

Approaches to veterinary education – tracking versus a final year broad clinical experience. Part one: effects on career outcome

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Summary

This is the first of two papers that provide extensive data and analysis on the two major approaches to clinical veterinary education, which either provide students with experience of a broad range of species (often defined as omni/general clinical competence), or just a few species (sometimes just one), usually termed 'tracking'. Together the two papers provide a detailed analysis of these two approaches for the first time. The responsibilities of veterinary medicine and veterinary education are rapidly increasing throughout the globe. It is critical for all in veterinary education to reassess the approaches that have been used, and evaluate on a school-by-school basis which may best meet its expanding and ever-deepening responsibilities.

Keywords

Curriculum structure – General clinical competence – Tracking.

Introduction

In winter 2006 and spring 2007 a survey was conducted of the graduates of the College of Veterinary Medicine at the Ohio State University (Ohio State) and the School of Veterinary Medicine at the University of California, Davis (UC Davis). Its purpose was to gain insights into some of the perceived benefits and deficits of the two major approaches to veterinary education that are implemented in schools and colleges of veterinary medicine. These two approaches have generally been termed 'omni/general clinical competence' and 'tracking'. In 'tracking', the student's clinical experience in the final year of veterinary school, and often in previous years too, is directed in-depth to 'a track' of one or a limited number of species. With the omni/general clinical competence approach, students in their senior clinical year are exposed to a broad variety of large and small animal species. The programme at Ohio State reflects the omni/general clinical competence approach, while UC Davis has adopted the tracking approach.

The merits of these two approaches to veterinary education have been debated with vigour around the globe, with many opposing statements (2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15). The paper by Prescott *et al.* (10) provides an excellent discussion of the perceived pros and cons of the two systems. The two approaches have been in use for over two decades, but while the discussion has often been avid there has been no systematic database-driven comparison between the two. This and the accompanying paper (14) provide for the first time an in-depth factual comparison between these two general approaches to veterinary education. The study was initiated by conducting a survey of the veterinarians who graduated from the Ohio State and UC Davis programmes between 1985 and 2004 or between 1988 and 2003, respectively. We are indebted to the large number of graduates who participated.

The broad-based, multi-species approach has been in place in various colleges and schools for most of the modern era of veterinary medical education. In the mid 1970s the School of Veterinary Medicine at UC Davis began a system of clinical training that has been termed 'tracking'. In the

tracking curriculum students concentrated their final clinical training on principally the single or multiple species that they intended to work with in practice upon graduation. The details of this are described by Cardinet *et al.* (3). In the initial phase students started this specialisation at the beginning of their final year, this has subsequently evolved, and currently some specialisation occurs as early as the end of the second year of training. Currently, nine clinical tracks are available for selection at UC Davis, as follows:

- equine
- food animal
- large animal (food plus equine)
- equine/small animal
- food animal/small animal
- small animal
- zoological medicine
- individual track (created with approval)
- mixed animal (equine, food animal, small animal).

A fully 'mixed track' is equivalent to an 'omni-competent' experience with all species; however, recently, there has been a significant decrease in the number of students at Davis who have taken the mixed animal track, with now only between 0 and 2 students enrolled in any one year. A major reason why this has occurred is because with a combination of equines, food animals and small animals there is a very intense requirement for preclinical course work. A track-based curriculum is now used in several veterinary colleges around the globe.

Historically, Ohio State has provided a notably less flexible curriculum wherein all students experience the same pre-clinical courses and the same clinical rotations. The first two pre-clinical years cover body systems and basic sciences (epidemiology, anatomy, histology, cell biology, pathology, infectious disease, radiology, ethics, population medicine, anesthesiology, fluid therapy, principles of surgery and radiology). Before 1992 the third pre-clinical year included didactic classes covering medicine and surgery topics for small animals, food and fibre animals and equids, and laboratory-based training in surgery and medical techniques applicable to all of these species. In 1992 the medicine and surgery classes for small animals, food and fibre animals and equids became elective courses. The material from these medicine and surgery classes which was considered core knowledge for graduate veterinarians was added to the body systems classes in the first two years. The senior year has remained a twelve-month experience of various required rotations in small animals, food and fibre animals and equids, with no elective or alternative experiences available to students.

The critical question to be addressed is which, if either, of these two approaches to curriculum may best serve veterinary medicine and veterinary education professionals in meeting the responsibilities they have to students,

individual communities, individual countries, and the world. These responsibilities are many, and are increasing in both breadth and intensity.

Materials and methods

An original pre-survey of 13 multiple-part questions was created by the authors (together with the help of a former Davis veterinary student, Lisa St. Clair) and mailed to 59 graduates from the two schools. Thirty responses were obtained, most with extensive comments and questions. Comments on the survey were also obtained from key education leaders from the two schools: Drs Bradford Smith and Joie Watson (both veterinary faculty at Davis) and Drs Jean Sanders and Lynne Olsen (both veterinary faculty at Ohio). Based upon these evaluations the final survey was developed. This survey and its implementation were approved by the Institutional Review Boards of both institutions.

The final survey contained 26 questions, several with sub-parts, and was administered by NCS Pearson Inc. (<http://www.ncspearson.com>). Mailings were performed on 12 January 2007 and 22 February 2007. Only those who had not returned the first survey received a second mailing. The survey respondents remained anonymous and the addresses of the survey recipients were associated with each survey only to facilitate the second mailing. The last day on which returned surveys were accepted for inclusion in the final data-set was 27 March 2007. A total of 4,592 surveys were mailed to alumni of Ohio State and UC Davis who graduated between the years 1985 and 2004 or 1988 and 2003, respectively. Each survey was sent with the following cover letter:

'Considerable demands on the veterinary profession are driving those both in and outside veterinary education to evaluate how well current veterinary medical curricula are meeting the needs of the veterinary profession. A question under extensive debate is whether, following preclinical training, the clinical experiences veterinary students obtain should be with a broad range of species or, alternatively, directed to a more in-depth clinical experience with one or just a few species. The latter is often called 'clinical tracking'. Veterinary schools in the US differ between these two alternatives. The type of clinical training that veterinary students obtain has implication for their veterinary competence and lifelong satisfaction. In addition, there are issues of accreditation of veterinary colleges and criteria for individual licensure. To gain insight into how different types of approaches to clinical education affect veterinary competence and career choices, we are asking graduates from the two veterinary schools to share some of their experiences and choices. Your input is

valuable and will provide key insights into the outcomes of the different educational approaches. We would appreciate if you would fill out the attached survey and return it in the stamped envelope.'

In total 1,714 surveys were analysed, 970 from Ohio State graduates and 744 from UC Davis graduates. The response rate was 40.3%. Survey responses were optically scanned by NCS Pearson and the data were provided as an Excel spreadsheet and subsequently analysed using standard Excel-based methods. Statistical validation was performed via chi-squared test for homogeneity or the Wilcoxon-Mann-Whitney Test, using the Minitab14 or the StatXact 8.0 programs, respectively. There were double responses, ambiguous responses or no responses to 1.3% of the questions, which accounts for some of the small variation in the total number of responses evaluated for a given question.

The data presented in each Table and Figure in this and the accompanying paper (14) are all taken directly from the specific questions asked in the survey. To give the reader a precise indication of what was asked, the wording in quote marks in the Table and Figure titles is identical to that used within the survey. In addition to those reported in this or the accompanying paper (14) the survey contained questions that asked for the following details:

- the college of graduation of the respondent
- the date of graduation (within a 4-year window)
- if an internship or residency had been completed
- when the last major change in career had occurred.

Data expressed as 'sub-analysis' was obtained by an Excel evaluation of components of the data from two or more of the direct survey questions.

Data and results

One of the key questions about tracking is to what extent graduates are able, or should be able, to change their area of veterinary practice during their veterinary career. Should veterinary schools provide training that would enable graduates to change areas of veterinary practice/expertise during their lifetime? The nature of such changes varies. Some might be viewed as a 'normal career progression', such as moving from direct food animal practice into a governmental position in food safety; others might be viewed as more radical, such as a move from rural food animal practice into urban small animal practice. It is the latter that is most debated: is it appropriate for a veterinary graduate to make this type of change (without re-education) and to what extent do veterinary schools have an obligation to prepare students to make such a significant change?

For the cohorts of graduates surveyed, respondents were asked to:

- indicate the clinical experience that 'best described' their 'clinical experience in the final year(s) of veterinary school' (using one of eleven categories)
- define their 'first professional practice/position in veterinary medicine following graduation from veterinary school'
- describe their 'current career position'.

For the latter two questions the range of possible clinical career areas from which they were asked to choose are listed in Tables II, III, IV and V (the abbreviations used are listed in Table I).

Table I
Areas of veterinary practice: abbreviations used in Tables II, III, IV and V

Area of practice	Abbreviation
Small companion animal	SCA
Small companion animal and exotics	SCE
Exotics	EXO
Equine	EQU
Food animal	FA
Mixed – small companion animal and equine (≥15% of each)	MCE
Mixed – small companion animal and food animal (≥15% of each)	MCF
Mixed – equine and food animal (≥15% of each)	MEF
Mixed – small, equine and food animal (≥10% of each)	MIX
Zoological medicine	ZM
Wildlife medicine	WM
Public health	PH
Laboratory animal medicine	LAM
Industry	IND
Government	GOV
Research (other than industry)	RES
A career not related to veterinary medicine	ANO
If no career was specified by the graduate	NS

How did final year clinical experience influence initial career choice?

The relationships between the area of concentration in veterinary school and that of their first professional practice/position following graduation are presented in Tables II and III, for Ohio and Davis graduates respectively. The primary clinical curriculum of the Ohio programme is that of a broad mixture of species, and the survey responses reflected this (839 of the 970 students chose 'a broad mixture' as the descriptor that best described their final year clinical experience [Table II]). However, 12.6% (n = 121) of the Ohio respondents considered that they had had the opportunity to obtain a more species-directed programme. This impression may be due to how the

Table II
Final year clinical experience and the areas of veterinary practice in which new graduates work (Ohio State responses)

Survey participants from the Ohio State University were asked to indicate the area of study that best described their clinical experience in the final year of veterinary education and then the area of veterinary practice in which they worked upon graduating (the abbreviations used are presented in Table I)

Type of final year clinical experience	No. of graduates who had this type of experience	Veterinary area in which graduates practised immediately after graduation (no. of graduates in each area)																	
		SCA	SCE	EXO	EQU	FA	MCE	MCF	MEF	MIX	ZM	WM	PH	LAM	IND	GOV	RES	ANO	NS
Broad mixture *	839	350	154	1	41	21	28	30	10	167	–	1	1	4	7	9	8	4	7
Clinical track																			
Mostly small companion animals **	43	31	8	–	1	1	1	–	–	1	–	–	–	–	–	–	–	–	–
Mostly small companion animals and equines	17	2	1	–	3	–	6	–	–	2	1	–	–	–	–	–	–	–	2
Mostly small companion animals and food animals	8	3	2	–	–	–	1	1	–	1	–	–	–	–	–	–	–	–	–
Mostly small companion animals with some exotic species	36	15	18	1	–	–	–	–	–	1	–	–	–	–	–	–	–	–	1
Mostly equines	10	2	–	–	6	1	–	–	–	–	–	–	–	–	–	–	1	–	–
Mostly food animals	4	1	–	–	–	2	–	1	–	–	–	–	–	–	–	–	–	–	–
Mostly equines and food animals	2	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–
Mostly small exotic animals	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mostly zoological medicine	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mostly wildlife	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Not specified	10	4	3	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	2
Total	970	408	187	2	52	25	37	32	10	173	1	1	1	4	3	9	9	4	12

* small companion animals, equine and food animals and possibly also exotic animals
 ** dogs and cats

administration has chosen to distribute the 50 weeks of the clinical year among the various areas of concentration. Likewise, whereas most Davis graduates indicated that their training was predominantly in a clinical track with a limited number of species (Table III), just under 25% of respondents (n = 179) indicated that they had had a broader experience. Some of the latter would have been in the mixed animal track, others would have probably gained the further experience by taking an elective(s). (We do not have the data to define the percentages, but general records/memory suggest that probably fewer than 50% of those that described their experience as broad were on the mixed animal track.) Not unexpectedly, the Davis graduates largely chose careers directly related to the clinical track they undertook during their fourth year (Table III).

What type of subsequent career changes, if any, did graduates make?

The next component of the study examined the relationships between 'the veterinary area of practice

immediately following graduation' and 'the most recent area of veterinary activity'. This is reported for the Ohio graduates in Table IV and for the Davis graduates in Table V. A broad diversity of changes was observed. These are analysed and discussed in this paper, especially in relationship to other data that were obtained by the survey. Some of these changes are as might be expected for a 'normal career progression', whereas others represent a very considerable change in career and clinical emphasis.

How long did it take for graduates to adapt to a change in career direction? What sort of changes did they find the most difficult?

To obtain further information on these reported changes in veterinary career following the first post-graduation position, an additional set of questions was asked. Table VI addresses how rapidly graduates that had changed their area of career considered they were 'up to speed' in their new areas of clinical practice. Of those that changed veterinary career direction, 68% percent of Ohio graduates and 56% of Davis graduates considered that they were up

Table III
Final year clinical experience and the areas of veterinary practice in which new graduates work (UC Davis responses)

Survey participants from the University of California, Davis, were asked to indicate the area of study that best described their clinical experience in the final year of veterinary education and then the area of veterinary practice in which they worked upon graduating (the abbreviations used are presented in Table I)

Type of final year clinical experience	No. of graduates who had this type of experience	Veterinary area in which graduates practised immediately after graduation (no. of graduates in each area)																	
		SCA	SCE	EXO	EQU	FA	MCE	MCF	MEF	MIX	ZM	WM	PH	LAM	IND	GOV	RES	ANO	NS
Broad mixture*	179	63	31	-	9	3	7	4	4	31	3	3	2	7	1	4	5		2
Clinical tracks																			
Mostly small companion animals**	239	209	28	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Mostly small companion animals and equines	70	39	9	-	7	-	9	-	-	6	-	-	-	-	-	-	-	-	1
Mostly small companion animals and food animals	27	18	4	-	-	-	-	1	-	2	-	-	-	1	-	-	-	-	1
Mostly small companion animals and some exotic species	111	41	60	3	-	-	-	-	-	1	-	1	-	1	-	-	1	-	3
Mostly equines	46	2	-	-	30	-	5	1	-	7	-	-	-	-	1	-	-	-	-
Mostly food animals	21	-	-	-	-	12	1	3	-	3	-	-	-	-	-	2	-	-	-
Mostly a mixture of equines and food animals	33	3	-	-	11	3	-	-	11	5	-	-	-	-	-	-	-	-	-
Mostly small exotic animals	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Mostly zoological medicine	8	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-
Mostly wildlife	3	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Not specified	4	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	744	382	136	4	57	18	22	9	15	55	4	6	3	10	2	6	8	0	7

* small companion animals, equine and food animals and possibly also exotic animals
 ** dogs and cats

to speed in their new area within a month or less (Table VI), with many being comfortable with the change in just a few days. Many of these changes are quite minor, such as for example an elimination of one of the species for which they were previously responsible. These minor changes are expected to be easy to accomplish. A sub-analysis (not shown) indicated that only a small subset of graduates experienced difficulties for a six-month period or longer. The most troublesome change reported by graduates was moving from a small animal practice to a practice of small animals plus exotics (with >70% of graduates from both schools reporting difficulties with the change). In addition, 62% of Davis graduates moving to small animal practice from equine practice reported having difficulties, as did 50% of those moving from small animal practice to mixed animal practice. In total, 50% of those who initially worked in mixed animal practice moved to small animal practice, but only 25% of those who initially selected equine medicine moved to practices that concentrated on

small animals only. That a move from small animal practice to small animal plus exotics practice was difficult to accomplish is not (in hindsight) unexpected. Firstly, although a number of clinical small animal practices have moved in the direction of adding exotic animal care into their practice in recent years, this change is not based on the similarity of the nature of veterinary medicine for the two areas, but upon changes in the population of pets in the urban environment; it is an adjustment based upon a business impetus rather than veterinary concerns. Secondly, while the exotics that are brought to these practices are for the most part 'small animals,' their physiology, anatomy and pharmacology are usually very different from those of dogs and cats. Furthermore, the different exotic animals now frequently encountered in general 'small animal' practices differ very considerably from species to species in these various attributes. Indeed, dogs and cats might be viewed as having greater medical similarity to horses than to the various exotic species.

Table IV**The areas in which new graduates worked immediately after graduation and the areas in which they are currently working (Ohio State responses)**

Survey participants from the Ohio State University were asked to indicate the area which best described their work immediately after graduation and then the area of veterinary practice which best described their current situation (the abbreviations used are presented in Table I)

Area of veterinary practice	No. of graduates who worked in this area immediately after graduation	Area of practice in which graduates currently work (no. of graduates in each area)																	Percentage of graduates remaining in initial area *	
		SCA	SCE	EXO	EQU	FA	MCE	MCF	MEF	MIX	ZM	WM	PH	LAM	IND	GOV	RES	ANO		NS
SCA	408	340	21	-	2	-	3	1	-	2	-	1	3	3	11	3	1	15	2	83
SCE	187	31	134	-	-	-	5	-	-	4	-	-	1	4	1	2	1	3	1	72
EXO	2	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	<50>
EQU	52	10	1	-	33	-	5	-	2	-	-	-	-	-	-	1	-	-	-	63
FA	25	6	-	-	-	14	-	2	1	-	-	-	-	-	1	1	-	-	-	56
MCE	37	11	7	-	2	1	10	-	1	1	-	-	1	-	1	-	-	1	1	27
MCF	32	11	1	-	1	6	1	8	1	1	-	-	-	-	-	1	1	-	-	25
MEF	10	2	-	-	1	1	1	-	1	2	-	-	-	1	-	1	-	-	-	10
MIX	173	66	24	1	5	6	13	3	4	35	-	1	1	3	1	5	-	2	3	20
ZM	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0>
WM	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	<100>
PH	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	<100>
LAM	4	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	1	-	<75>
IND	3	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	<66>
GOV	9	1	2	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	1	22
RES	9	1	1	1	-	-	-	-	-	-	-	-	-	-	2	-	3	1	-	33
ANO	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	
NS	12	4	1	1	-	-	-	-	-	1	-	-	-	1	-	-	-	-	4	
Total	970	485	192	4	44	28	38	14	10	46	1	3	7	15	19	16	7	29	12	

* numbers within angular brackets indicate that fewer than 5 graduates in that area made a change and consequently these values are not particularly valid indicators. More attention should be paid to those values that are not in brackets

Further sub-analysis provides some important insights. The graduates who experienced some trouble did so in a multiple of different and distinctive directions. Approximately 25% were with movement into less prominent areas such as zoological medicine, wildlife medicine, public health, laboratory animal medicine, and careers in industry and government, 15% each for movement from large to small animals, small to large animals, and within areas of large animal medicine, and 15% for movement from small animal into small animal plus exotics. Of note is that 30% of the changes where considerable difficulty was experienced were changes from mixed animal practice into any of a variety of practices (including movement into a narrower species practice range of either small or large animals).

How did graduates prepare for career changes?

The data of Table VII examines the measures graduates took to prepare for a change in career. Approximately half of the graduates who made a change (43% Ohio, 57% Davis) took one or more steps (average two) to prepare for the change in their veterinary career. Sub-analysis (not

shown) indicated that these were broadly scattered across the areas of career changes. Many (~50%), however, chose not to take any (further) steps to prepare for their change in veterinary practice. For three quarters of this group this was a reasonable decision and they made the change in career without difficulty. The remaining one quarter, however, reported having difficulty with the transition. Sub-analysis (not shown) indicated that those who did not take any steps to prepare and subsequently experienced difficulty were fairly randomly distributed across the various career changes that were made.

How many graduates were satisfied with their initial choices, how many changed direction, and why?

The reason(s) behind the career changes are reported in Table VIII. Graduates often listed multiple reasons (average two), but more than 50% from both Ohio and Davis listed lifestyle/family reasons as the reason or one of the reasons. Health reasons, often considered to be a concern for large animal veterinary medicine practitioners,

Table V
The areas in which new graduates worked immediately after graduation and the areas in which they are currently working (UC Davis responses)

Survey participants from the University of Davis, California, were asked to indicate the area which best described their work immediately after graduation and then the area of veterinary practice which best described their current situation (the abbreviations used are presented in Table I)

Area of veterinary practice	No. of graduates who worked in this area immediately after graduation	Area of practice in which graduates currently work (no. of graduates in each area)																	Percentage of graduates remaining in initial area *	
		SCA	SCE	EXO	EQU	FA	MCE	MCF	MEF	MIX	ZM	WM	PH	LAM	IND	GOV	RES	ANO		NS
SCA	382	334	19	-	1	-	2	-	1	2	1	-	1	3	5	3	3	5	2	87
SCE	136	21	93	4	-	-	-	-	1	1	3	2	1	2	3	-	3	1	1	68
EXO	4	-	2	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	<25>
EQU	57	16	1	-	32	-	-	-	2	1	-	-	1	-	3	-	-	1	-	56
FA	18	1	-	-	-	13	-	1	-	-	-	-	1	-	1	1	-	-	-	72
MCE	22	10	1	-	3	-	6	-	-	1	-	-	-	-	-	-	-	1	-	27
MCF	9	5	-	-	1	1	-	1	-	-	-	-	-	-	-	1	-	-	-	11
MEF	15	2	-	-	3	2	-	-	4	2	-	-	1	-	-	1	-	-	-	26
MIX	55	17	7	-	2	1	2	2	4	15	-	-	-	-	2	1	1	-	1	27
ZM	4	-	1	-	-	-	-	-	-	-	2	-	-	-	-	1	-	-	-	<50>
WM	6	-	1	-	-	-	-	-	-	-	-	3	-	-	-	1	1	-	-	50
PH	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	<100>
LAM	10	-	-	-	-	-	-	1	-	-	1	-	-	8	-	-	-	-	-	80
IND	2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	<50>
GOV	6	1	-	-	-	-	-	-	-	-	-	1	-	-	-	3	1	-	-	50
RES	8	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	5	-	-	62
ANO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NS	7	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Total	744	410	129	5	42	17	10	5	12	22	7	7	9	13	16	11	16	8	5	

* numbers in angular brackets indicate that fewer than 5 graduates in a specific area made a change and consequently these values are not particularly valid indicators. More attention should be paid to those values that are not in brackets

actually only accounted for 14% of the changes from veterinary careers involving large animal medicine and for less than 10% of the changes in career overall.

For those graduates who have not made a career change since their first career position, the survey examined their satisfaction with their current career (Table IX). A very large number (81%) were clearly very satisfied with the first career area of veterinary medicine they had selected, with only a very low number (<4%) potentially not making a career change because of having major concerns about their skills and their ability to make the change. The degree of satisfaction with their career choice was the same for both Ohio and Davis graduates. Thus, even though the Davis graduates, for the most part, make the decision about the area of their veterinary career prior to the start of their fourth year of veterinary school (whereas this is not a necessity for Ohio students), having to make this earlier choice appears by no means detrimental.

A summary of the career change results of Ohio and Davis graduates can be found in Table X. Three hundred and

nineteen (34.3%) Ohio graduates made a change in their careers compared to 180 (24.6%) Davis graduates. The right-hand column of Tables IV and V report the percentage of graduates who have remained in their initial area of practice. Attention should be paid primarily to those values that are not in angle brackets; those in angle brackets are for areas where fewer than 5 students were initially in that area and are probably not a valid indicator of a trend. The data in Table IX show a remarkable similarity between Ohio and Davis graduates with respect to being similarly satisfied or dissatisfied with their initial choice of practice area; this is thus independent of the nature of the veterinary education that they received. It is of significance that the major difference between the two schools is the number of graduates going into, and then changing from, a career in a fully mixed animal practice (small animal, equine, and food animals). A far higher percentage of Ohio graduates initially went into fully mixed animal practice, and a very high percentage of these students (79%) chose to change careers (Table IV). Of note, while far fewer Davis graduates initially chose a career in mixed animal practice, their attrition rate (75%)

Table VI
Graduates' appraisal of their ability to adapt to a change in career

Survey participants were asked, 'If, as indicated, you have made a major change in the direction of your veterinary career and have changed your area of clinical practice, how successful do you consider you were in making the change? Which statement best describes the situation? Mark one.'

Survey option	Number of graduates that chose this option			Percentage of career-changing graduates that chose this option *
	Ohio	Davis	Total	
I felt up to speed in clinical practice within a few days	159	66	225	43
I felt up to speed in clinical practice within about a month	58	32	90	17
I felt up to speed in clinical practice within about six months	81	64	145	27
I struggled for a substantial period of time	21	18	39	7

* indicated as the percentage of the total number of graduates who have changed direction in their veterinary career

Table VII
Preparing to make a career change: methods used

Survey participants were asked, 'If, as indicated, you have changed the direction of your veterinary career, did you use any of the following to prepare for this career change? Mark all that apply.'

Method of preparing for career change	Number of graduates that said they had used the method			Percentage of career-changing graduates that used the method *
	Ohio	Davis	Total	
Continuing education courses	113	79	192	36
Internship and/or residency training	28	23	51	10
A retraining opportunity at a veterinary school (other than internship or residency)	4	3	7	1.3
Graduate programme	31	22	53	10
Mentor relationship with a colleague or employer in the alternate career area	71	65	136	26
Text- or web-based self-study	48	42	90	17
Industrial or governmental courses	12	3	15	3
None	182	77	259	49

* the percentage of the total number of graduates who have changed direction in their veterinary career

was very similar to that observed with Ohio graduates (Table V). While notably lower numbers of Davis graduates initially selected other mixed practices (i.e. small companion animal and equine, small companion animal and food animal, or equine and food animal) they also had quite a high attrition rate (Tables IV and V).

If the data on the students who initially selected a fully mixed animal practice are excluded from the comparison, then the career change results observed for the Ohio and the Davis students are remarkably similar. This is illustrated in Table X. With the data on students who chose fully mixed animal practice excluded, the percentages of students from the two schools who were still in the same career that they started upon graduation are very similar (Ohio, 74.4%; Davis, 78.1%). Likewise, the total number of graduates who are either in the same career or were very comfortable with their career change is also very similar (Ohio, 89.4%; Davis, 89.2%) (Table X, line 4). This very strongly suggests that with the exception of what is

occurring with fully mixed animal practice the two schools are achieving very similar results and that the vast majority of the graduates of both schools are successfully and happily pursuing their career in veterinary medicine. The data in Tables IV and V also show that there was quite a remarkably similar distribution of career areas being followed by the graduates of the two schools. Statistical analysis (by chi-squared test of homogeneity) indicated that when the entire set of career selections, minus the fully mixed animal practice, were examined, the selection of careers immediately following graduation (Tables II and III) or eventually (Tables IV and V) by the 970 Ohio and 744 Davis graduates were statistically indistinguishable (p-values 0.10 and 0.13, respectively). When fully mixed practice was included in the analysis the results were statistically quite distinct (p-values <0.0001 and <0.001, respectively).

The number of graduates in some of the 'less prominent' areas, i.e. zoological medicine, wildlife medicine, public health, laboratory animal medicine, and careers in

Table VIII
Reasons for changing career

Survey participants were asked, 'If, as indicated, you have changed the direction of your veterinary career, please select the reason(s) that prompted this career change. Mark all that apply.'

Survey option	Number of graduates that chose this option *			Percentage of career-changing graduates that chose this option **
	Ohio	Davis	Total	
Developed an interest in a different area of veterinary medicine	87	50	137	26
Dissatisfaction with my previous area of veterinary medicine	93	51	144	27
Health (including practice-related injury)	23	26	49	9
Lifestyle/family	167	91	258	49
Business/fiscal	83	44	127	24
Wanted more intellectual stimulation	50	37	87	16
Wanted more opportunity to practice medicine	28	20	48	9
Other/specify ***	93	64	157	30

* no significant difference between Davis and Ohio responses
 ** stated as a percentage of the total number of graduates who have changed direction in their veterinary career
 *** many of the other reasons were not in fact different reasons, but a variation on those already specified, the others covered a broad gamut of issues

Table IX
Graduates who have not changed career direction: level of satisfaction and reasons for not changing

Survey participants were asked, 'If, as indicated by your responses, you are still in the same career that you started upon graduation, which statement best describes you current situation. Mark one.' Of the 1,714 graduates who responded to the survey a total of 1,138 indicated that they had not changed career

Survey option	Number of graduates that chose this option *			Percentage of non-career-changing graduates that chose this option **
	Ohio	Davis	Total	
I am satisfied pursuing the same career in veterinary medicine that I began upon graduation	481	440	921	81
I am somewhat dissatisfied with the career that I began upon graduation, but have not changed my area of veterinary medicine. I feel confident in my ability to transition into another area of the profession, should I choose to do so	39	33	72	6.3
Since graduation, I have considered changing my area of veterinary medicine and pursuing a career in some other area of the profession, but I have some concerns about my skills and abilities to do so	58	50	108	9.4
Since graduation, I have considered changing my area of veterinary medicine and pursuing a career in some other area of the profession, but I have major concerns about my skills and abilities to do so	19	18	37	3.2

* no statistical difference between the responses of UC Davis graduates and Ohio State graduates (Chi²)
 ** percentage of the total number of graduates who were still in the same career

government and industry, is low (only 10.6% of Davis graduates and 7.0% of Ohio graduates work in these areas). Many might argue that neither school is close to meeting its responsibilities in terms of providing veterinarians to work in these very critical areas of veterinary medicine.

As discussed in the previous paragraph Ohio graduates enter fully mixed animal practice (i.e. small animals, equids and food animals) at a much higher rate than Davis graduates. What might be the cause of this? Also, veterinarians who begin their careers in mixed animal

practice (both Davis and Ohio graduates) are much more likely to change career direction than veterinarians who begin their professional lives in other areas of clinical practice. Why should this be? These are two intriguing questions. Certainly, the nature of the two education programmes probably has an influence on the first selection. All students at Ohio follow a training programme that equips them to be mixed animal practitioners, whereas it is exceptionally difficult for Davis students to take the mixed animal track because of its staggeringly high workload. This alone might explain the difference in selection. Another important difference is that Davis

Table X
Summary of career changes from the first area of professional practice to the most recent area of veterinary activity

Graduates	Ohio State graduates (n = 929)		UC Davis graduates (n = 731)		Ohio State graduates minus those initially selecting mixed animal practice (n = 756)		UC Davis graduates minus those initially selecting mixed animal practice (n = 676)	
	Number	%	Number	%	Number	%	Number	%
Graduates still in the same career	598	64.3	541	74.0	563	74.4	528	78.1
Graduates who have made a change in their career focus	319	34.3	180	24.6	180	24.2	140	20.95
Graduates who changed career focus and were up to speed within a month or less (Table VI)	217	23.3	99	13.5	113	15.0	75	11.1
Graduates who are comfortable with their career change plus those who have never changed (line 1 plus 3)	815	87.6	640	87.5	676	89.4	603	89.2
Graduates who found the change difficult	102	11.0	81	11.1	77	10.2	67	9.9

Discrepancies in these figures can be accounted for by the fact that there were several double responses, ambiguous responses or missing responses

students are required to make a decision about their practice area at least a year before graduation, which is not the case for Ohio graduates. Perhaps Ohio graduates continue in mixed animal veterinary medicine upon graduation intending to make up their minds later as to their eventual area of specialisation. Possibly the Davis students who initially selected mixed animal practice had the same approach. This might explain the high rate of attrition that is observed with mixed animal practice, in both Ohio and Davis graduates, compared to many other areas of veterinary practice. Or perhaps it is the mixed animal career path that is to blame. Is this area of clinical practice diminishing in importance and is there a decrease in demand in this area? Are there financial, quality of life or other job-related factors that are causing veterinarians to leave this area of practice at such a high rate?

Further assessment is required to determine whether it is beneficial or detrimental for students to select mixed animal practice as their first postgraduate position, even if they subsequently then move into a different career path. Our survey provides us with no information on this. Sub-analysis indicated that the Davis students entering into mixed animal practice were those who had graduated in the 1980s and early 1990s; students who graduated later were less likely to enter into mixed animal practice upon graduation. This is probably because programme changes have made it increasingly difficult to take the mixed animal track at Davis.

Summary

To date, the debate has been which of the two systems of veterinary education, 'omni/general clinical competence' or

'selective clinical tracking' is the best, but the authors are struck more by similarities between these systems than differences. The collected data appears to refute some of the suggested benefits or deficits of each system and reveals that both systems of clinical training appear to be accomplishing very similar results. The data in this and the accompanying paper (14) is the first to comprehensively evaluate and compare the possible benefits and deficits of the two major directions of veterinary education and to address many of the concerns and questions that have been raised (2, 4, 6, 7, 8, 9, 10, 11, 12). Some of those questions can be answered as follows:

– Are non-tracking students more likely to enter a wider variety of different veterinary careers? *No difference was apparent.*

– Do tracking graduates pursue career paths that are different from non-tracking graduates? *No, the extensive similarity of the career paths chosen by students from the two types of education programme is remarkable. Both systems provide graduates for the multiple areas of veterinary medicine.*

– Is there a difference in the frequency with which veterinarians from the two types of educational programmes change their area of practice? *No, there is no apparent difference. A variable frequency is observed depending on the areas of practice initially selected. By far the predominant reason for change is individual lifestyle/family issues. The key question to be addressed is whether veterinary schools should be obliged to prepare their graduates to readily make a change in the type of veterinary medicine that they practice.*

– Do those who experience tracking have a lower frequency of changing their practice area? *Excluding the*

apparently separate issue of initial selection of a fully mixed animal practice – No.

– Is the reason for change in career due to veterinary-practice-induced injury or other health-related injury? *Apparently not frequently.*

– Does tracking limit a veterinarian's confidence to change their area of practice? *Apparently not.*

– Do graduates who tracked have a much lower appreciation of comparative medicine? *Apparently not* (see accompanying paper [14]).

Another key question is whether or not there is a difference in the employability of graduates from the two areas of training? This question has yet to be sufficiently addressed, but clearly from the data in Tables II, III and IV in the accompanying paper (14) its resolution is imperative.

Proponents of 'omni-competent' training have suggested that graduates from this system may be more likely to enter a wider variety of veterinary careers or that these graduates more frequently or more easily change their area of clinical practice due to their comprehensive clinical training. However, graduates from both systems of education are, upon graduation, selecting careers in the different fields of veterinary medicine to a very similar extent (Tables IV and V). Except for mixed animal practice, an equivalently high number of graduates remain in the career they selected upon graduation (Ohio, 75%; Davis, 78%). The total number of graduates who are either very happy in the career they selected upon graduation, or are very satisfied with their career change is also very similar (Ohio, 88%; Davis, 88%). The percentages of graduates experiencing significant difficulty with making a career change is also very similar (Ohio 11%, Davis 11%) (Table X) and for some (~25%) that difficulty may be because they did nothing to prepare for the change. Overall, although the clinical experience of students on the tracking programme was quite different from that of students following the omni-competent programme the survey results of all students were remarkably similar.

The above percentages are in reference to a data set which removes the mixed animal area of clinical practice. Although more Ohio graduates are entering mixed animal practice, they are also leaving this area of clinical practice at a high rate. With this high attrition rate, it is unclear if this difference between the two training programmes is an asset or a liability. Further research must be done to determine if this apparently singular difference is due to the training programme experienced, or whether there are larger issues surrounding mixed animal practice. Is this area of clinical practice diminishing in importance, with a concomitant decrease in demand for mixed animal practitioners? Are there financial, quality of life or other

factors related to working in mixed animal practice that are causing this exodus? Further elucidation of this difference may be essential as universities attempt to provide graduates who will select careers in all areas of veterinary medicine. One unique difference between the two education programmes that might be affecting the outcome with respect to mixed animal practice, and its subsequent attrition rate, is that in the 'tracking curriculum' all students must choose their area of training before they enter their fourth year of veterinary education, whereas those in an 'omni-general clinical competent' training programme do not need to do so until graduation. Even then, some may select a mixed animal practice to delay an eventual selection of an area of specialisation until after some further time working with all species.

If the educational systems are producing very similar results, then what is the factor driving veterinary practice career choice? The more important question, however, is 'Are the results obtained what indeed veterinary medicine needs to accomplish?' Currently, despite quite a difference in the two educational systems, the results (i.e. the numbers of veterinarians in the different areas of practice) are predominantly student driven. This is not an unreasonable result if – but only if – veterinary medicine is meeting the full breadth of society's veterinary needs. Given the wealth of papers in this volume, it would appear clear that veterinary medicine is indeed not meeting society's broad range of needs. If this is the case we must alter the nature of the education programme so that universities can meet these needs by providing the right numbers of veterinarians for each area of specialisation. There are two routes of change in the education structure that might be envisioned to accomplish this. Eyre (5, 11) has proposed that veterinary medicine should adopt the 'Engineering model' for veterinary education. With this route the veterinary school would establish multiple paths, each leading to a separate career pathway and the enrolment number in each pathway would be pre-established to match the range of societies' needs for each. The alternate approach is that used in human medicine, where the first phase of education up to the awarding of the medicine degree is a general education and then postgraduate/resident education is mandatory, with the number of residency slots matching the needs of the profession. In both of these approaches it is the profession, not the student, that determines the outcome. The first of these options would be comparable to the tracking approach, but with overall quotas for each track, the second matches the omni-general clinical competence programme, albeit with the added step of mandatory postgraduate education. Neither system, however, as currently operated, has the necessary profession-based controls. Of the two current systems, the undergraduate 'tracking' system is the one that would be the easiest to adapt. Bringing in obligatory veterinary resident education would require an extraordinary investment of funds, funds

that are probably not needed given that a 'tracking curriculum' can produce graduates with specialised competence for each of the different areas of veterinary medicine.

The pros and cons of any new system will be varied and opinions about which of the educational models will be the best choice for the future will surely be debated with vigour. It is essential, however, that veterinary medicine meets the broad veterinary needs of our global society. Meeting the targets for each area will probably best be accomplished if students that are applying for veterinary medical school already have a solid knowledge of the different areas of veterinary medicine. It is very likely that at the moment students do not have this knowledge and

that this is a key weakness in the current system. It is believed that if they did there would be a broader selection of veterinary careers chosen. To be truly effective a system of education of students, advisors and parents needs to be put in place so that the 14-16 year olds can know and, especially importantly, become enthused about the variety of careers that veterinary medicine offers. Andrews, elsewhere within this compendium (1), provides a model for youth recruitment which could be more rapidly implemented than any large-scale shifts in the current veterinary educational system. Ultimately, the time for robust and conscientious decisions about the future of our profession has arrived, and willingness to adapt customary practices will surely be a key to our future successes. ■

Les différents types d'organisation de l'enseignement vétérinaire : filière de spécialisation ou dernière année d'expérience clinique multi-espèces.

Première partie : les conséquences sur les possibilités de carrière

E.S. Klosterman, P.H. Kass & D.A. Walsh

Résumé

Cet article est le premier volet d'une présentation en deux parties visant à réunir et à analyser le plus d'informations possible sur les deux grands types d'organisation de l'enseignement vétérinaire mis en œuvre aujourd'hui : le premier consiste en une formation couvrant un large éventail d'espèces animales (compétences cliniques générales), tandis que le deuxième se concentre sur quelques espèces seulement (voire une seule espèce) (cursus orienté vers une filière). Il s'agit de la première analyse détaillée jamais réalisée de ces deux types d'organisation de l'enseignement vétérinaire. Nous assistons actuellement à un renforcement du rôle et des responsabilités de la médecine vétérinaire, ce qui a des conséquences également pour l'enseignement vétérinaire partout dans le monde. Les responsables de l'enseignement vétérinaire doivent réexaminer les types d'organisation de cet enseignement afin d'évaluer, établissement par établissement, la meilleure approche pour répondre aux défis de plus en plus complexes et nombreux qui attendent la profession.

Mots-clés

Enseignement par filière – Omni-compétence – Programme d'études. ■

Dos concepciones de la enseñanza veterinaria: experiencia clínica con énfasis por especie frente a genérica. Primera parte: influencia sobre la actuación profesional

E.S. Klosterman, P.H. Kass & D.A. Walsh

Resumen

Este es el primero de dos artículos en que los autores ofrecen datos y análisis muy completos sobre dos grandes formas de entender la enseñanza clínica veterinaria: por un lado, proporcionar a los alumnos experiencia con un gran número de especies (lo que da a menudo en llamarse competencia omniclínica o clínica general); por el otro, centrarse en unas pocas especies (a veces solamente una). En conjunto, ambos artículos ofrecen un detallado análisis de las dos concepciones citadas, en el primer gran estudio de estas características jamás realizado. La medicina y la enseñanza veterinaria están asumiendo cada vez más responsabilidades en todo el planeta. Por ello es esencial que todas las instancias ligadas a la enseñanza veterinaria consideren las concepciones aplicadas hasta ahora y que cada facultad decida qué modelo resulta idóneo para atender a sus responsabilidades, cada vez más importantes y numerosas.

Palabras clave

Competencia clínica con énfasis por especie – Competencia omniclínica – Estructura del currículum.



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