

# Factors Influencing Veterinary Students' Career Choices and Attitudes to Animals

James A. Serpell

## ABSTRACT

The purpose of the study was to investigate the influence of demographic and experiential factors on first-year veterinary students' career choices and attitudes to animal welfare/rights. The study surveyed 329 first-year veterinary students to determine the influence of demographic factors, farm experience, and developmental exposure to different categories of animals on their career preferences and on their attitudes to specific areas of animal welfare and/or rights. A significant male gender bias toward food-animal practice was found, and prior experience with particular types of animals—companion animals, equines, food animals—tended to predict career preferences. Female veterinary students displayed greater concern for possible instances of animal suffering than males, and prior experience with different animals, as well as rural background and farm experience, were also associated with attitude differences. Seventy-two percent of students also reported that their interactions with animals (especially pets) had strongly influenced the development of their values. Animals ranked second in importance after parents in this respect. The present findings illustrate the importance to issues of animal welfare of the cultural context of past experience and influences on attitude development. The results also suggest that previous interactions with animals play a critical role in guiding veterinary students into their chosen career, as well as in helping to determine their specific employment preferences within the veterinary profession. From an animal welfare perspective, the dearth of women choosing careers in food-animal practice is a source of concern.

## INTRODUCTION

The results of a number of recent studies have suggested that experiences of interactions with animals, especially during childhood, are associated with the development of long-term animal-related preferences and attitudes later in life.<sup>1-5</sup> Specifically, it has been found that affectionate childhood interactions with animals are associated with more humane adult attitudes,<sup>3,4</sup> while more exploitative or consumptive early interactions tend to result in more utilitarian perspectives.<sup>1,2</sup> It has also been suggested that these two distinct orientations to animals—utility and affect—are to some extent incompatible, in the sense that animals regarded with positive affect tend to be exempt from harmful exploitation, while animals with strongly positive or negative utility value tend to be precluded from becoming the objects of people's positive affections.<sup>5</sup>

Veterinary students represent a particularly interesting test of these ideas. Studies have shown that a majority of prospective veterinarians are drawn to the profession by a pre-existing interest in, and affection for, animals;<sup>6</sup> and at least one national questionnaire survey of first- and fourth-year veterinary students found that 96% had previously owned dogs and/or cats—a much higher rate of ownership than among the general population.<sup>7</sup> Such findings raise the interesting possibility that by promoting greater sympathy, positive interactions with companion animals in childhood and adolescence tend to predispose young people to choose careers in veterinary medicine. At the same time, many veterinarians opt for mixed or food-animal practice, and this raises questions concerning whether these individuals come from different backgrounds than small-animal practitioners, and/or experienced different kinds of childhood relationships with animals.

To address these kinds of questions, the present study explored the hypothesis that developmental exposure to

different categories of animals (e.g., companion small animals *versus* food animals *versus* equines) affects veterinary students' long-term attitudes to animals in general and their future employment preferences within veterinary medicine. Specifically, the study used a questionnaire approach to investigate the distribution of animal-related attitudes among first-year veterinary students so as to determine how students' attitudes to animals and employment preferences are affected by demographic and experiential factors, including animal-ownership experience.

## METHODOLOGY

### Subjects

Three-hundred-and-twenty-nine first-year veterinary students attending a 14-hour required course on Veterinary Ethical Issues at the School of Veterinary Medicine, University of Pennsylvania, were surveyed over a period of three years (2000–2002). Students were surveyed on the first day of classes and the completed surveys were submitted to the course organizer at the end of that class. The surveys were initially administered as a means of collecting teaching material for presentation later in the course. Students were informed of this and were told that completion of the survey was voluntary and anonymous.

### The Survey

The survey questionnaire consisted of two parts. Part 1 requested information on students' age, sex, and background (*predominantly rural, predominantly suburban, predominantly urban*), on the kinds of animals they or their families had kept or owned (*dogs, cats, horses/ponies, cattle/sheep/goats, pigs, poultry*), and on whether they had ever spent a significant amount of time living or working on a farm. They were also asked to state their preferred type of employment after graduation (*food animal practice, equine*

**Table 1: List of animal rights/welfare attitude statements used in the study<sup>a</sup>**

---

Hunting is an acceptable recreational activity (*hunting*).

The number of live animals used in teaching surgery in veterinary schools should be reduced (*live surgery*).

Controversial issues such as “animal rights” should not be included in the veterinary curriculum (*animal rights*).

Veterinarians have an obligation to provide services such as ear-cropping and tail-docking when these are requested by a client (*ear-cropping*).

Dog-fighting should be treated as a serious crime (*dogfighting*).

The same standards of humane treatment should be applied equally to companion animals and food animals (*equal treatment*).

The use of leg-hold traps for trapping fur-bearing animals should be prohibited (*trapping*).

Animals do not experience pain the way humans do (*pain*).

When the interests of an animal patient are in conflict with the wishes of its owner, the veterinarian’s first responsibility should be to the animal (*duty to animal*).

Cockfighting should be prohibited (*cockfighting*).

Veterinarians should not be obligated to euthanize a healthy animal at the client’s request (*euthanasia*).

A certain amount of suffering and pain in animal research is justified if people will benefit from the research (*research*).

---

a All but item 12 were derived from Shurtleff and colleagues.<sup>7</sup> Students responded to the statements on a series of 1–5 (*strongly disagree/disagree/neutral/agree/strongly agree*) Likert scales. The one-word abbreviation for each is used within the text to denote the response to each specific question.

*practice, small-animal practice, mixed practice, exotics, other*), and to indicate from a list of choices all the persons and/or experiences that had had great influence on their personal and professional moral values (*parents, other family members, practicing veterinarians, peers, religion, interaction/experience(s) with animals, other experiences*). Finally, if they had indicated in the previous question that interaction/experience(s) with animals had influenced their moral values, they were asked to describe briefly the type of interaction/experience(s) involved.

Part 2 of the questionnaire consisted of a series of 12 Likert-type (*strongly disagree, disagree, neutral, agree, strongly agree*) attitude statements designed to assess the students’ attitudes to a variety of animal welfare/animal rights issues (see Table 1). With the exception of statement 12 concerning the use of animals in biomedical research, which was designed for the study, all of these attitude statements were derived from an earlier published survey.<sup>7</sup>

### Analyses

The results were analyzed using Statview 5.1 statistical software.<sup>8</sup> Statistically significant differences in employment preferences associated with demographic and experiential variables, such as sex, background, farm experience, and previous animal ownership, were investigated using chi-square tests and multiple logistic regression models. The association between demographic and experiential factors and attitudes to animal welfare/rights was examined using nonparametric Mann-Whitney U tests.

## RESULTS

### Descriptive Findings

Three-hundred-and-two correctly completed surveys were returned (80 in 2000, 117 in 2001, and 105 in 2002) for a total response rate of 92%. The mean age of respondents was

24.58 ( $\pm 3.81$ ) years. Seventy-one percent were female, and 77% reported coming from predominantly urban/suburban backgrounds, compared with 23% from rural backgrounds (the numbers from predominantly urban backgrounds were too small to be analyzed separately and so were combined with those from the suburbs). More than 99% of students reported having owned or kept some kind of animal, and over 98% had owned or kept dogs and/or cats. Of these, 65% had kept or owned just dogs and/or cats; 14% had owned dogs/cats and equines; 11% had owned dogs/cats, equines, and food animals, and 7% had owned dogs/cats and food animals. Only 0.4% of the total sample had kept just food animals and equines, and 0.3% had kept equines only. Sixty-five percent of the sample reported little or no experience, and 35% reported significant experience of living and/or working on a farm. Forty-nine percent of the respondents expressed a preference that their future employment be in *small-animal practice*, 24% preferred *mixed practice*, 12% *equine practice*, 6% *food-animal practice*, 4% *exotics*, and 4% *other*.

The most frequently reported influences on students’ personal and professional moral values were parents (88%), interaction/experience(s) with animals (72%), practicing veterinarians (45%), other experiences (24%), religion (18%), peers (15%), and other family members (5%). Of those who indicated that interaction/experience(s) with animals had influenced their moral values, 84% reported “pet ownership” as an influential experience.

### Demographic Factors, Animal Ownership, and Employment Preferences

Chi-square analyses revealed strong species-specific associations between students’ employment preferences and the kinds of animals they or their families had owned or kept. Because such a high proportion of students or their families had kept dogs and/or cats (98.6%), it was not possible to

**Table 2: Association between dog and cat ownership only (yes/no) and employment preferences<sup>a</sup>**

	Food Animals	Equine	Small Animals	Mixed	Exotics	Others
Yes	4 (11.6)	5 (23.2)	122 (92.2)	35 (45.2)	12 (8.4)	11 (8.4)
No	14 (6.4)	31 (12.8)	21 (50.8)	35 (24.8)	1 (4.6)	2 (4.6)
Totals	18	36	143	70	13	12

a  $\chi^2 = 94.5$ ,  $p < 0.0001$ ; expected values in parentheses.

**Table 3: Association between horse ownership (yes/no) and employment preferences<sup>a</sup>**

	Food Animals	Equine	Small Animals	Mixed	Exotics	Others
Yes	7 (4.8)	30 (9.5)	14 (37.6)	25 (18.5)	0 (3.4)	1 (3.2)
No	11 (13.2)	6 (26.5)	128 (104.4)	45 (51.5)	13 (9.6)	11 (8.8)
Totals	18	36	142	70	13	12

a  $\chi^2 = 91.2$ ,  $p < 0.0001$ ; expected values in parentheses.

make pure comparisons between the effects of the different animal categories on employment preferences or attitudes. However, students who had owned only dogs and/or cats were compared with those who had owned other kinds of animals, either on their own or in addition to dogs and/or cats. Students who had owned horses with or without dogs and/or cats were compared with those who had not owned horses, and students who had owned or kept food animals with or without dogs and/or cats were compared with those who had not owned or kept food animals.

As reported in Table 2, students who had owned exclusively dogs and/or cats displayed a strong bias toward employment in small-animal practice and away from employment in food-animal and equine practice compared with those who had owned other kinds of animals ( $\chi^2 = 94.5$ ,  $p < 0.0001$ ); this was despite the fact that most of these other students had also owned dogs and/or cats. Students who had owned or kept horses/ponies exhibited a strong bias toward equine practice, and to a lesser extent, towards food-animal and mixed practice, rather than to future careers in small-animal practice (Table 3) ( $\chi^2 = 91.2$ ,  $p < 0.0001$ ). This also was irrespective of the fact that most of these students had also owned dogs and/or cats. Students who had owned food animals showed a similar strong bias toward food-animal practice and away from careers in small-animal practice (Table 4), as well as showing some increased preference for equine and mixed practice ( $\chi^2 = 63.99$ ,  $p < 0.0001$ ). Interpretation of these associations was complicated, however, by the finding that both rural background and experience of living/working on a farm were also strongly and positively associated with

**Table 4: Association between food animal ownership (yes/no) and employment preferences**

	Food Animals	Equine	Small Animals	Mixed	Exotics	Others
Yes	13 (3.6)	13 (7.1)	9 (28.3)	22 (13.9)	1 (2.6)	0 (2.6)
No	5 (14.4)	23 (28.9)	134 (114.7)	48 (56.1)	12 (10.4)	13 (10.4)
Totals	18	36	143	70	13	13

a  $\chi^2 = 63.99$ ,  $p < 0.0001$ ; expected values in parentheses.

food-animal and horse/pony ownership and with preferences for employment in food-animal and equine practice ( $\chi^2 = 29.7-73.8$ ,  $p < 0.0001$ ).

Employment preferences were also strongly affected by gender ( $\chi^2 = 24.11$ ,  $p < 0.0001$ ). Post-hoc cell contributions suggested that most of this effect was due to a highly significant male bias toward food-animal practice (ratio 14:3) and a slight, but non-significant, female bias toward equine practice. Gender distributions in relation to *small-animal*, *mixed*, *exotic-animal*, and *other* practices did not differ significantly from random expectations. No significant gender biases were found in relation to background, experience of living or working on a farm, or animal ownership history. However, the tendency for more women to have kept horses previously than men approached significance ( $\chi^2 = 4.43$ ,  $p < 0.06$ ).

To further clarify the relative contributions of demographic and experiential factors to employment preferences, multiple logistic regression analyses were performed using *sex*, *background*, *farm experience*, and *owning or keeping specific animal types* as the independent variables, and after converting the dependent variable *employment preferences* to the three separate dichotomous variables, preference for food animal practice versus all other preferences; preference for equine practice versus all other preferences; and preference for small animal practice versus all other preferences. The results (Table 5) indicated that male veterinary students are 13 times more likely to favor a career in food-animal practice than females; that students in general are 13 times more likely to prefer food-animal practice if they or their families have previously kept or owned food animals, and 6 times more likely to do so if they come from a rural background. Experience of living or working on a farm was not a significant predictor of a preference for food-animal practice when the effects of these other variables were taken into account. Only two variables were found to be significant predictors of a preference for equine practice: Veterinary students who had previously kept or owned horses/ponies were 21 times more likely to favor this career path than those who had not, and those who had significant experience of living/working on a farm were 8 times more likely to prefer equine practice than were those without this experience. Similarly, previous experience of owning or keeping dogs and/or cats only was a significant predictor of a preference for small-animal

**Table 5: Results of logistic regression analyses evaluating practice preferences**

Variable (versus baseline group)	$\beta$	SE	Wald $p$ -Value	Odds Ratio
Likelihood of Preferring Food Animal Practice <sup>a</sup>				
Gender—male (versus female)	2.81	0.72	0.0001	13.5
Had previously owned or kept food animals (versus had not)	2.35	0.65	0.0003	13.2
Rural background (versus urban/suburban)	1.5	0.63	<0.02	6.2
Likelihood of Preferring Equine Practice <sup>b</sup>				
Had previously owned or kept horses/ponies (versus had not)	2.57	0.50	<0.0001	21.0
Had previously lived or worked on a farm (versus had not)	1.19	0.47	<0.02	8.3
Likelihood of Preferring Small Animal Practice <sup>c</sup>				
Had previously owned or kept dogs and/or cats only	1.49	0.32	<0.0001	7.0
Had previously lived or worked on a farm (versus had not)	-1.19	0.31	0.0001	6.0

a likelihood ratio test,  $\chi^2 = 50.99$ ,  $df = 3$ ,  $p < 0.0001$ .

b likelihood ratio test,  $\chi^2 = 65.09$ ,  $df = 2$ ,  $p < 0.0001$ .

c likelihood ratio test,  $\chi^2 = 72.16$ ,  $df = 2$ ,  $p < 0.0001$ .

practice (odds ratio 7:1), as was a lack of experience of living/working on a farm (odds ratio 6:1).

#### Attitudes to Animal Welfare/Rights

Univariate analyses revealed that female students displayed significantly greater concerns for the welfare/rights of animals than male students on all 12 attitude questions (Table 1). These effects were strongest for the attitude statements related to hunting, to the use of live animals in surgery training, to equal treatment for farm and companion animals, to the use of leg-hold traps, to the duty to favor the welfare of the animal patient over the wishes of the client, to cockfighting, and to the use of animals in biomedical research (Mann-Whitney U test,  $p < 0.001$ ). Significant differences were also found with respect to statements regarding the teaching of "animal rights" in the veterinary curriculum, elective tail-docking and ear-cropping procedures, dog fighting, pain equivalence in humans and animals ( $p < 0.01$ ), and elective euthanasia of healthy pets ( $p < 0.05$ ).

Rural background was associated with significantly less negative attitudes towards hunting and leg-hold trapping (Mann-Whitney U test,  $p < 0.001$ ), toward the use of live animals for surgery teaching ( $p < 0.01$ ), and toward elective/cosmetic procedures ( $p < 0.05$ ), and with more negative attitudes towards the need to teach "animal rights" in the veterinary curriculum ( $p < 0.01$ ). The experience of living/working on a farm was associated with significantly less negative attitudes toward hunting (Mann-Whitney U test,  $p < 0.001$ ), the use of live animals in surgery teaching, the performance of euthanasia on a healthy animal at a client's request ( $p < 0.01$ ), elective/cosmetic procedures, and unequal treatment for food and companion animals ( $p < 0.05$ ).

The experience of owning/keeping food animals was also associated with significantly less negative attitudes toward hunting, live-animal surgery teaching, "painful" research using animals (Mann-Whitney U test,  $p < 0.001$ ),

cockfighting, elective/cosmetic procedures, a reduced tendency to recognize a primary duty to the animal ( $p < 0.01$ ), and unequal treatment for food and companion animals ( $p < 0.05$ ). It was also associated with the view that animals experience pain differently than humans ( $p < 0.01$ ). Previous horse/pony ownership was associated with significantly more positive attitudes to hunting ( $p < 0.01$ ) but did not influence responses to any of the other attitude statements. Students who had previously owned only dogs and/or cats were more opposed to hunting ( $p < 0.001$ ) and the use of live animals for surgery teaching ( $p < 0.01$ ). They were also more supportive of equal treatment for food and companion animals, of the view that animals experience pain the same way humans do, and of the belief that a veterinarian's primary duty is to serve the interests of the animal patient over those of the client ( $p < 0.05$ ).

#### DISCUSSION

Previous experience of animal ownership, and especially dog and/or cat ownership, appeared to be an important predictor of the choice of a career in veterinary medicine, at least in this population of students. Dog and cat ownership closely approached 100 percent in this population, as it did in an earlier survey,<sup>7</sup> far in excess of the US national average. A survey of first-year veterinary students in Australia reported that "an interest in animals" was the most important reason cited for choosing a career in veterinary medicine, with "concern for animals" and "love for animals" ranking third and sixth in importance.<sup>6</sup> The authors do not speculate as to whether animal ownership history is the cause of this interest in, and affection for, animals, although a variety of other studies have suggested that this may be the case.<sup>5</sup>

Reinforcing this idea, the results of the present survey indicated that previous experiences with particular categories of animals—companion animals, equines, and food animals—are also influential in affecting students' choices among different career paths within veterinary medicine.

Given the retrospective nature of the data, it remains uncertain whether these effects are due to some direct formative affect of the animals and/or relationships with animals or to some other correlated factor that was not measured (e.g., parental influences). However, the species-specificity of the observed associations, and the fact that a majority of students (72%) reported that "interactions/experiences with animals" were a major influence on their personal and professional moral values points to a direct impact of the animals themselves. These results contrast with those of an Australian survey of first-year veterinary students that found "no significant relationship between prior experience with animals and either career plans or success in the job market." It is unclear why the two studies produced such different results, although the latter employed different and more complex methods of evaluating animal ownership history.<sup>6</sup> Species-specific orientations to animals as a consequence of early experience are not widely reported in the literature, although one previous study found that adult pet owners tend to remain loyal to the particular species (dogs or cats) with which they grew up.<sup>9</sup>

Another striking finding of the present study was the marked male gender bias towards the preference for a career in food-animal practice and the absence of clear gender biases with respect to other branches of veterinary medicine. For most of its history, the veterinary profession has been largely an all-male enclave, at least in the United States and Europe. Women did not start entering veterinary schools in any numbers until the 1950s and 1960s and these initial pioneers reportedly encountered particular antipathy from colleagues and clients toward the idea of women's working with livestock animals.<sup>10</sup> The current findings suggest either that these prejudices persist and/or that women are avoiding food-animal practice for other reasons, possibly due to their greater sensitivity to animal welfare issues (see below).<sup>11</sup> Either way, given the recent growth of public concern for the welfare of production animals, this field would likely benefit from concerted efforts to encourage more women veterinary graduates to engage in food-animal practice.

With respect to the attitude assessment, female gender was the most significant predictor of humane attitudes to animals, and their use among these students. A substantial number of previous studies have identified a similar gender bias in attitudes to animal welfare/rights, with women and girls characteristically displaying more positive or "caring" attitudes on these issues.<sup>5,11-24</sup> Several studies have also demonstrated comparable effects in veterinary students and recent graduates.<sup>7,25-27</sup> It is not currently known whether these observed gender differences are due to differences in the ethical socialization of boys and girls or are the result of more fundamental, and possibly innate, gender-specific empathic responses to animals and their welfare.<sup>11</sup> However, it is probable that previous findings showing an apparent association between the preference for food-animal practice and reduced concerns for animal welfare<sup>7</sup> may have been related to this gender effect.

Both rural background and the experience of living and/working on a farm were associated with reduced concern for animal welfare/rights, particularly in relation to hunting and trapping and the use of live animals in surgery

training. This finding concurs with the results of several previous studies that have found associations between rural background and farming and more utilitarian attitudes to animals.<sup>11,13,18</sup> In addition to affecting career preferences, previous animal ownership was also associated with specific attitudes to animals. As might be expected in light of the earlier discussion, prior ownership of companion animals only was associated with increased opposition to recreational hunting and to the use of live animals in surgery teaching, and generally with more egalitarian attitudes to such issues as animals' experience of pain, their status relative to their owners, and unequal treatment of food and companion animals. Of the issues tested, prior horse ownership was only associated with more positive attitudes to hunting; an unsurprising finding given the association that exists between horses and hunting. Conversely, attitudes associated with prior ownership of food animals were almost the mirror image of those associated with companion animals, in spite of the fact that most of these food-animal owners had also owned dogs and/or cats. This would tend to suggest that utility considerations inherent in the culture of food-animal production can override the affective responses to animals typically associated with dogs and cat ownership.<sup>5</sup> However, it is also possible that these students are able to compartmentalize their affect and utility orientations according to the type of animal and its primary function(s).

## CONCLUSIONS

The degree of male gender bias in food animal medicine was somewhat disturbing, both in terms of equal opportunity for male and female graduates and from an animal welfare perspective. Certainly, one conclusion might be that this is an unfortunate legacy of the past<sup>28</sup> and that the University of Pennsylvania, the site of this study (and perhaps other veterinary colleges), should make greater efforts to recruit female graduates into this field of practice. On the other hand, there is no evidence at present to suggest that male veterinary students' ethical positions on animal welfare/rights are any less sympathetic than male non-veterinary students of a similar age and background, so it would be difficult to argue that their preponderance in food-animal medicine will necessarily be detrimental to the welfare of food animals. It should also be emphasized that these data were collected approximately halfway through the first year of veterinary education, and it is far from certain whether the observed gender-linked attitudes would persist into subsequent years or beyond graduation. Other authors have suggested, however, that students may become desensitized to some degree toward ethical issues during the course of veterinary education.<sup>29,30,31</sup>

The apparent impact of previous animal ownership on both attitudes and employment preferences reinforces the notion that early relationships with animals can exert a formative influence on people's animal-oriented values and professional aspirations. However, more detailed studies exploring the effects of parental values and the precise timing of animal-related experiences during development would be needed to confirm this conclusion.

## REFERENCES

- 1 Ascione FR. Children who are cruel to animals: A review of research and implications for developmental psychopathology. *Anthrozoös* 6:226–247, 1993.
- 2 Bjerke T, Kaltenborn BP, Odegardstuen TS. Animal-related activities and appreciation of animals among children and adolescents. *Anthrozoös* 14:86–94, 2001.
- 3 Miura A, Bradshaw JWS, Tanida H. Childhood experiences and attitudes towards animal issues: A comparison of young adults in Japan and the UK. *Anim Welf* 11:437–448, 2002.
- 4 Paul ES, Serpell JA. Childhood pet keeping and humane attitudes in young adulthood. *Anim Welf* 2:321–337, 1993.
- 5 Serpell JA. Factors influencing human attitudes to animals and their welfare. *Anim Welf* 13:S145–S151, 2004.
- 6 Heath TJ, Lynch-Blosse M, Lanyon A. A longitudinal study of veterinary students and recent graduates: 1. Backgrounds, plans and subsequent employment. *Aust Vet J* 74:291–296, 1996.
- 7 Shurtleff RS, Grant P, Zeglen ME, McCulloch WF, Bustad LK. A nationwide study of veterinary students' attitudes on ethical issues. *J Vet Med Ed*, 9:93–96, 1983.
- 8 SAS. StatView version 5.0.1 [computer software]. Cary, NC: SAS Systems, 1999.
- 9 Serpell JA. Childhood pets and their influence on adults' attitudes. *Psychol Rep* 49:651–654, 1981.
- 10 Lawrence EA. A woman veterinary student in the fifties: The view from the approaching millennium. *Anthrozoös* 10:160–169, 1997.
- 11 Herzog HA, Betchart NS, Pittman RB. Gender, sex role orientation, and attitudes toward animals. *Anthrozoös* 4:184–191, 1991.
- 12 Paul LS, Podberscek AL. Veterinary education and students' attitudes towards animal welfare. *Vet Rec* 146:269–272, 2000.
- 13 Bjerke T, Odegardstuen TS, Kaltenborn BP. Attitudes toward animals among Norwegian adolescents. *Anthrozoös* 11:79–86, 1998.
- 14 Bowd AD, Bowd AC. Attitudes toward the treatment of animals: A study of Christian groups in Australia. *Anthrozoös* 3:20–24, 1989.
- 15 Burghardt GH, Herzog HA. Animals, evolution and ethics. In Hoage RJ, ed. *Perceptions of Animal in American Culture*. Washington, DC: Smithsonian Institution Press, 1989 p129–151.
- 16 Driscoll JS. Attitudes toward animal use. *Anthrozoös* 5:32–39, 1992.
- 17 Galvin SL, Herzog HA. Attitudes and dispositional optimism of animal rights demonstrators. *Soc Anim* 6:1–12, 1998.
- 18 Hills AM. The motivational bases of attitudes to animals. *Soc Anim* 1:111–128, 1993.
- 19 Kellert SR, Berry JK. *Phase III: Knowledge, Affection and Basic Attitudes toward Animals in American Society*. Washington, DC: US GPO, 1980.
- 20 Kruse CR. Gender, views of nature, and support for animal rights. *Soc Anim* 7:179–198, 1999.
- 21 Miura A, Bradshaw JWS, Tanida H. Attitudes towards dogs: A study of university students in Japan and the UK. *Anthrozoös* 13:80–88, 2000.
- 22 Nakajima S, Arimitsu K, Lattal KM. Estimation of animal intelligence by university students in Japan and the United States. *Anthrozoös* 15:194–205, 2002.
- 23 Paul E. Empathy with animals and with humans: Are they linked? *Anthrozoös* 13:194–202, 2000.
- 24 Pifer L, Shimizu K, Pifer R. Public attitudes toward animal research: Some international comparisons. *Soc Anim* 2:95–113, 1994.
- 25 Wells D, Hepper P. Attitudes to animal use in children. *Anthrozoös* 8:159–170, 1995.
- 26 Capner CA, Lascelles BDX, Waterman-Pearson AE. Current British attitudes to perioperative analgesia for dogs. *Vet Rec* 145:95–99, 1999.
- 27 Raekallio M, Heinonen KM, Kuusaari J, Vainio O. Pain alleviation in animals: Attitudes and practices of Finnish veterinarians. *Veterinary Journal* 165:131–135, 2003.
- 28 Heath TJ, Lanyon A. A longitudinal study of veterinary students and recent graduates: 4. Gender issues. *Aust Vet J* 74:305–308, 1996.
- 29 Hart LA, Melese-d'Hospital P. The gender shift in the veterinary profession and attitudes toward animals: A survey and overview. *J Vet Med Ed* 16:27–30, 1989.
- 30 O'Farrell V. Students' stereotypes of owners and veterinary surgeons. *Vet Rec* 127:625, 1990.
- 31 Blackshaw JM, Blackshaw AW. Students' perceptions of attitudes to the human–animal bond. *Anthrozoös* 6:190–198, 1993.

## AUTHOR INFORMATION

**James A. Serpell**, PhD, is the Marie A. Moore Professor of Humane Ethics and Animal Welfare at the School of Veterinary Medicine, University of Pennsylvania, 3900 Delancey Street, Philadelphia, PA 19104–6010 USA. E-mail: serpell@vet.upenn.edu. He also directs the Center for the Interaction of Animals & Society at the University of Pennsylvania.