

Influence of socio-demographic and experiential factors on the attitudes of Croatian veterinary students towards farm animal welfare

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ABSTRACT: The aim of this study was to examine the factors influencing the attitudes of veterinary students in Croatia toward farm animal welfare. The survey was carried out at the only faculty of veterinary medicine in Croatia and included students from all years of the integrated undergraduate and graduate study programme. The response rate was 91% ($n = 505$ subjects). According to the socio-demographic and experiential factors observed, females, students in their initial years of study, younger students with urban backgrounds, non-religious/non-spiritual students and vegetarians, and those intending to work with companion animals expressed more concerned attitudes regarding farm animal welfare (all $P < 0.05$). The type of secondary school completed, family monthly income and previous experience with farm or pet animals had no impact on student attitudes. The results of the study point to a variety of factors influencing veterinary student attitudes towards farm animal welfare. A recognition of these factors can contribute considerably to increasing student awareness of farm animal welfare. These results provide a basis for further research into the factors influencing veterinary attitudes to animal welfare and the complexity of their interactions.

Keywords: farm animals; veterinary medicine; education; awareness; questionnaire

There are tens of formal definitions of attitude; however, although uttered years ago and frequently redefined since, Allport's definition of the term attitude remains applicable today, both in terms of terminology and content (Bordens and Horowitz 2008; Nakic 2014). He stated that attitude is "... a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related" (Allport 1935). In this sense, attitudes help us to both define and know how to behave toward the situation or object, and are determined by three components, i.e., affective (an emotion), cognitive (a thought or belief) and behavioural (an action) components (Pickens 2005). These components are

closely inter-related; i.e., changes in one component can influence the other two as well as the resulting attitude (Hawkins 2010).

Attitudes toward animals are important because they influence validation of animal life in economic or emotional terms (Zinsstag et al. 2015), human behaviour towards animals (Bertenshaw and Rowlinson 2009) and how animals are treated (Knight and Herzog 2009; Hazel et al. 2011). Human attitudes toward animals are influenced by many factors that can be classified into several categories, as follows: animal traits (e.g., similarity to humans, cuteness, vulnerability), individual human attributes (e.g., gender, age, educational level, early environment, experience with animals) and cultural (history, cultural and religious beliefs) fac-

tors (Serpell 2004; Ormandy and Schuppli 2014; Borgi and Cirulli 2015).

Public opinion is the most potent driving force for animal welfare (AW) improvement. Along with a large body of scientific research conducted in recent decades, the increasing public concern for farm animals and their breeding conditions has resulted in new, more stringent legal provisions from the European Union on animal breeding related to their welfare protection (Moynagh 2000; Broom 2017). However, there are differences among EU member countries concerning awareness and implementation of farm animal welfare (FAW), which geographically more or less follow a northwest-southeast division (Spinka 2012). For example, according to the results of the latest Eurobarometer survey on attitudes of Europeans toward AW (European Commission 2016), Croatian respondents ranked second (11%) in answering that they “do not think the protection of farm animals is an important issue”. In addition, respondents in Croatia showed the lowest rate of compliance with the statement that decisions on the laws regulating the protection of farm animals should be taken at both EU and national levels jointly (36%), and were more in favour of legislation at the national level only (41%). Such variations among EU member countries may be caused by differences in culture and traditions, standard of living, and public knowledge about FAW (Martelli 2009; Miele 2010; Cornish et al. 2016), as well as by the timing of when a particular country joined the EU, which may lead to gaps in FAW research, publications and university education, including veterinary education (Illmann et al. 2014; Magnani et al. 2017), and *vice versa* (Spinka 2012).

Veterinarians, who recognise the crucial role that animals have in food production, as pets, in biomedical research and education, should act as the main supporters of the welfare of all animals (OIE 2012). Yet, the results of our previous study (Ostovic et al. 2016) on veterinary student attitudes toward FAW, which was the first conducted in Croatia (as the last country to join the EU in 2013) to address veterinary attitudes toward (farm) AW, showed that veterinary students associated AW primarily with the biological functioning of animals. These results also implied that students did not validate equally different farm animal species and management procedures performed on them. They tended to consider pain in farm animals caused by these

procedures only in the case of pronounced pain affliction. First-year student attitudes to FAW issues generally did not change after having completed a course on AW. Moreover, students in their final years showed the least empathy with farm animals, raising concerns about these veterinarians-to-be in promoting good FAW and pointing to the need of modifying their education in the field of FAW.

Considering these results, we embarked upon a study to identify the factors that influenced their attitudes.

MATERIAL AND METHODS

Subjects and questionnaire. Students attending the integrated undergraduate and graduate study programme at the Faculty of Veterinary Medicine, University of Zagreb, the only veterinary faculty in Croatia, were surveyed in the autumn semester of the 2013–2014 academic year. The questionnaire was filled out by students from all study years, first to sixth, with a 91% response rate ($n = 505$; Table 1). The questionnaire consisted of two sections. In the first section, students were asked about gender, age, secondary school, early environment, monthly family income, whether they were religious/spiritual and consumed meat, and whether they owned or kept farm or pet animals. The initial part of the questionnaire also included information on the favoured/chosen study track. The second section of the questionnaire included a series of 5-point Likert scale questions (1 = strongly disagree to 5 = strongly agree) designed to examine the student attitudes to FAW, with higher scores suggesting that students were more concerned about farm animals. Twenty-two statements were chosen to represent the student attitudes (Ostovic et al. 2016).

Students were told that completion of the questionnaire was voluntary and anonymous, and that responses would be used for scientific and educational purposes. The survey was approved by the Faculty Board for Quality Management. Students attend a course on AW in the first study year, and they all have the same curriculum.

Statistical analyses. All analyses were carried out using SPSS v. 17.0 statistical software. The frequencies of student responses were tested using univariate analysis. Factor and cluster analyses were employed to divide students into various segments/groups, whereby student attitudes to FAW

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issues were used as input variables for factor analysis. In order to determine the appropriateness of each inter-correlation matrix for factor analysis, Bartlett's test, the Kaiser-Meyer-Olkin measure of sampling adequacy (MSA) and the Kaiser-Meyer-Olkin criterion were used (Hair et al. 2010). The principal component method was performed on the 22 variables chosen and eigenvalues greater than one were selected as the criteria to determine the number of factors to be extracted. The varimax rotation procedure was performed to ease the interpretation of each factor. Factor scores of attitude variables were used to cluster the students into segments, with Euclidean distance and Ward's aggregation method applied in the analyses. The appropriateness of the obtained factors for cluster analysis was tested by use of discriminant analysis. Differences between the clusters, i.e., student segments, in attitudes toward the FAW topics observed were examined using the Kruskal-Wallis test and Mann-Whitney *U*-test, while differences between

student segments according to their socio-demographic and experiential characteristics were determined using the χ^2 -test. $P < 0.05$ was considered as a significant value for all tests.

RESULTS

As shown in Table 1, female students predominated in the study (74.9%); 59% of study subjects were aged 18–21, 81.8% had completed high school and 74.9% had grown-up in urban settings. The greatest proportion of students were from families with monthly incomes of less than €1000 (29.5%), were moderately religious/spiritual (39.2%) and consumed meat 3–5 times a week (42.2%). More than half of the students (60.2%) had no previous experience with farm animals, while almost all students (95%) owned or kept pets. The majority of study subjects (53.1%) had favoured/chosen the Companion Animals study track.

Table 1. Socio-demographic and experiential characteristics of the student sample ($n = 505$)

Characteristics	Sample (%)	Characteristics	Sample (%)
Study year		Religiosity/spirituality	
First	26.7	High	15.2
Second	21.4	Moderate	39.2
Third	14.7	Weak	20.2
Fourth	14.5	No	25.4
Fifth	10.9	Meat consumption	
Sixth	11.8	Every day	38.6
Gender		3–5 times a week	42.2
Male	25.1	Less often	14.5
Female	74.9	No	4.7
Age (years)		Previously owned/kept farm animals	
18–21	59.0	Yes	39.8
22–24	30.5	No	60.2
> 24	10.5	Previously owned/kept pet animals	
Secondary school		Yes	95.0
High school	81.8	No	5.0
Veterinary	11.5	Favoured/chosen study track*	
Other	6.7	Companion animals	53.1
Monthly family income (€)		Farm animals and horses	19.6
< 1000	29.5	Veterinary public health	20.8
1000–1500	29.1	I do not know	6.5
1500–2000	22.2	Early environment	
> 2000	15.0	Rural	25.1
No answer	4.2	Urban	74.9

*Students choose their study track in the 10th semester; particular study tracks have enrolment quota

Bartlett's test (χ^2 -test = 6638.179, $P < 0.001$), the Kaiser-Meyer-Olkin MSA (0.823) and the Kaiser-Meyer-Olkin criterion (MSA coefficients > 0.7) indicated appropriateness of the data for factor analysis. Using factor analysis, 22 statements were grouped into six independent factors explaining 74.22% of the total variance, with the first factor explaining 28.81%. Upon more detailed analysis of the loading on each factor in the rotated component matrix, six extracted factors were named as follows: (1) level of cognitive abilities in cattle, pigs and poultry; (2) welfare compromises in cattle, pigs and poultry; (3) management practices, defined as standard procedures, detrimental for FAW; (4) management practices, defined as procedures without pain relief, detrimental for FAW;

(5) role of biological functioning, natural living and emotional states for FAW; and (6) role of FAW for sustainability of farming systems and food safety and quality (Table 2).

Based on the six factors described above, cluster analysis identified three homogeneous groups of veterinary students with different inclinations to FAW. The clusters, i.e., student segments, were named as indifferent, concerned and contradictory relative to FAW. Discriminant analysis revealed all six factors to have significantly influenced ($P < 0.05$) cluster differentiation, with the fifth factor having the greatest impact (role of biological functioning, natural living and emotional states for FAW) and the lowest Wilks' Lambda coefficient. It was found that 82.80% of the originally grouped cases (i.e.,

Table 2. The factor loading matrix

Statement	Factor loading	Variance explained (%)
Factor 1 – level of cognitive abilities in cattle, pigs and poultry		
Level of cognition in cattle	0.821	28.81
Level of cognition in pigs	0.755	
Level of cognition in poultry	0.718	
Level of emotions in cattle	0.787	
Level of emotions in pigs	0.758	
Level of emotions in poultry	0.726	
Factor 2 – welfare compromises in cattle, pigs and poultry		
Welfare compromise in cattle	0.858	14.03
Welfare compromise in pigs	0.842	
Welfare compromise in poultry	0.813	
Factor 3 – management practices, defined as standard procedures, detrimental for FAW		
Piglet castration	0.809	9.25
Teeth-clipping in piglets	0.865	
Tail-docking in piglets	0.840	
Beak-trimming in poultry	0.883	
Factor 4 – management practices, defined as procedures without pain relief, detrimental for FAW		
Piglet castration	0.826	8.19
Teeth-clipping in piglets	0.886	
Tail-docking in piglets	0.869	
Beak-trimming in poultry	0.705	
Factor 5 – role of biological functioning, natural living and emotional states for FAW		
Role of biological functions for FAW	0.866	7.30
Role of natural living for FAW	0.805	
Role of emotional states for FAW	0.881	
Factor 6 – role of FAW for sustainability of farming systems and food safety and quality		
Role of FAW for sustainability of farming systems	0.917	6.64
Role of FAW for food safety and quality	0.924	

FAW = farm animal welfare

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students according to FAW attitudes) were classified correctly, proving that dividing students into segments was not just incidental.

Concerning the student segments identified, contradictory students predominated, accounting for more than half of the study subjects (56%), followed by concerned students (37%) and then indifferent students (7%). In comparison to indifferent and contradictory students, concerned students showed a significantly higher rate of agreement ($P < 0.05$) with the assertions that cattle, pigs and poultry had cognitive abilities and that cattle and pig

welfare was compromised in commercial production. All livestock management practices, defined either as standard ones or procedures without pain relief, were also ranked as being more detrimental ($P < 0.05$) for FAW by concerned students as compared with the other two student segments. Moreover, concerned students considered biological functions, natural living and emotional states as more important for FAW and were more likely to believe that good FAW is necessary for sustainability of farming systems and food safety and quality as compared with the other two student

Table 3. Student segments according to attitudes toward farm animal welfare (FAW) issues

Statement	Indifferent students* <i>n</i> = 34 (7%)	Concerned students* <i>n</i> = 187 (37%)	Contradictory students* <i>n</i> = 284 (56%)	Overall mean (<i>n</i> = 505)
Factor 1 – level of cognitive abilities in cattle, pigs and poultry				
Level of cognition in cattle	3.74 ^a	4.40	3.65 ^a	3.93
Level of cognition in pigs	3.94 ^a	4.62	3.92 ^a	4.18
Level of cognition in poultry	2.71 ^a	3.44	2.63 ^a	2.94
Level of emotions in cattle	3.79 ^a	4.69	3.86 ^a	4.16
Level of emotions in pigs	4.18 ^a	4.68	3.94 ^a	4.23
Level of emotions in poultry	3.06 ^a	3.98	2.98 ^a	3.35
Factor 2 – welfare compromises in cattle, pigs and poultry				
Welfare compromise in cattle	3.91 ^a	4.18	3.75 ^a	3.92
Welfare compromise in pigs	3.91 ^a	4.22	3.61 ^a	3.86
Welfare compromise in poultry	4.25 ^a	4.39 ^a	3.78	4.04
Factor 3 – management practices, defined as standard procedures, detrimental for FAW				
Piglet castration	3.38	3.98	2.82	3.29
Teeth-clipping in piglets	3.53	4.17	2.90	3.41
Tail-docking in piglets	3.35	4.29	2.92	3.46
Beak-trimming in poultry	3.82	4.47	3.25	3.74
Factor 4 – management practices, defined as procedures without pain relief, detrimental for FAW				
Piglet castration	3.88 ^a	4.72	3.93 ^a	4.22
Teeth-clipping in piglets	3.74 ^a	4.43	3.54 ^a	3.88
Tail-docking in piglets	4.00 ^a	4.69	3.72 ^a	4.10
Beak-trimming in poultry	3.91 ^a	4.61	3.65 ^a	4.02
Factor 5 – role of biological functioning, natural living and emotional states for FAW				
Role of biological functions for FAW	2.65	4.90	4.69	4.63
Role of natural living for FAW	2.09	4.88	4.44	4.44
Role of emotional states for FAW	2.24	4.79	4.24	4.31
Factor 6 – role of FAW for sustainability of farming systems and food safety and quality				
Role of FAW for sustainability of farming systems	4.00 ^a	4.42	4.00 ^a	4.16
Role of FAW for food safety and quality	4.00 ^a	4.36	3.99 ^a	4.13

All values in the same row differed significantly among particular student segments at the level of $P < 0.05$, except for those marked with the same letter as superscript

*mean; 1 = strongly disagree, 5 = strongly agree

segments (all $P < 0.05$). There were no differences in attitudes between indifferent and contradictory students, except for the fact that indifferent students were more concerned ($P < 0.05$) that poultry welfare was compromised in livestock production and that standard management practices were detrimental for the farm animal species observed, while contradictory students found all biological functions, natural living and emotional states to be more important ($P < 0.05$) for FAW as compared with indifferent students (Table 3).

The extent to which socio-demographic and experiential factors influenced student attitudes is presented in Table 4. Non-religious/non-spiritual ($P < 0.001$) and younger students ($P = 0.001$) expressed greater concern for FAW, as did students who were raised in urban environments and vegetarians (both $P < 0.01$). Such an attitude was recorded among students in their initial years of study and in females, as well as in students aspiring to work with companion animals (all $P < 0.05$). There was no impact of the type of secondary school completed, family monthly income and previous experience with farm animals or pets on student attitudes.

DISCUSSION

Studies conducted worldwide in both veterinary students (Paul and Podberscek 2000; Serpell 2005; Hazel et al. 2011; van der Weijden 2013) and in veterinarians and veterinary faculty members (Heleski et al. 2005; Sabuncuoglu and Coban 2008; Izmirli and Phillips 2012) have shown females to have greater concern for farm animals compared with males, which is consistent with this study. Comparing attitudes toward animals between male and female students from 102 universities in 11 Eurasian countries, Phillips et al. (2011) also confirmed that female students were more concerned for AW and rights, in particular, in more female-empowered countries, with the closer relations of female students with pet animals compared to male students appearing to be the major contributing factor to this finding.

As reported by Kendall et al. (2006), females are generally the primary family caretakers and as such are more engaged in household tasks, and thus also have more contact with animals. In addition, by taking on nurturing roles, they are more likely to assume attitudes that go beyond the family bound-

aries, extending them to animals; an additional explanation related to the structural position of women in society could also refer to their identification with the disadvantaged (Jackman 2010). The gender gap in attitudes to animals can also be ascribed to the more 'moralistic' attitudes of women toward the environment, while men express more 'dominionistic' attitudes (Ormandy and Schuppli 2014). Thus, females were found to have higher levels of belief in the animal mind (Herzog and Galvin 1997; Apostol et al. 2013), a strong predictor of emotion attribution to animals (Wilkins et al. 2015), as it might be that women are simply predisposed to sympathise with others (Knight et al. 2004). Males are less likely to believe that animals can experience complex emotions such as depression, anxiety, love and grief. Further, unlike females, they are also less likely to believe that animals can manifest certain behavioural changes when feeling grief and that they grieve as a result of separation from their conspecifics. Thus, taken together, they evince more scepticism (Walker et al. 2014).

A study of veterinary student attitudes toward AW conducted at two British universities (Paul and Podberscek 2000) demonstrated an association between the study year and student sentience toward dogs, cats and cows. That is, students in their final years of study showed a lower level of empathy than those in their initial years of study. This finding was also reported by Pollard-Williams et al. (2014) in their investigations of veterinary student attitudes at an Australian university. The results of the present study support the finding that students in their final years of study are less sentient toward farm animals; however, in our study, student attitudes were more influenced by age, although it is presumed that older students are in their final years of study and younger students in their initial years. Clark et al. (2016) also report that younger people have greater awareness of FAW. The effect of age on people's attitudes toward animals can be expressed as a cohort effect, whereby the people sharing the history are likely to also share the beliefs and attitudes, and it can also be related to changes in attitudes that occur with age (Ormandy and Schuppli 2014), e.g., because mental attributes become more complex (Cornish et al. 2016).

The hardening of veterinary student attitudes occurs right at the time of their greatest exposure to practice, according to Pollard-Williams et al. (2014), probably as a mechanism of defence against stress-

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Table 4. Differences among student segments ($n = 505$) according to their socio-demographic and experiential characteristics

Characteristics		Indifferent students (%) $n = 34$	Concerned students (%) $n = 187$	Contradictory students (%) $n = 284$	P
Study year	first	17.6	33.7	23.2	< 0.05
	second	14.7	23.5	20.8	
	third	20.6	13.4	14.8	
	fourth	14.7	12.8	15.5	
	fifth	8.8	7.0	13.7	
	sixth	23.6	9.6	12.0	
Gender	male	29.4	19.3	28.5	< 0.05
	female	70.6	80.7	71.5	
Age (years)	18–21	38.2	66.3	56.7	0.001
	22–24	32.4	26.7	32.7	
	> 24	29.4	7.0	10.6	
Secondary school	high school	73.5	82.4	82.4	> 0.05
	veterinary	8.8	10.6	12.3	
	other	17.7	7.0	5.3	
Early environment	rural	44.1	19.8	26.4	< 0.01
	urban	55.9	80.2	73.6	
Family monthly income (€)	< 1000	35.3	26.7	30.6	> 0.05
	1000–1500	38.2	29.9	27.5	
	1500–2000	8.8	24.1	22.5	
	> 2000	17.7	13.9	15.5	
	no answer	0.0	5.4	3.9	
Religiosity/spirituality	high	14.7	15.5	15.1	< 0.001
	moderate	38.2	27.8	46.8	
	weak	32.4	21.9	17.6	
	no	14.7	34.8	20.5	
Meat consumption	every day	32.4	35.8	41.2	< 0.01
	3–5 times a week	41.2	42.2	42.3	
	less often	26.4	12.8	14.1	
	no	0.0	9.2	2.4	
Previously owned/kept farm animals	yes	38.2	39.0	40.5	> 0.05
	no	61.8	61.0	59.5	
Previously owned/kept pet animals	yes	91.2	95.7	95.1	> 0.05
	no	8.8	4.3	4.9	
Favoured/chosen study track	companion animals	50.0	59.9	48.6	< 0.05
	farm animals and horses	11.8	18.2	21.8	
	veterinary public health	35.3	17.1	21.5	
	I do not know	2.9	4.8	8.1	

ful events and the frequent conflicts of interest in veterinary practice, as well as due to the weariness and stress associated with advancing study years. This has also been confirmed in studies conducted among medical students (Newton et al. 2008; Hojat et al. 2009). Chen et al. (2007) found that medi-

cal students preferring people-oriented specialties (e.g., family medicine, paediatrics, psychiatry) had higher empathy scores as compared with students preferring technology (instrument)-oriented specialties (e.g., radiology, surgery) characterised by less physician-patient interaction. Similar correla-

tions can be found for veterinary students with farm animals. The results of our previous study (Ostovic et al. 2016) suggested the management procedures performed on farm animals to be more acceptable to students in their final years of study than those in their initial years irrespective of whether these were defined as standard procedures or procedures without pain relief. The same study also revealed that students generally think of management procedures performed on farm animals and the pain caused by these procedures exclusively in cases of severe pain or absence of pain relief. On the one hand, it might seem that in spite of ample information on animal pain and its management in many courses during the study of veterinary medicine (Pollard-Williams et al. 2014), veterinary curriculum does not adequately address the problem of pain in many common farm animal practices. On the other hand, and what is also more likely, taking in consideration the fact that greater knowledge need not be associated with more positive attitudes (Serpell 2008), veterinary students, and in particular those in their final years of study, perceive farm animals simply as 'instruments' in food production, i.e., as animals that will soon serve their economic purposes, thus emphasising their practical value. Raekallio et al. (2003) reported that younger veterinarians rate animal pain higher and treat it more frequently than their older colleagues. According to these authors, younger veterinarians and those in large practices had more analgesics available than older veterinarians and those in small practices.

Heleski et al. (2005) found no association between age and attitudes toward FAW of veterinarians at US veterinary colleges but did find one between their religiosity and their attitudes; veterinarians declaring themselves as more religious showed less concern about FAW, similar to the present study in veterinary students and other studies assessing attitudes towards the treatment of animals (Bowd and Bowd 1989). These findings are quite contradictory to what would be expected, i.e., that more religious people should express a higher level of empathy for animals, as also speculated by Heleski et al. (2004).

Kendall et al. (2006) found people with lower levels of education and those experiencing economic hardship to show greater concern for animal well-being, linking it to their class position in society (similar to that described above for gender difference) and suggesting that economically marginalised groups have more positive attitudes toward

animals. Another study carried out by Peek et al. (1997) also showed that lower socio-economic status (generally estimated by educational level and in one case by income) was associated with their greater affinity for animal rights. On the other hand, Serpell (2008) reported that higher educational level and higher income tend to predict greater concern for animals. According to the results reported by Phillips et al. (2012), students from European countries showed greater concern for AW than students from Asian countries, which could in part be ascribed to the increased affluence of European students, as there was positive correlation between student monthly expenditure and their concern for AW and rights. In the present study, there was no difference in the attitudes between students from families with different monthly incomes or between students having completed different secondary schools; however, it should be noted that more than 80% of the students in the study had completed high school.

Early environment did influence the attitudes of veterinary students toward FAW. Students who were raised in urban environments were found to be more empathic toward farm animals than those with rural backgrounds. This finding could be explained by the different opportunities for contact and relationship with animals offered by rural and urban settings. People from urban settings in developed countries need not ever come into contact with the animals they eat and are spared from watching animal slaughter; instead, in urban settings, animals are perceived as companions and family members, they are given names, supplied with toys, ascribed human properties, protected from any harm, offered medical care and are mourned and even buried when they die; all this can contribute to urban people expressing a higher level of concern for AW, including FAW, as was reported by Pifer et al. (1994) and Ormandy and Schuppli (2014). As also suggested by these authors, countries with closer contact with the soil are characterised by more pragmatic and utilitarian attitudes toward animals, in which animal usage by humans is not considered disputable.

The study by Serpell (2005) also revealed that rural background of veterinary students at the University of Pennsylvania, as well as their experience of living and/or working on a farm was associated with lower empathy for AW/rights. Moreover, students who previously owned or kept farm ani-

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mals revealed less negative attitudes to hunting, use of live animals in surgery teaching and 'painful' research, cockfighting and elective/cosmetic procedures. Previous student experience of owning/keeping farm animals was also associated with a decreased tendency to recognise their primary commitments toward animals, as well as with treating farm animals and companion animals unequally. Students having previously kept only cats and/or dogs expressed the opposite attitudes towards hunting and the use of live animals in surgery teaching; they also considered farm animals and companion animals to deserve identical treatment, while acknowledging that placing the interests of the animal patient over those of the client is the primary duty of the veterinarian.

In the present study, there was no effect of previous experience either with farm animals or pet animals on student attitudes, although almost all study students had previously been in contact with pets and more than two-thirds of them had grown-up in urban environments. Therefore, differences in attitudes toward FAW between urban and rural settings should presumably also be attributed to factors other than varying opportunities for contact with animals and relationships between humans and animals, such as different cultural experiences in these settings (Kendall et al. 2006). Assessing the attitudes of students from three different master courses concerning AW and ethics at a Dutch university, including veterinary students, van der Weijden (2013) also recorded no effect of the previous keeping of pets on attitudes. However, vegetarian students had more positive attitudes toward animals, including farm animals, which was also confirmed by the results of our study. In his review article, Ruby (2012) thoroughly describes the motivations of people who become vegetarians, of which the most common was just concern for the ethics of raising and slaughtering animals, followed by personal health implications, whereas environmental sustainability, spiritual purity and disgust for sensory characteristics of meat emerged as other frequent reasons. Furthermore, the motivations of humans for being vegetarians are not static and can be added, dropped or modified with time. A study carried out by Fox and Ward (2008) has revealed that vegetarians can follow a pathway on which the initial motivations are being enhanced with time and coupled with other reasons to persist or additionally restrict their diets; such a lifestyle

is being practiced by ever more people all over the world (Povey et al. 2001; Pribis et al. 2010).

Levine et al. (2005) found that veterinary students at a US college aspiring to work with farm animals considered more procedures performed on various animal species to be humane, as compared with students intending to work with companion animals. The results of the present study also showed that students preferring work with companion animals had more concerned attitudes toward FAW than those having chosen work with farm animals, which could be explained by the reasons described above related to the effect of early environment on student attitudes. However, as reported by Hazel et al. (2011), veterinary students at the University of Adelaide electing to work with farm animals also showed less empathy for this animal category, whereas those preferring to work with wildlife had more empathy for farm animals. According to this and the above, it appears that irrespective of all other factors involved, veterinary students and in particular those planning to work with farm animals, may generally have different perceptions of these animals, the humaneness of management practices performed on them or stress and pain caused by these practices. As argued by Serpell (2005), this may also imply that the utilitarian viewpoint characteristic of the culture of food animal production has overcome affective responses to animals, which typically are related to pets, i.e., in rating their levels of affection and perception of utility, students are oriented by the type of animal and its basic function.

It has previously been reported that continental and national differences influence the attitudes of veterinary students and their teachers toward AW (Phillips and McCulloch 2005; Izmirlı and Phillips 2012; Phillips et al. 2012; van der Weijden 2013), which should be taken into consideration for student education. In this regard, it must also be borne in mind that veterinary curricula vary across the world (Hewson et al. 2005). According to Illmann et al. (2014), there seem to be no regional differences across Europe in the content of the courses in FAW university education, but they do vary according to the number of hours of education and interactive teaching. A significantly higher number of FAW teaching hours has been recorded in the Northwest region of Europe as compared with other regions, including the Balkans and Croatia. The Northwest of Europe also has more interac-

tive education methods, e.g., group discussions and on-farm demonstrations, probably owing to the raised pedagogical awareness of teachers of all the advantages of interactive teaching and better training in these methods.

The results of our previous study (Ostovic et al. 2016) pointed to the need of increasing the number of FAW teaching hours, with special reference to practical on-farm teaching, which has been demonstrated by Pollard-Williams et al. (2014) to have greater impact on veterinary student attitudes toward AW than other education methods. These authors also concluded that AW courses should be shifted to higher study years because they found that AW teaching early in the program had no impact on student attitudes, or on their decreasing empathy over the course of their studies. This is also supported by the results of this study, which are complementary to those of our previous publication (Ostovic et al. 2016). In contrast, Hazel et al. (2011) found AW teaching in the first study year to have a favourable influence on veterinary student attitudes toward farm animals. Still, these attitudes were lower than those toward pets or pests, and they did not examine student attitudes in later years of study.

In conclusion, the present study performed in Croatian veterinary students contributes to the scant research into the factors influencing veterinary student attitudes toward FAW. The obtained results are highly consistent with other FAW surveys conducted in veterinary students all over the world; yet, according to the available data, it seems that most of the respective studies were conducted outside Europe and in particular outside the EU. On the one hand, these results point to the complexity of factors influencing student attitudes, while, on the other hand, they reveal that many of these factors influence student attitudes in the same way. It is quite disturbing that students planning to work with farm animals as relatively short-lived animals that serve economic uses tend to express less concern about FAW than students expecting to work with companion animals (or some other animal category). Furthermore, the results suggest that recognition of the factors influencing (veterinary) student attitudes toward FAW can provide a clue to improving their awareness of FAW. Finally, the results of this survey provide a basis for future research including veterinary students, veterinary faculty members and veterinarians, in order to gain

comprehensive insights into the factors influencing veterinary attitudes toward (farm) AW and how these factors interact with each other.

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