depending on whether that college utilizes a credit hour system or some other method. Survey questions included eight “yes-no” questions, twenty “free response” questions, and two “multiple choice”/“mark-all-that-apply” questions.

The survey was organized into seven pages of questions (Appendix A). The first page solicited identifying information to categorize respondents. The first question

asked for the country of the responding veterinary school. This answer was required and the survey could not be continued until answered. The second question asked for the name of the veterinary school, which was optional. A disclaimer was provided stating that college name would only be used to prevent duplicate responses thus college identification would not be used during data analysis or revealed during the results of the survey. These questions were both of the “free response” type.

The second page focused on “Clinical Experiences” in the veterinary curriculum. This section solicited information regarding the amount of time students spend working with animals. The first question asked how many weeks veterinary students are required to spend working with animals under the guidance of practicing veterinarians prior to graduation. This was followed by asking what percentage of that practice time is related to public health. Both questions were of the “free response” type.

The third page only had one “yes-no” question to determine if the college was structured on a credit hour based system. If the respondent answered “yes” they were directed to the fourth page, titled “Curriculum: Credit Hour.” If the respondent answered “no” or “don’t know” they were directed to the fifth page, titled “Curriculum: Non-Credit Hour.”

The fourth and fifth sections of the survey requested information regarding the amount of the curriculum spent on certain topics. If the curriculum did not utilize credit hours, respondents were asked to answer in terms of percentages. These topics included large animal medicine or surgery, small animal medicine or surgery, public health education, and elective courses. Of the questions, seven were “free response” type and one was a multiple choice question. The multiple choice question asked the respondent

to mark all answers which applied to the college's goal for public health education. An "(other please specify)" option was also provided with a "free response" space.

The next section, titled "Post-graduate Education," requested information regarding expectations of graduating students and opportunities provided by the university for post-graduate education. The first two questions were of the "free response" type, asking about the percentage of the graduating class expected to continue in post-graduate education and training. The next four "yes-no" questions asked about opportunities and information provided by the college regarding post-graduate education and training.

The last page (seventh), titled "Online Education," requested information regarding online courses. The three "yes-no" questions asked about online courses offered and if online courses from other veterinary colleges could count toward their students' curriculum. The "free response" question asked what language(s) the online course(s) is(are) offered in.

### *Survey Distribution*

Invitation letters containing a link to the survey and requesting participation were sent out via electronic mail to the dean's offices of all the colleges of veterinary medicine in twelve developed countries. The countries were Australia, Canada, China, France, Germany, Great Britain, Italy, Japan, Scotland, Turkey, the United States, and the West Indies. These countries were selected out of over one hundred countries possessing AVMA recognized veterinary colleges due to their economic status as developed nations, in addition to the fact they are distributed throughout different regions of the globe [1, 2].

The invitation letters informed potential respondents about the survey's objectives and that it was voluntary.

### *Data Analysis*

To avoid biases, duplicate answers were removed from the data analysis. In the case of duplicate responses from the same veterinary school, only the first completed response received was used. Partial responses, ones where the entire survey was not completed, were also omitted from data analysis. Respondents were categorized into three groups according to their countries of origin. The three groups were: (1) United States (US), (2) English speaking countries outside of the United States (ES), and (3) non-English speaking countries (NE). These categories were then used to compare results. "Yes-no" questions were analyzed by comparing the proportion of "yes's" for each category. Numerical data were analyzed by analysis of variance (ANOVA) to calculate *p*-values, and a Bonferroni post-test was performed. *P*-values less than or equal to 0.05 were considered significant.



## Results

A total of 168 responses were recorded for the online survey. Of these responses 121 reported their country of origin to be France. However, only 24 out of the 168 respondents completed the survey. After eliminating incomplete and duplicate surveys, 13 remained for data analysis (4 US, 4 ES, 5 NE). These thirteen surveys were from colleges in eight different countries. The countries were Australia, China, France, Great Britain, Italy, Japan, Turkey, and the United States. Due to the small sample size, it is unknown how representative these respondents are of their countries. But the responses to the questionnaire may be viewed as representative of the country, in the absence of other evidence.

### *Clinical Experiences*

When examining the number of weeks veterinary students spend working under the guidance of a practicing veterinarian, there is a trend for colleges within the United States to spend more weeks than colleges in English speaking countries outside the United States, and in non-English speaking countries ( $P=0.07$ ) (Table 4). With respect to percentage of time working in the area of public health under the guidance of a practicing veterinarian, there was no significant difference between US, ES, and NE ( $P=0.41$ ).

### *Curriculum*

Veterinary colleges in English speaking countries outside the United States had a higher percentage of the curriculum dedicated to large animal medicine and surgery than veterinary colleges in the United States and in non-English speaking countries ( $P=0.05$ )

(Table 4). However, there was no significant difference between US, ES, and NE veterinary colleges in the percentage of curriculum dedicated to small animal medicine and surgery. There was also no significant difference with respect to percentage of curriculum offered as electives or percentage dedicated to public health education. With respect to the percentage of elective courses available in public health, no significant difference was observed between US, ES, and NE.

When comparing the percentage of curriculum dedicated to small animal medicine and surgery to the percentage of the curriculum dedicated to large animal medicine and surgery, there was no significant difference between US, ES, and NE. There was also no significant difference in US, ES, and NE when comparing the percentage of curriculum dedicated to public health to the percentage of curriculum dedicated to large animal medicine and surgery. Veterinary colleges in the United States had a greater proportion of their percentage of curriculum as electives compared to percentage of required curriculum in large animal medicine and surgery than other English speaking and non-English speaking countries ( $P=0.03$ ).

When asked to select what their college's goal for public health education was, all thirteen colleges answered 'prevent zoonoses through food safety' (Table 5). Eleven colleges said that their goal was to 'prevent zoonoses through education of clinical veterinarians' (four US, four ES, and three NE). Twelve of the thirteen colleges also selected 'prevent zoonoses in human communities by prevention in animal populations' (four US, four ES, and four NE). 'Provide food and water quality assurance' was part of the public health goal of nine out of the thirteen veterinary colleges (three US, four ES, and two NE). 'Educate veterinarians for biomedical research' was only chosen by four

colleges as part of their public health education goal (three ES and one NE). Only one ES college supplied an additional answer, “one health direction” as part of their goal for public health education.

### *Post-Graduate Education*

All of the responding veterinary colleges offered post-graduate training opportunities or educational degrees and aided their students in finding post-graduate opportunities by providing information about available programs. A majority of these veterinary colleges also offer post-graduate training opportunities or educational degrees in public health (three US, three ES, and four NE) or aided their students in finding post-graduate opportunities in public health by providing information about available programs (four US, two ES, and four NE).

While comparing the approximate percentage of graduating veterinary students expected to continue in post-graduate training or education, there were no significant differences between US, ES, or NE. There was a trend toward more US graduating students expected to continue in post-graduate training or education in public health than graduating students from ES or NE colleges ( $P=0.05$ ).

Table 4: Survey results for numerical “free response” questions

	United States Schools n=4	English (non-US) n=4	non-English n=5	ANOVA
	Average±SD	Average±SD	Average±SD	<i>P</i> -value
<b>Weeks working under a veterinarian</b>	100.33±44.30	45.25±6.70	61.33±19.63	0.0743
<b>Weeks working under a veterinarian related to public health</b>	0.26±0.37	1.81±0.41	10.00±7.07	0.4099
<b>Percent of required curriculum- large animal</b>	9.79±1.84	34.75±10.72	17.28±15.25	0.0487
<b>Percent of required curriculum- small animal</b>	12.97±1.66	37.00±22.32	20.57±19.63	0.2538
<b>Percent of required curriculum- public health</b>	1.58±0.54	15.75±17.00	6.79±4.82	0.1994
<b>Percent of required curriculum- elective</b>	15.74±9.39	7.50±2.89	11.22±14.55	0.5677
<b>Percent of elective credits available in public health</b>	4.46±5.25	32.50±45.73	6.62±8.91	0.2690
<b>Percent of graduating students continuing in post-grad</b>	35.00±10.00	8.75±2.50	21.50±26.94	0.1382
<b>Percent of graduating students continuing in public health post-grad</b>	4.00±1.73	1.75±0.96	1.05±1.34	0.0520
<b>Percentage Small Animal/Percentage Large Animal</b>	1.35±0.27	1.09±0.66	1.17±0.21	0.7450
<b>Percentage Public Health/Percentage Large Animal</b>	0.17±1.05	0.57±0.71	0.52±0.14	0.4722
<b>Percentage Elective/Percentage Large Animal</b>	2.08±0.07	0.23±0.10	0.67±1.21	0.0304
<b>Total Percentage</b>	40.08±6.07	95.00±17.68	55.86±37.86	0.0614

### *Online Education*

Only four out of the thirteen responding veterinary colleges offered online courses. These four respondents were similarly dispersed among the three groups: one US, one ES, and two NE (Table 6). Depending upon the country of origin, these online courses were offered in English, Chinese, or French. In regard to public health education, three of the four veterinary schools offering online courses offered at least one online course in public health (one ES and two NE). Only two out of the thirteen responding veterinary colleges allowed online public health courses taken from other veterinary colleges to count toward their students' curriculum (one US and one NE), these two colleges did not offer any online courses of their own.

Table 5: Goals for public health education in veterinary schools

<i>What is your college's goal for public health education?</i>	<b>United States n=4</b>	<b>English Speaking Countries (non-US) n=4</b>	<b>Non-English Speaking Countries n=5</b>
<b>Prevent zoonoses through education of clinical veterinarians</b>	4	4	3
<b>Prevent zoonoses in human communities by prevention in animal populations</b>	4	4	4
<b>Prevent zoonoses through food safety</b>	4	4	5
<b>Provide food and water quality assurance</b>	3	4	2
<b>Educate veterinarians for biomedical research</b>	0	3	1
<b>Other (please specify)</b>	0	1 (one health direction)	0

Table 6: Survey results for “Yes-no” questions

Number of Colleges with:	US Schools n=4	English (non-US) n=4	Non-English n=5
<b>Offering Postgraduate training opportunities/Educational Degrees</b>	4	4	5
<b>Offering Postgraduate training opportunities/Educational Degrees in Public Health</b>	3	3	4
<b>Aid students in finding Postgraduate opportunities by providing information</b>	4	4	5
<b>Aid students in finding Postgraduate opportunities in Public Health by providing information</b>	4	2	4
<b>Offer online Veterinary Courses</b>	1	1	2
<b>Offer online Veterinary Courses in Public Health</b>	0	1	2
<b>Count online Public Health Courses from other Universities towards their Veterinary Curriculum</b>	1	0	1

\* Numbers in the squares indicate “yes” answers

## Discussion

Based on the small sample of this survey, few distinctions could be made between the veterinary education in United States, English speaking developed countries, and non-English speaking developed countries. Differences in the (1) percentage of curriculum devoted to large animal medicine and surgery as well as in the (2) comparison between the amount of curriculum offered as electives and the percentage of curriculum devoted to large animal medicine and surgery were apparent. The United States has the highest proportion of electives when compared to the amount of curriculum focused on large animal medicine and surgery ( $P=0.03$ ). English speaking countries outside the United States have a larger proportion of their curriculum designated to large animal medicine and surgery than in the United States and non-English speaking countries ( $P=0.05$ ). There is no evidence from other studies to support or refute these results. One potential reason for an increased proportion of curricula designated to large animal veterinary education in ES schools could be due to there being a greater total percentage of curricula designated to large animal medicine and surgery, small animal medicine and surgery, public health, and electives.

When adding up all the percentages for the categories of large animal medicine and surgery, small animal medicine and surgery, public health education, and electives, there is a trend towards a difference between US, ES, and NS. The US schools mean $\pm$ SD for these courses in the curriculum was 40.08 $\pm$ 6.07%; which was less than both ES and NE (95.00 $\pm$ 17.68% and 55.86 $\pm$ 37.86%, respectively) ( $P=0.06$ ) (Table 4). None of the respondents' total percentage added up to 100%. One possible reason for this is the



addition of more basic science courses, such as anatomy, physiology, immunology, or pathology, as a greater part of the veterinary curriculum in the US. For example, at one US college, the curriculum consists of primarily of anatomy, physiology, immunology, and pathology for the first year of the curriculum. The complete four year curriculum for this college is provided in Table 7.

Because the response rate was low and the sample size was small, the results are not fully representative of veterinary education around the world. One reason for the low response rate might be that the survey was not pre-approved by the American Association of Veterinary Medical Colleges (AAVMC). Most US veterinary colleges would not complete the survey without AAVMC approval. Another possible reason for low response may have been the timing of distribution. The survey link was emailed during mid-December and follow up emails were sent in early January. Because that was during the holiday season and many universities were on breaks, survey recipients may have been less likely to respond to their email over that time period.

Future comparisons should correct for the difficulties faced in the current study when collecting survey responses, so that the results can better represent global veterinary education and the differences that might exist between countries. In addition, having the survey translated into the main languages of the countries receiving it might also encourage more responses from non-English speaking countries as well as promoting more accurate responses by removing the language barrier. It would also be interesting to find another method of distributing the survey, rather than through email and the internet, so that developing countries could also be included in the global comparison of veterinary colleges. There are many other studies with information about

veterinary education in developing nations suggesting large differences compared to developed nations, but including them in this study would have created a bias due to the limited access to internet in many developing countries.

Table 7: Complete curricula of a sample United States veterinary college

	First Year	Second Year	Third Year	Fourth Year*
First Quarter	Veterinary Medicine Orientation	Systemic Pathology I	Large Animal Medicine I	Diagnostic Clinical Pathology
	Veterinary Gross Anatomy	Veterinary Virology	Medicine Laboratory I	Diagnostic Services
	Veterinary Microscopic Anatomy	Veterinary Bacteriology and Mycology	Small Animal Medicine I	Clinical Cardiology
	Veterinary Physiology	Veterinary Parasitology	Theriogenology I	Clinical Oncology
	Veterinary Integrative Problem Solving	Veterinary Pharmacology	Small Animal Surgery	Clinical Medicine I
	Introduction to Animal Care			Clinical Surgery I
Second Quarter	Veterinary Gross Anatomy	Systemic Pathology II	Medicine Laboratory II	Rural Veterinary Practice I
	Veterinary Microscopic Anatomy	Veterinary Pharmacology II	Practice Management	Emergency Care
	Veterinary Neurosciences	Veterinary Clinical Pathology	Large Animal Surgery	Clinical Small Animal Medicine
	Veterinary Physiology	Diagnostic Imaging	Large Animal Medicine II	Clinical Small Animal Surgery
	Veterinary Integrative Problem Solving		Small Animal Medicine II	OHS Small Animal Primary Care
			Animal Behavior	Clinical Imaging
			Elective	Small Animal Critical Care and Hospital Service
Third Quarter	Veterinary Gross Anatomy	Veterinary Toxicology	Special Animal Medicine	Electives
	Veterinary Physiology	Principles of Surgery	Communications for Veterinarians	
	Veterinary Immunology	Veterinary Medical Ethics	Large Animal Medicine III	
	Veterinary Pathology	Veterinary Medicine and Public Health	Small Animal Medicine III	
	Veterinary Integrative Problem Solving	Veterinary Epidemiology	Third Year Clinics	
	Veterinary Clinical Nutrition	Principles of Anesthesia	Elective	
		General Medicine		

\* Required courses, specific quarter not identified

## **Conclusion**

There were very few differences found between veterinary colleges in the United States, other English speaking developed countries, and non-English speaking developed countries. We were not able to reject any of the null hypotheses. All countries surveyed offered both large animal and small animal medicine and surgery in similar ratios. Only four of the thirteen responding veterinary colleges offered online courses as part of the veterinary curricula. All veterinary schools participating in the survey offered post-graduate training opportunities and educational degrees as well as aid to their students in finding post-graduate opportunities by providing information on the programs. Public health education was required in all of the countries surveyed and the amount included in the various curricula did not differ significantly.

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## Appendix A: Survey

### Veterinary Education

**\* 1. What country is your veterinary school in?**

**2. What is your college's name?**

College name is optional and would only be used to prevent duplicate responses; the college identification will not be used during data analysis or in the results of this survey.



## **Veterinary Education**

### **Clinical Experience**

**3. How many weeks are your veterinary students required to spend working with animals under the guidance of practicing veterinarians prior to graduation?**

**4. Approximately what percentage of this practice time is related to public health?**

**5. Is your college structured on a credit hour based system?**

**(for example one class may range between 1 to 5 credits depending on length and difficulty)**

- ☐ Yes
- ☐ No
- ☐ Don't know

## Veterinary Education

### Curriculum: Credit Hour

**6. Please define what 1 credit hour means at your college**

**7. How many total credit hours are required for graduation with a degree in veterinary medicine at your college?**

**8. How many credit hours of your veterinary curriculum are required in large animal medicine or surgery?**

**9. How many credit hours of your veterinary curriculum are required in small animal medicine or surgery?**

**10. How many credit hours of your veterinary curriculum are required in public health education?**

**11. How many credit hours of your veterinary curriculum are electives chosen by your students?**

**12. How many credits hours are available in public health as electives?**

**13. What is your college's goal for public health education? (mark all that apply)**

- ☐ Prevent zoonoses through education of clinical veterinarians
- ☐ Prevent zoonoses in human communities by prevention in animal populations
- ☐ Prevent zoonoses through food safety
- ☐ Provide food and water quality assurance
- ☐ Educate veterinarians for biomedical research
- ☐ Other (please specify)

## Veterinary Education

### Curriculum: Non-Credit Hour

**14. Please explain the system/units used to quantify classes taken at your college**

**15. Approximately what percent of your required veterinary curriculum is large animal medicine/surgery?**

**16. Approximately what percent of your required veterinary curriculum is small animal medicine/surgery?**

**17. Approximately what percent of the veterinary curriculum consists of electives chosen by your students?**

**18. Approximately what percentage of available elective courses are public health education?**

**19. Approximately what percent of your required veterinary curriculum includes public health education?**

**20. What is your college's goal for public health education? (mark all that apply)**

- ☐ Prevent zoonoses through education of clinical veterinarians
- ☐ Prevent zoonoses in human communities by prevention in animal populations
- ☐ Prevent zoonoses through food safety
- ☐ Provide food and water quality assurance
- ☐ Educate veterinarians for biomedical research
- ☐ Other (please specify)

## Veterinary Education

### Post-graduate Education

\*Post-graduate training/education includes Masters, PhD programs, residencies, internships, etc.

**21. Approximately what percentage of your graduating class is expected to continue in post-graduate training/education\*?**

**22. Approximately what percentage of your graduating class is expected to continue in post-graduate training/education\* in public health?**

**23. Does your college offer post-graduate training/educational degrees\*?**

- ☐ Yes  
☐ No  
☐ Don't know

**24. Does your college offer post-graduate training/educational degrees\* in public health education?**

- ☐ Yes  
☐ No  
☐ Don't know

**25. Does your college aid students in finding post-graduate education/training\* opportunities by providing information?**

- ☐ Yes  
☐ No  
☐ Don't know

**26. Does your college aid students in finding post-graduate education/training\* opportunities in public health by providing information?**

- ☐ Yes  
☐ No  
☐ Don't know

## Veterinary Education

### Online Education

**27. Does your veterinary college offer online courses?**

- ☐ Yes  
☐ No  
☐ Don't know

**28. Does your veterinary college offer online courses in public health?**

- ☐ Yes  
☐ No  
☐ Don't know

**29. In what language(s) are online public health courses offered?**

**30. Does your college allow online public health courses taken from other veterinary colleges to count towards your student's curriculum?**

- ☐ Yes  
☐ No  
☐ Don't know