

Attitudes of veterinary students in Croatia toward farm animal welfare

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Abstract

This survey was undertaken to assess the attitudes of Croatian veterinary students regarding farm animal welfare issues. The study included students of all undergraduate years at the only Faculty of Veterinary Medicine in Croatia. First-year students were surveyed twice, ie before and after attending the course on animal welfare, using a written questionnaire containing statements with a five-point Likert scale for choice of answers. Students consider good animal welfare necessary for sustainability of farming systems and food quality and safety, ranking particular issues in the following order: biological functioning > natural living > emotional states. Students also believe that cattle and pigs have greater cognitive abilities and that their welfare is less compromised in comparison with poultry, whereas standard management procedures performed in pig production are perceived as more humane than beak-trimming in poultry. In addition, students tend to consider pain in farm animals caused by management procedures only when these procedures involved the affliction of significant pain. There were no differences between attitude scores on most of the statements from first-year students before and after the course. Furthermore, for the majority of statements, the mean responses were lower in final-year students, suggesting a lower level of empathy toward farm animals. Although similar results have also been recorded elsewhere in the world, these results raise concerns as to the ability of these future veterinarians to promote good farm animal welfare in the country and abroad. The results also suggest a need to modify veterinary student education in Croatia in the field of farm animal welfare.

Keywords: animal welfare, attitudes, Croatia, farm animals, survey, veterinary students

Introduction

Providing good farm animal welfare (FAW), among other issues, has a growing role in the quality of human life. Due to outbreaks of many food-borne diseases, genetically modified food and food products from cloned animals, greater attention is being paid to food quality and safety on the market, while consumers show ever greater interest in food origin and production (Verbeke 2005; EC 2007a; Antunović *et al* 2014). While poor animal welfare (AW) directly reduces product quality, consumer perception of animal well-being affects it indirectly (Jago *et al* 2000; Pavičić & Ostović 2013) by equating good AW standards with good food quality standards (Meehan *et al* 2002; Awuor & Karugu 2014).

To date, Croatian citizens/consumers have participated in only a few surveys of attitudes toward FAW. According to the Eurobarometer survey (EC 2007b), on the 1–10 scale (1: not at all important to 10: very important) they ranked importance of farm animal protection as 7.9 (mean), which is consistent with the mean recorded in the European Union (EU) countries (7.8); yet, more than half of the Croatian consumers surveyed reported that they did not consider

FAW when buying meat or meat products (EC 2007c; Cerjak *et al* 2011). Also, when asked who they believe is the best to ensure that food products are produced in an AW-friendly way, both Croatian and other EU citizens ranked veterinarians second only to farmers as the professionals best positioned to ensure FAW (EC 2007b).

Although treatment of diseases and pain relief in animals remain the primary task of veterinary medicine, the role of veterinarians has assumed some additional, modern aspects. Nowadays, veterinarians have the key role in health protection and implementation of the ‘one-health concept’ which, in the case of farm animals, implies ‘healthy food from healthy animals’ (Blažič & Köfer 2009; Wall 2014). According to this concept, farm-oriented veterinary professionals should be properly qualified in the field of FAW, thus being able to provide consultation to farmers, owners or managers of animal production systems on the most appropriate management practices (Cáceres 2012) and to ensure efficient application of relevant standards, ie meeting the needs of animals kept for production purposes (Edwards & Schneider 2005), whereby education of veterinarians-to-be

Table 1 Number of students included in the survey and response rate.

	Study year							Total (- ^B)	Total (+ ^B)
	First ^A	First ^B	Second	Third	Fourth	Fifth	Sixth		
Total number of students per year (n)	149	149	113	82	84	65	60	553	702
Number of respondents (n)	143	135	108	74	73	55	60	513	648
Response rate (%)	96	91	96	90	87	85	100	93	92

^A Responded before attending the course on animal welfare; ^B responded after the course.

has a prominent role (Main 2010; OIE 2012). However, as indicated by Špinka (2012), across Europe there are many differences in the FAW university education and research that go hand-in-hand with gaps in FAW awareness and implementation. These differences can lead to variations in the levels of knowledge and skills and, thus, in competence at the international labour market, including future professionals such as veterinarians.

A number of studies have been conducted worldwide on veterinary attitudes toward AW including that toward farm animals (Paul & Podberscek 2000; Heleski *et al* 2005; Levine *et al* 2005; Serpell 2005; Sabuncuoglu & Coban 2008; Lord *et al* 2010; Hazel *et al* 2011; Izmirli & Phillips 2012; Pollard-Williams *et al* 2014). To our knowledge, this has never been extended to include Croatia.

The present study aimed to examine the attitudes of veterinary students in Croatia on various FAW topics and potential differences between study years, in order to assess their compatibility with the promotion of good FAW and to identify any need to modify current AW curriculum.

Materials and methods

Subjects

The Faculty of Veterinary Medicine at the University of Zagreb is the only veterinary faculty in Croatia. Students attending the integrated undergraduate and graduate study programme were surveyed in the autumn semester of academic year 2013–2014. Prior to the survey, students were introduced to the objectives and purpose of the study and informed that the results obtained would be used for scientific and educational purposes. Student participation was voluntary and anonymous. The survey was approved by the Faculty of Veterinary Medicine Board for Quality Management. The student sample was representative since the questionnaire was answered by students of all study years (from first- to sixth-year students). The number of students according to study years, total number of students and response rate are shown in Table 1. First-year students answered the questionnaire twice, ie before and after attending a compulsory 40-h course entitled ‘Environment, Animal Behaviour and Welfare’, to see whether attending the course would engender some substantial attitudinal changes. Also, on initial testing

(before attending the course on AW), first-year students did not answer particular questions because we considered them too professionally demanding for these students. All students had the same curriculum on AW.

Questionnaire

A written questionnaire was developed and pre-tested on a sample of 55 students (including 10% of each study year students) and corrected according to their inquiries and suggestions. The questionnaire consisted of 30 closed-ended questions with restricted categorical response options, divided into two parts. The first group of questions requested information on demographic and experiential characteristics of subjects including gender, age, secondary school, whether they grew up in rural or urban environment, whether they owned or kept farm animals or pets, and favoured/chosen study track, as presented in Table 2. The second part of the questionnaire contained a series of five-point Likert scale questions (1: full disagreement to 5: full agreement) on FAW issues, where higher scores suggested a higher level of students’ empathy for farm animals. Twenty-two statements were chosen to represent students’ attitudes toward FAW (Tables 3–5). The questionnaire was focused on FAW topics in Croatia, with special reference to those animal species that are most numerous (cattle, pigs and poultry) and most intensively bred in Croatia (Croatian Bureau of Statistics [CBS] 2012).

Statistical analysis

Data collected by the survey were analysed using SPSS v17.0 software. Univariate analysis was employed to determine frequencies of students’ answers and their attitudes were investigated by calculating mean responses on Likert scale. Since the data set were non-parametric, differences in first-year students’ attitudes before and after attending the course on AW were tested by Wilcoxon signed-ranks test, while differences in the attitudes between particular study years and in overall mean scores (sum of mean values recorded in all study years) were tested by Kruskal-Wallis test and Mann-Whitney *U*-test. The level of statistical significance was set at $P < 0.05$.

Results and Discussion

Demographic and experiential data on the study sample of students are shown in Table 2 and mean results of Likert scale choices regarding their opinions on different FAW topics in Tables 3–5.

Table 2 Demographic and experiential characteristics of the sample of veterinary students in Croatia.

	Study year					
	First (n = 143)	Second (n = 108)	Third (n = 74)	Fourth (n = 73)	Fifth (n = 55)	Sixth (n = 60)
<i>Gender</i>						
Male	21.0	20.4	21.6	35.6	30.9	26.7
Female	79.0	79.6	78.4	64.4	69.1	73.3
<i>Age (years)</i>						
18–21	96.5	96.3	64.9	20.5	–	–
22–24	3.5	3.7	23.0	72.6	87.3	46.7
> 24	–	–	12.1	6.9	12.7	53.3
<i>Secondary school</i>						
High school	91.6	87.0	74.3	76.7	80.0	70.0
Veterinary	2.8	9.3	13.5	16.4	9.1	20.0
Other	5.6	3.7	12.2	6.9	10.9	10.0
<i>Environment grown up in</i>						
Rural	25.2	20.4	24.3	32.9	18.2	31.7
Urban	74.8	79.6	75.7	67.1	81.8	68.3
<i>Have you owned or kept farm animals?</i>						
Yes	37.1	38.9	39.2	53.4	34.5	50.0
No	62.9	61.1	60.8	46.6	65.5	50.0
<i>Have you owned or kept pet animals?</i>						
Yes	93.7	97.2	98.6	91.8	92.7	98.3
No	6.3	2.8	1.4	8.2	7.3	1.7
<i>Favoured/chosen study trackST</i>						
Companion animals	59.4	52.8	48.6	60.3	60.0	36.7
Farm animals and horses	17.5	27.8	17.6	11.0	14.5	28.3
Veterinary public health	20.3	15.7	27.0	16.4	18.2	35.0
I do not know	2.8	3.7	6.8	12.3	7.3	–

ST Students choose study track in the fifth study year (10th semester), with enrolment quota for particular tracks.

Gender distribution of study students revealed a female predominance (about two-thirds) in all study years, which is consistent with a growing trend of greater female entry into the veterinary profession worldwide (Lofstedt 2003; Irvine & Vermilya 2010). In 96.5% of cases, students enrolled in the veterinary faculty at the age of 18–21 years. Considering their secondary school, more than two-thirds had completed high school, in particular first- and second-year students (91.6 and 87.0%, respectively), as compared with a very low percentage of students having completed vocational schools including secondary veterinary school ($\leq 20\%$). The majority of students grew up in an urban environment and more than half of them

had no previous interaction with farm animals, while more than 90% of students of all study years had or were taking care of a pet at some period of their lives. The favoured specialty areas of the study were companion animals, with much the same number of students preferring farm animals and horses and veterinary public health. Good AW is essential for sustainability of farming systems (Keeling 2005; Broom *et al* 2013) and is becoming increasingly recognised as an important mark of food quality, for European citizens and consumers in particular (Blokhuis *et al* 2008; Viegas *et al* 2011). According to the overall mean scores (Table 3), veterinary students in Croatia agree that good AW is necessary for sustainability of farming systems

Table 3 Mean (\pm SEM) students' attitudes regarding the role of good farm animal welfare in sustainability of farming systems and food safety and quality and the role of biological functions, natural living and emotional states in farm animal welfare as expressed on the five-point Likert scale (1: fully disagree to 5: fully agree).

		Study year							
		First ^A (n = 143)	First ^B (n = 135)	Second (n = 108)	Third (n = 74)	Fourth (n = 73)	Fifth (n = 55)	Sixth (n = 60)	Overall score (^L A)
Sustainable farming systems	–	4.13 ^a (\pm 0.08)	4.13 ^a (\pm 0.08)	4.43 ^{abc,de} (\pm 0.08)	4.14 ^b (\pm 0.12)	4.11 ^c (\pm 0.10)	4.06 ^d (\pm 0.11)	3.88 ^e (\pm 0.15)	4.16 (\pm 0.04)
Food safety and quality	–	4.10 ^a (\pm 0.08)	4.10 ^a (\pm 0.08)	4.34 ^{abc,d} (\pm 0.08)	4.24 ^{ef} (\pm 0.11)	4.11 ^b (\pm 0.09)	3.89 ^{c,e} (\pm 0.14)	3.87 ^{df} (\pm 0.14)	4.13 (\pm 0.04)
Biological functioning		4.75 ^{ab} (\pm 0.05)	4.77 ^{c,de} (\pm 0.05)	4.74 ^{f,gh} (\pm 0.07)	4.54 (\pm 0.10)	4.52 ^{a,c,f} (\pm 0.09)	4.53 ^{d,g} (\pm 0.12)	4.47 ^{b,e,h} (\pm 0.11)	4.63 ^x (\pm 0.03)
Natural living		4.57 ^{ab} (\pm 0.05)	4.63 ^{c,de} (\pm 0.06)	4.54 ^{f,g} (\pm 0.09)	4.45 ^h (\pm 0.12)	4.36 ^c (\pm 0.11)	4.20 ^{a,d,f,h} (\pm 0.14)	4.18 ^{b,e,g} (\pm 0.15)	4.44 ^x (\pm 0.04)
Emotional states		4.30 (\pm 0.08)	4.45 ^{abc} (\pm 0.05)	4.49 ^{d,ef} (\pm 0.08)	4.22 (\pm 0.12)	4.18 ^{a,d} (\pm 0.12)	4.15 ^{b,e} (\pm 0.13)	4.05 ^{cf} (\pm 0.16)	4.31 ^x (\pm 0.04)

^A Responded before attending the course on animal welfare; ^B responded after the course.

^{a,b,c,d,e,f,g,h} Mean values in the same row marked with the same letter in superscript differ statistically significantly at the level of $P < 0.05$.

^x Total mean values for biological functioning, natural living and emotional states differ statistically significantly at the level of $P < 0.05$.

Table 4 Mean (\pm SEM) students' attitudes regarding the level of cognitive abilities in cattle, pigs and poultry and their welfare compromise in commercial livestock production as expressed on the five-point Likert scale (1: fully disagree to 5: fully agree).

		Study year							
		First ^A (n = 143)	First ^B (n = 135)	Second (n = 108)	Third (n = 74)	Fourth (n = 73)	Fifth (n = 55)	Sixth (n = 60)	Overall score (^L A)
Thought process	Cattle	3.87 (\pm 0.07)	4.03 (\pm 0.08)	3.96 (\pm 0.09)	3.96 (\pm 0.12)	3.84 (\pm 0.11)	3.76 (\pm 0.14)	3.90 (\pm 0.12)	3.93 ^x (\pm 0.04)
	Pigs	3.94 ^a (\pm 0.09)	4.40 ^{abc,de,f} (\pm 0.07)	4.18 ^b (\pm 0.09)	4.15 ^c (\pm 0.11)	4.04 ^d (\pm 0.11)	4.02 ^e (\pm 0.13)	4.05 ^f (\pm 0.12)	4.18 ^x (\pm 0.04)
	Poultry	2.75 ^a (\pm 0.08)	3.10 ^{ab} (\pm 0.10)	2.84 (\pm 0.10)	2.99 (\pm 0.15)	2.88 (\pm 0.14)	2.87 (\pm 0.17)	2.78 ^b (\pm 0.14)	2.94 ^x (\pm 0.05)
Emotions	Cattle	4.18 (\pm 0.08)	4.27 ^a (\pm 0.07)	4.22 (\pm 0.09)	4.24 ^b (\pm 0.12)	3.93 ^{ab} (\pm 0.12)	4.00 (\pm 0.13)	4.13 (\pm 0.12)	4.16 ^x (\pm 0.04)
	Pigs	3.98 ^{ab} (\pm 0.09)	4.26 ^a (\pm 0.07)	4.21 (\pm 0.09)	4.27 ^b (\pm 0.11)	4.25 (\pm 0.11)	4.18 (\pm 0.13)	4.15 (\pm 0.12)	4.23 ^y (\pm 0.04)
	Poultry	3.01 ^{abc} (\pm 0.11)	3.41 ^a (\pm 0.11)	3.23 (\pm 0.11)	3.46 ^b (\pm 0.16)	3.41 ^c (\pm 0.16)	3.33 (\pm 0.16)	3.27 (\pm 0.17)	3.35 ^{x,y} (\pm 0.06)
Welfare compromise	Cattle	3.63 ^{abc,d} (\pm 0.06)	3.81 ^e (\pm 0.06)	3.94 ^{a,f} (\pm 0.06)	4.08 ^{b,ef,g} (\pm 0.09)	4.00 ^c (\pm 0.08)	3.98 ^d (\pm 0.09)	3.77 ^e (\pm 0.10)	3.92 ^x (\pm 0.03)
	Pigs	3.86 (\pm 0.08)	3.90 (\pm 0.08)	3.94 (\pm 0.09)	3.93 (\pm 0.12)	3.86 (\pm 0.12)	3.78 (\pm 0.14)	3.60 (\pm 0.14)	3.86 ^y (\pm 0.04)
	Poultry	3.80 ^{abc} (\pm 0.07)	4.05 ^a (\pm 0.06)	4.19 ^{b,de,f} (\pm 0.07)	4.16 ^{c,g,h,i} (\pm 0.09)	3.95 ^{d,g} (\pm 0.08)	3.89 ^{e,h} (\pm 0.10)	3.80 ^{f,i} (\pm 0.11)	4.04 ^{x,y} (\pm 0.03)

^A Responded before attending the course on animal welfare; ^B responded after the course.

^{a,b,c,d,e,f,g,h,i} Mean values in the same row marked with the same letter in superscript differ statistically significantly at the level of $P < 0.05$.

^{x,y} Total mean values within thought process, emotions and welfare compromise, respectively, marked with the same letter in superscript differ statistically significantly between particular animal species at the level of $P < 0.05$.

and food safety and quality. Yet, students at higher study years were significantly less ($P < 0.05$) likely to indicate that they felt AW to be important than those at lower study years. With respect to the core concept of Five Freedoms, good AW is recognised as freedom from thirst, hunger and malnutrition; discomfort; pain, injury and disease; fear and distress; and freedom to express normal behaviour

(FAWC 1993). However, all commercial husbandry systems have their strengths and weaknesses, so that absolute attainment of all five freedoms is unrealistic (Webster 1994). Different people emphasise different AW concepts, ie animal basic health and functioning, their natural living or emotional states, in assessing and improving FAW. These are not only science-based concepts, but are also influenced

Table 5 Mean (\pm SEM) students' attitudes regarding neonatal livestock management practices, defined in different ways, detrimental for animal welfare as expressed on the five-point Likert scale (1: fully disagree to 5: fully agree).

		Study year						Overall score
		First ^b (n = 135)	Second (n = 108)	Third (n = 74)	Fourth (n = 73)	Fifth (n = 55)	Sixth (n = 60)	
Piglet castration	Standard procedure	3.73 ^{a,b,c,d,e} (\pm 0.08)	3.20 ^a (\pm 0.12)	3.11 ^b (\pm 0.14)	3.14 ^c (\pm 0.14)	3.11 ^d (\pm 0.15)	3.02 ^e (\pm 0.16)	3.29 ^x (\pm 0.05)
	Without pain relief	4.24 (\pm 0.09)	4.25 (\pm 0.10)	4.42 ^{a,b} (\pm 0.10)	4.25 (\pm 0.13)	4.07 ^a (\pm 0.12)	3.97 ^b (\pm 0.15)	4.22 (\pm 0.05)
Teeth-clipping in piglets	Standard procedure	3.90 ^{a,b,c,d,e} (\pm 0.09)	3.45 ^a (\pm 0.12)	3.18 ^b (\pm 0.15)	3.19 ^c (\pm 0.14)	3.11 ^d (\pm 0.15)	3.08 ^e (\pm 0.16)	3.41 ^{x,y} (\pm 0.05)
	Without pain relief	4.09 ^{a,b} (\pm 0.09)	3.92 ^c (\pm 0.10)	3.96 ^d (\pm 0.12)	3.93 ^e (\pm 0.14)	3.78 ^{a,f} (\pm 0.12)	3.28 ^{b,c,d,e,f} (\pm 0.15)	3.88 (\pm 0.05)
Tail-docking in piglets	Standard procedure	3.82 ^{a,b,c,d} (\pm 0.09)	3.47 (\pm 0.12)	3.27 ^a (\pm 0.15)	3.33 ^b (\pm 0.15)	3.20 ^c (\pm 0.14)	3.23 ^d (\pm 0.16)	3.46 ^y (\pm 0.05)
	Without pain relief	4.24 ^{a,b} (\pm 0.08)	4.11 ^c (\pm 0.10)	4.27 ^{d,e} (\pm 0.10)	4.18 ^f (\pm 0.13)	3.91 ^{a,d,f} (\pm 0.11)	3.62 ^{b,c,e,g} (\pm 0.15)	4.10 ^z (\pm 0.05)
Beak-trimming in poultry	Standard procedure	4.14 ^{a,b,c,d} (\pm 0.08)	3.90 ^{e,f} (\pm 0.11)	3.53 ^a (\pm 0.15)	3.64 ^b (\pm 0.14)	3.33 ^{c,e} (\pm 0.14)	3.33 ^{d,f} (\pm 0.16)	3.74 (\pm 0.05)
	Without pain relief	4.27 ^{a,b,c} (\pm 0.08)	4.06 ^{a,d} (\pm 0.09)	4.00 ^e (\pm 0.12)	4.15 ^f (\pm 0.12)	3.78 ^{b,f} (\pm 0.13)	3.50 ^{c,d,e,g} (\pm 0.16)	4.02 ^z (\pm 0.05)

^b Responded after attending the course on animal welfare.

^{a,b,c,d,e,f,g} Mean values in the same row marked with the same letter in superscript differ statistically significantly at the level of $P < 0.05$.

^{x,y,z} All total mean values on identically defined procedures differ statistically significantly at the level of $P < 0.05$, except for those marked with the same letter in superscript.

All total mean values on the same procedure differ statistically significantly at the level of $P < 0.05$.

by the individual culture views about what is important for animals to have a good life. Because of the nature of their expertise, veterinarians might be expected to tend to favour basic health and functioning of the animals. Yet, to ensure high FAW standards, each of these concepts should be taken in consideration, at least to some extent (Fraser 2008).

In line with this suggestion, our students believed that biological functions were the most important for FAW, followed by natural living, and only then emotional states (all $P < 0.05$), although all parameters were scored high, on average. Moreover, the first-year students' attitudes regarding the importance of these parameters for FAW did not change significantly ($P > 0.05$) after the course on AW. The mean student responses on Likert scale were also significantly lower ($P < 0.05$) in later years as compared with the first two study years. In addition, significantly lower ($P < 0.05$) means for biological functioning and natural living were recorded in the last study year as compared with the first, before the course on AW (Table 3).

The extent to which the students agree with the statement that cattle, pigs and poultry have cognitive abilities is presented in Table 4. In first-year students, the mean attitude scores related to the thought process and emotions in cattle showed no significant changes after attending the AW course (both $P > 0.05$), but did increase significantly in relation to pigs and poultry (all $P < 0.05$). The students of all higher study years, compared to first-year students after AW course, considered pigs significantly less ($P < 0.05$) capable to think. Aside from this, generally, there were no

significant differences ($P > 0.05$) in the mean student scores between first-year students after attending the AW course and students of higher study years, or between higher study years, concerning the level of cognitive abilities in the animal species observed.

Investigating veterinary student attitudes regarding cognitive abilities of various domestic animals at a US college, Levine *et al* (2005) found students to be more likely to believe that cattle and pigs could think and were capable of having emotions as compared with poultry, while cognitive abilities of cattle and pigs were ranked similarly. Results of the present study are consistent with their findings, except for the Croatian veterinary students who associated the ability to think with pigs significantly more often ($P < 0.05$) than with cattle (Table 4), as also reported by Davis and Cheeke (1998).

Although our students believed poultry to have a significantly lower ($P < 0.05$) level of cognitive ability as compared with cattle and pigs, they also considered AW in intensive husbandry systems to be poorest ($P < 0.05$) in poultry, and *vice versa*. In first-year students, a significant increase in their attitudes toward welfare compromise after the AW course was only recorded with respect to poultry ($P < 0.05$) (Table 4). Students did not perceive the cognitive abilities of pigs and poultry as pertinent to their welfare (Held *et al* 2002; Mendl & Nicol 2014) in particular (Table 4), which could be explained by the students interacting predominantly with cattle during the study rather than with the other two animal species.

Table 6 Overall attitude of Croatian veterinary students toward FAW as expressed on the five-point Likert scale (1: fully disagree to 5: fully agree).

	Mean (\pm SEM) overall score
Role of FAW for sustainability of farming systems and food safety and quality	4.14 (\pm 0.03)
Role of biological functioning, natural living and emotional states for FAW	4.46 (\pm 0.02)
<i>Level of cognitive abilities in cattle, pigs and poultry</i>	
Thought process	3.68 (\pm 0.03)
Emotions	3.91 (\pm 0.03)
Compromised welfare of cattle, pigs and poultry	3.95 (\pm 0.02)
<i>Management practices, differently defined, detrimental for FAW</i>	
Standard procedures	3.48 (\pm 0.03)
Procedures without pain relief	4.06 (\pm 0.02)
Total	3.93 (\pm 0.01)

FAW: Farm animal welfare.

Protection of AW is one of the main tasks of the veterinary profession. Amongst the others, one of the veterinarian's duties is to respect the principle of equality, ie to approach equally all the treatments and procedures performed on vertebrates (Vučinić 2006) because all vertebrates are considered capable of experiencing the aversive state of pain (National Research Council [NRC] 2009). The zootechnical procedures performed on farm animals, usually without the use of anaesthesia and analgesia, are the most striking examples of causing pain in animals (Gregory 2007; Stafford & Mellor 2010; Viñuela-Fernández *et al* 2011).

Students were asked twice in the questionnaire about their opinion on the extent to which castration, teeth-clipping and tail-docking in piglets and beak-trimming in poultry are detrimental to AW; the first time as part of the standard livestock management procedures and second as procedures performed in the first days of an animal's life without pain relief (Anonymous 1999, 2008). As shown in Table 5, when students were asked about these practices as ones performed without anaesthesia and analgesia, the mean values (as well as the overall mean scores, [$P < 0.05$]) for all procedures were higher in all study years than when students were asked about the same practices as standard husbandry procedures. It seems, then, that students evaluated the same practice differently according to whether their attention had been drawn to the pain caused, even though they would be expected to understand that these practices can be performed without anaesthesia and additional prolonged analgesia. In addition, procedures either defined as standard, or procedures performed without pain relief, were ranked lower by higher year students than lower study

years. This finding might be attributed to the lower level of empathy for animals shown by students at higher study years, a finding also reported elsewhere (Paul & Podberscek 2000; Pollard-Williams *et al* 2014).

Furthermore, students considered piglet castration, as a standard farming procedure, significantly more humane than tail-docking in piglets and beak-trimming in poultry (both $P < 0.05$), probably because of all these practices, students were previously familiar only with piglet castration (a traditional procedure at family farms). As a practice performed without anaesthesia and analgesia, piglet castration was considered significantly less ($P < 0.05$) acceptable in comparison with all other practices observed, probably because of the need for pain relief in longer lasting and more complicated procedures. Moreover, as all procedures are defined as standard ones, these were ranked significantly more ($P < 0.05$) humane in pigs than beak-trimming in poultry, which is consistent with the study by Levine *et al* (2005), although, for example, piglet castration takes longer. This may suggest that not all animal species are perceived equally; the more so, as mentioned above, pigs are considered more sentient than poultry. It seems that, when speaking about emotions in farm animals, students appear to consider positive emotions only, while forgetting negative ones such as pain.

The perceived inconsistencies in the students' considerations call for further investigations, primarily to identify the factors influencing their attitudes.

Animal welfare implications and conclusion

The overall attitudes of Croatian veterinary students regarding FAW (Table 6) appear to express a high level of empathy toward farm animals. However, they associate FAW primarily with biological functioning. Study results also indicate that veterinary students do not perceive different farm animal species and the procedures performed on them equally. They tend to think of management procedures on farm animals and pain thus inflicted as important for FAW only when these are likely to cause significant pain and in the absence of pain relief.

Generally, the attitudes of first-year students toward the FAW topics under study did not change after attending the AW course. On the one hand, this may point to their deep-rooted attitudes toward AW and, on the other, to certain failures in their education. Also, final-year students chose the lowest scores to most questionnaire statements, indicating a lower level of sentience for farm animals. Although similar findings have been recorded elsewhere in the world, the question arises as to whether these future veterinarians can promote good FAW in Croatia and what will be their level of competence on the international labour market. Accordingly, our results suggest the need to make modifications to their education, for example, by introducing an AW course in their final year of study and by increasing the number of both theoretical lessons and practical exercises, particularly field education at pig and poultry farms.

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