

## Attitudes of students from south-east and east Asian countries to slaughter and transport of livestock

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### Abstract

Attitudes to animals have been extensively studied for people in developed countries, but not for those in developing countries. The attitudes of prospective stakeholders in the livestock sectors in south-east and east Asia toward transport and slaughter were examined by surveying university students studying veterinary medicine and animal science in Malaysia, Thailand, China and Vietnam, with a total of 739 students taking part. Students had greater acceptability of transport than slaughter issues for livestock, and female students found most transport and slaughter issues of greater concern than male students. Veterinary students were more accepting of several issues than animal science students, in particular killing animals that were injured or ill. Religion had a major effect on attitudes. Muslim students found using animals that died naturally for products least acceptable. Compared to them, Hindu students were less accepting of killing injured or ill animals and Buddhist students less accepting of euthanasing healthy pets. Students with more experience of pets were less accepting of both transport and slaughter issues. It is concluded that concern was exhibited by future stakeholders in the SE and E Asian livestock industries for slaughter and, to a lesser extent, transport issues, although attitudes were influenced by their religion, gender and experience of pet-keeping.

**Keywords:** animal welfare, Asia, attitudes, livestock, slaughter, transport

### Introduction

Societal interest and awareness in animal welfare have been increasing over the past decades, with the development and implementation of the Five Freedoms evident in developed countries (Botreau *et al* 2007; Eurobarometer 2007; European Commission Food [ECF] 2015). Stakeholders' awareness of and interest to advocate for and implement better husbandry practices have been a focus of research (eg Phillips *et al* 2012). Many universities have included animal ethics and welfare topics into future stakeholders' curricula, in particular for veterinary and animal science students, even though there are major variations in what is taught (Broom 2005). Veterinary science and animal science students should have the sensitivity and capacity for analysis of animal ethics issues and may increase their level of concern for animal welfare problems after undergoing animal welfare courses (Hazel *et al* 2011; Verrinder & Phillips 2014).

These trends have not been confirmed for students in developing countries, some of which have a growing interest in animal welfare. A recent study found that university

students in some Asian countries tended to be more accepting of issues of concern in relation to animal welfare than those in some European countries, which could be partially explained by the differences in the socio-economic status of people in Asia (Phillips *et al* 2010). Attitudes of Asian stakeholders towards animal welfare are particularly relevant to the transport and slaughter of livestock that have been imported from developed countries where there is an awareness of the potential welfare problems for these animals in Asia. For example, there was recently significant concern amongst Australians about the methods of slaughter of Australian cattle in Indonesia (Tiplady *et al* 2013).

Since the attitudes of stakeholders in the livestock industries in the south-east and east Asian countries are unknown and access to the industries in these countries is limited, we surveyed university students of veterinary medicine and animal science there. They were chosen because they are assumed to be knowledgeable about the industries, as well as potentially being future stakeholders.

We conducted surveys in four SE and E Asian countries, namely China, Malaysia, Thailand and Vietnam to assess

university students' attitudes to the welfare of livestock during slaughter and transport, as well as investigating their moral reasoning methods to resolve ethical dilemmas related to livestock transport. China, Malaysia, and Vietnam were chosen because they are major importers of livestock from developed countries, as well as having contrasting religions. Thailand was chosen for its concentration of Buddhists, which was anticipated to impact on attitudes to slaughter in particular. As well as surveying attitudes, we attempted to elucidate drivers for these attitudes, in particular determining the effects of nationality, religion, gender and pet-keeping experience, and the students' methods of moral reasoning when considering transport and slaughter ethical dilemmas.

### Materials and methods

Approval for the study was obtained from the University of Queensland Human Ethics Committee, Australia (approval number 2014001646).

Collaborators were appointed in each country to assist in the design of the questionnaire and manage the project in that country. Pilot surveys were then undertaken in the four universities and feedback used to revise the survey structure and content. In Malaysia, the questionnaire was administered in English as this was the students' medium of instruction. In the remaining three countries, the survey was translated into the native languages by the collaborators, which was back-translated and checked by third parties for accuracy and consistency, with changes if necessary.

The questionnaire consisted of four sections with 29 questions relating to livestock welfare, specifically focusing on slaughter and transport via sea and road. The first section had a total of nine questions that focused on respondents' demographic information: gender, age, current university education level, university degree, religion, type of residence, amount of farm animal experiences, years of companion-animal ownership, and average monthly living expenses in their local currency.

Students were also provided with short descriptions of sheep and cattle welfare issues during transportation and slaughter, eight for transport and six for slaughter (Table 1, Appendix 1 [see supplementary material to papers published in *Animal Welfare* on the UFAW website: <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>]), which were derived from the Killing Animals Index used in a large Eurasian survey (Phillips *et al* 2012). Respondents rated each issue on a five-point Likert scale, from 1 'extremely unacceptable' to 5 'extremely acceptable'. They were also asked the maximum distance that they found acceptable for the livestock to travel via ship and road transportation. After these acceptability questions, there were four issues relating to transport, with the students asked to indicate their level of concern, from 1 'extremely unconcerned' to 5 'extremely concerned'.

Finally, three ethical dilemmas regarding ship transportation for animal export were presented, together with background information. The aim was to identify the students'

capacity for moral judgment of animal ethics transport issues. At the end of each dilemma, nine relevant questions were provided and the students were asked to rank these questions in order of importance for resolving the dilemma. The nine questions were based on the cognitive psychologist James Rest's moral judgment model, with three each relating to Personal Interest reasoning (PI), Maintaining Norms reasoning (MN), and Universal Principles reasoning (UP) (Rest *et al* 1999). We assume that students with more principled and maintaining norms reasoning will be more likely to take action to improve animal welfare than those displaying personal interest reasoning, a concept that is the subject of a future paper (Verrinder & Phillips, in prep).

The survey was administered to a selected university teaching veterinary and animal science in each of the four countries: Guangzhou University (GU) in China, Universiti Putra Malaysia (UPM), Suranaree University of Technology in Thailand (SUT), and Vietnam National University of Agriculture (VNUA). The teaching of an animal welfare course was compulsory for veterinary science and optional for animal science students in UPM. In SUT, an animal welfare and ethics course was compulsory for animal science students and also offered as an elective for all university students. This course was popular and had approximately 900 students enrolled per year. GU in China offered a compulsory animal welfare course in the first and second years of the university degree. VNUA offered an elective course on animal behaviour and welfare, which attracted about 180 students per year out of the enrolling cohort of 800 students. A second course was also available that was entitled animal welfare for vet students.

The survey was distributed by two methods, first via an online platform, and second by a hardcopy option in which the collaborators in each country collected the surveys and sent them back to The University of Queensland, Australia.

### Statistical analysis

Statistical software Minitab 16 was used to analyse the survey results. An initial Multiple ANOVA was utilised to identify key drivers of attitudes, using Wilks test statistic. Differences between overall means were analysed by one-way ANOVA. The analysis then employed ordinal logistic regression to establish the effects of the demographic variables on the attitudes towards transport and slaughter of livestock animals. The regression analysis generated Odds Ratios (OR), as well as confidence intervals (CI) and a probability (*P*-value) for the regression. The OR indicates the strength of association between the demographic variables on attitudes, and the more it deviates above or below 1 the greater the association. The CI indicates the level of confidence that the OR deviates from 1; if 1 is within the bounds of the CI values then the OR is not significant, which is confirmed by the probability. The variables for which an association with attitudes was sought included each student's country, gender, age, university education status, major subject study, religion, place of residence, farm animal experience, duration of living with pets, and financial status. As the Malaysian and Muslim students were most numerous,

**Table 1** Levels of acceptance and concern about transport and slaughter of livestock, with both overall means and means for males compared to those of females.

Factor	Overall mean <sup>§</sup> (n = 739)	Males (n = 227)	Females (n = 511)	OR <sup>†</sup>	Lower CI <sup>‡</sup>	Upper CI <sup>‡</sup>	P-value
<i>Slaughter (1 extremely unacceptable–5 extremely acceptable)</i>							
Killing young animals that are still depending on their parents	1.76 <sup>f</sup>	1.85	1.66	1.64	1.17	2.29	0.004
Allowing animals to experience pain during slaughter	1.79 <sup>f</sup>	1.89	1.69	1.25	0.90	1.74	0.19
Letting animals see each other being slaughtered	1.84 <sup>f</sup>	1.93	1.75	1.39	1.00	1.92	0.05
Regarding companion animals only, euthanasing healthy and unwanted pets (such as cats and dogs) due to over-population	2.29 <sup>e</sup>	2.54	2.04	1.90	1.38	2.60	< 0.001
Using animals that have died naturally for products	2.73 <sup>d</sup>	2.77	2.70	1.17	0.86	1.60	0.33
Killing animals when they are seriously injured or ill	3.31 <sup>c</sup>	3.40	3.22	1.95	1.41	2.70	< 0.001
<i>Transport (1 extremely unacceptable–5 extremely acceptable)</i>							
Livestock transport by ship	3.52 <sup>b</sup>	3.69	3.35	1.92	1.36	2.71	< 0.001
Exporting livestock from a developed country to developing countries	3.54 <sup>b</sup>	3.68	3.41	1.59	1.14	2.21	0.007
Consumption of products from imported animals	3.57 <sup>b</sup>	3.66	3.49	1.27	0.91	1.77	0.17
Livestock transport by road	3.76 <sup>a</sup>	3.86	3.67	1.46	1.03	2.07	0.03
<i>Transport (1 extremely unconcerned–5 extremely concerned)</i>							
Transporting animals from a country with extensive animal welfare legislation to one with limited/no animal welfare legislation	3.61 <sup>b</sup>	3.59	3.63	0.91	0.64	1.28	0.58
Transporting animals in an environment with clean air and minimal ammonia	3.97 <sup>a</sup>	3.89	4.04	0.69	0.49	0.99	0.04
Transporting animals with sufficient space and proper facilities	4.02 <sup>a</sup>	3.94	4.10	0.61	0.42	0.87	0.007
The provision of food and water to animals before or during transport	4.09 <sup>a</sup>	4.09	4.09	1.02	0.74	1.42	0.89

<sup>§</sup> Least square means for Acceptance or Concern with different superscripts within the column are different by Tukey's test.

<sup>†</sup> Odds Ratio determined by ordinal logistic regression.

<sup>‡</sup> Confidence interval determined by ordinal logistic regression.

these were used as the reference group for country and religion analyses, respectively. For the categorical variables, such as country, gender, major subject study and religion, least square mean values for attitudinal results with a *P*-value of  $\leq 0.10$  are presented in tabular form, being considered as significant or close to significant.

For the ethical dilemmas, values of one (most important) to nine (least important) were attributed to the rankings of question importance. Mean rankings were calculated for each question. Mean rankings for PI, MN and UP schema were also calculated and analysed by one-way ANOVA analysis and a pair-wise comparison with Tukey's test. All residuals were tested for normality by the Anderson Darling test. Finally, all the PI, MN and UP scores from the three cases were combined and a general linear model was used to analyse these. Results with *P*-value of  $\leq 0.05$  were considered significant.

## Results

### Student demographics

A total of 2,621 students were invited to take part and 739 responded, giving an overall response rate of 28.2%. There were more females ( $n = 511$ ; 69%) than males ( $n = 227$ ; 31%), with one for whom gender was undeclared. The largest number of respondents came from Malaysia ( $n = 437$ ; 59%) (Table 2). Most respondents were aged from 19 to 23 ( $n = 630$ ; 85%), with just seven respondents aged 18, 74 aged 24/25, 13 > 26 and 15 undeclared. The most numerous religion was Muslim ( $n = 301$ ; 41%), then Buddhists and atheists. More respondents studied veterinary science ( $n = 409$ ; 55%) than animal science ( $n = 330$ ; 45%), and the different years of undergraduate study were well represented, with most in their second year of study

**Table 2** Demographics of student responses.

Country	Invited (n)	Respondents (n)	Response rate
Malaysia	706	437	62%
Thailand	473	122	26%
Vietnam	210	103	49%
China	1,232	77	6%
Religion	Respondents (n)		
Muslim	301		
Buddhist	207		
Atheist	164		
Christian	32		
Hindu	24		
Other	10		
Unknown	1		
Education level	Respondents (n)		
Year 1	101		
Year 2	227		
Year 3	102		
Year 4	155		
Year 5	126		
Master's degree	21		
PhD	7		
Place of residence	Respondents (n)		
Urban	314		
Rural: country town	348		
Rural: farm	58		
Other	15		
Unknown	4		

(n = 227; 31%) and just 28 postgraduate students. Most claimed some (n = 311; 52%) or moderate (n = 216; 36%) experience with farm animals, with 138 (23%) students reporting no experience, 66 (11%) extensive experience and 8 (1.3% undeclared). Nearly all students lived either in urban regions or in a rural country town (n = 662; 89%), with the rest mostly from a farm (n = 58; 8%). Mean ( $\pm$  SEM) number of years living with companion animals was 9.4 ( $\pm$  0.27). The mean level of monthly expenditure on living expenses was US\$156 ( $\pm$  5.8).

### Overall attitudes

Students' mean attitudes (Table 1) towards the acceptance of the different welfare issues indicated that they found livestock transport by road more acceptable than consumption of products from imported animals, exporting from a developed to a developing country and livestock transport by ship. These they found more acceptable than killing animals that are ill which, in turn, was more acceptable than using animals that have died. Less acceptable still was euthanasing pets and, finally, the least acceptable issues were letting animals see each other being slaughtered, allowing animals to experience pain during slaughter and killing dependent young (standard error of the difference between two means, SED 0.049;  $P < 0.001$ ).

Students were less concerned about transporting animals from a developed country to a developing country than they were about transporting with sufficient space and clean air and providing food and water before or during transport (SED 0.056;  $P < 0.001$ ).

Multiple analysis of variance determined that there were significant effects on acceptance levels for gender ( $P < 0.001$ ), country ( $P < 0.001$ ), university education level ( $P = 0.01$ ), study major ( $P = 0.01$ ), religion ( $P = 0.002$ ), but not residence place ( $P = 0.08$ ) or farm animal experience ( $P = 0.28$ ). There were significant effects on levels of concern for gender ( $P = 0.01$ ), country ( $P < 0.001$ ) and university education level ( $P < 0.001$ ), but not study major ( $P = 0.90$ ), religion ( $P = 0.44$ ), residence place ( $P = 0.65$ ) or farm animal experience ( $P = 0.07$ ). This identified that the major drivers of attitudes were gender, country and university education level.

### Gender differences

Females were less accepting than males of all except five issues (Table 1): allowing animals to experience pain during slaughter; using animals that died naturally for products; consumption of products from imported animals; transporting animals from a developed to a developing country; and provision of food and water to animals before or during transport. They had more concern than males about transporting animals with sufficient space and clean air, but not about provision of food and water before or during transport or transporting animals from a developed to a developing country.

### Differences between countries

Students from Thailand found the euthanasing of healthy and unwanted pets and consumption of products from imported animals less acceptable than did Malaysian students, but they found killing young, dependent animals, allowing animals to experience pain during slaughter, using animals that died naturally for products, and letting them see slaughter more acceptable than Malaysian students (Table 3). In addition, the students from Thailand were less concerned about provision of food and water before or during transport and transporting animals with sufficient space and in a clean air environment than Malaysian students.



**Table 3** Significant differences between students' responses from China, Thailand and Vietnam, compared to the reference group, Malaysian students, on the levels of acceptance and concern about transport and slaughter of livestock.

Factor	Malaysia (n = 437)	Thailand (n = 122)	Vietnam (n = 103)	China (n = 77)
<i>Slaughter (1 extremely unacceptable–5 extremely acceptable)</i>				
Killing animals when they are seriously injured or ill	3.42	3.29	2.80***	3.05
Using animals that have died naturally for products	2.59	3.05*	2.70	2.97
Regarding companion animals only, euthanasing healthy and unwanted pets due to over-population	2.19	1.47***	2.81	2.55
Letting animals see each other being slaughtered	1.63	1.98*	2.18*	2.01
Allowing animals to experience pain during slaughter	1.57	1.84*	2.00†	2.29*
Killing young animals that are still depending on their parents	1.58	2.21*	1.46*	2.04
<i>Transport (1 extremely unacceptable–5 extremely acceptable)</i>				
Livestock transport by road	3.60	3.81	4.24**	3.65*
Consumption of products from imported animals	3.66	2.80***	3.91	3.53†
Exporting livestock from a developed country to developing countries	3.42	3.34	4.00*	3.48
Livestock transport by ship	3.31	3.48	3.95*	3.60
<i>Transport (1 extremely unconcerned–5 extremely concerned)</i>				
Transporting animals from a country with extensive animal welfare legislation to one with limited/no animal welfare legislation	3.68	3.51	3.84	3.22
Transporting animals in an environment with clean air and minimal ammonia	4.48	2.82***	4.14	3.60†
Transporting animals with sufficient space and proper facilities	4.52	2.82***	4.31	3.66
The provision of food and water to animals before or during transport	4.36	3.20***	4.36	3.68

† 0.10 ≥ P > 0.05; \* 0.05 ≥ P > 0.01; \*\* 0.01 ≥ P > 0.001; \*\*\* P ≤ 0.001.

Vietnamese students found killing young dependent animals and animals that are injured or ill less acceptable than students from Malaysia. They found transporting livestock by ship or road and exporting from a developed to a developing country more acceptable than Malaysian students, and tended to find animals experiencing pain during slaughter more acceptable.

Chinese students found animals experiencing pain during slaughter and transport of animals by road more acceptable than Malaysian students, but tended to find the consumption of imported animals less acceptable. They tended to be less concerned about transporting animals in a clean air environment than Malaysian students.

#### Study major effects

Veterinary science students found using animals that have died naturally for products, killing animals when they are seriously injured or ill, and exporting livestock from developed to developing countries more acceptable than animal science students (Table 4).

#### Religion effects

Christians, students of other religious faiths and possibly atheists found killing young dependent animals more acceptable compared to Muslim students (Table 5). Students of all religions found using animals that died naturally for products more acceptable than Muslim students. However, Hindu students found killing injured or ill animals less acceptable than Muslim students, and Buddhist students found euthanasing healthy pets less acceptable than Muslim students. Both Christian and Hindu students found transporting animals from a developed country with good animal welfare legislation to a developing one without such legislation of more concern than did the Muslim students.

#### Other (ordinal variable) effects

As age increased, the level of acceptance of livestock transport by ship or road increased (Table 6). However, older students were more concerned about transporting animals from a developed country with good animal welfare legislation to a developing one without such legislation.

**Table 4 Significant ( $P < 0.05$ ) differences between veterinary science and animal science students on the level of acceptance of slaughter and transport of livestock.**

Factor	Veterinary science (n = 409)	Animal science (n = 330)	OR <sup>†</sup>	Lower CI <sup>‡</sup>	Upper CI <sup>‡</sup>	P-value
<i>(1 extremely unacceptable–5 extremely acceptable)</i>						
<i>Slaughter</i>						
Using animals that have died naturally for products	2.73	2.70	2.21	1.44	3.38	< 0.001
Killing animals when they are seriously injured or ill	3.37	3.15	2.24	1.45	3.47	< 0.001
<i>Transport</i>						
Exporting livestock from a developed country to developing countries	3.51	3.47	0.58	0.37	0.91	0.02

† Odds Ratio determined by ordinal logistic regression.  
‡ Confidence interval determined by ordinal logistic regression.

**Table 5 Significant differences between Christians, Buddhists, Hindus, atheists and others, and the reference group, Muslim students, on the levels of acceptance and concern about slaughter and transport of livestock.**

Factor	Muslim (n = 301)	Christian (n = 32)	Buddhist (n = 207)	Hindu (n = 24)	Atheist (n = 164)	Others (n = 10)
<i>Slaughter (1 extremely unacceptable–5 extremely acceptable)</i>						
Killing young animals that are still depending on their parents	2.39	3.06**	3.01**	2.92*	2.82*	3.30 <sup>†</sup>
Using animals that have died naturally for products	3.39	3.59	3.36	3.13*	2.93	3.10
Killing animals when they are seriously injured or ill	2.13	2.28	1.87*	1.92	2.71	2.50
<i>Transport (1 extremely unconcerned–5 extremely concerned)</i>						
Transporting animals from a country with extensive animal welfare legislation to one with limited/no such legislation	3.58	4.13*	3.60	4.29*	3.55	3.75

† 0.10 ≥ P > 0.05; \* 0.05 ≥ P > 0.01; \*\* 0.01 ≥ P > 0.001; \*\*\* P ≤ 0.001.

As students' education level increased, the level of acceptance of killing young, dependent animals increased, and concern about transporting animals from a developed to a developing country declined. However, advanced-level students were less accepting of using animals that have died naturally for products.

Students from more rural backgrounds were more accepting of killing dependent young and healthy pets, but less accepting of killing injured or ill animals. Students with more farm animal experience were less accepting of killing injured or ill animals, allowing animals to see each other being slaughtered, transport by road but more accepting of transport by sea.

Students that had spent a longer time with pets were less accepting of killing dependent young and allowing animals to see each other being slaughtered and more concerned about providing food and water and sufficient space before transport, and transporting animals from a developed country with good animal welfare legislation to a developing one without the legislation.

### Moral judgement

The ranking of the questions is displayed in Appendix 1 (see supplementary material to papers published in *Animal Welfare* on the UFAW website: <http://www.ufaw.org.uk/the-ufaw-journal/supplementary-material>). Students responding to Case one had higher MN and UP scores than PI, and when responding to Cases two and three they had highest score for MN, then UP and lowest score for PI (Table 7).

Combining the PI, MN, and UP scores for the three scenarios, females had lower PI scores (32.0) than males (36.2), SED = 0.74;  $P = 0.001$ , and higher UP scores (50.4) than males (48.2), SED = 0.65;  $P = 0.049$ . There was no gender difference in MN scores (females 50.8 males 52.4, SED 0.60;  $P = 0.11$ ). There was also a study major effect: students of veterinary science had lower PI scores (32.2) than students of animal science (36.0), SED = 0.74;  $P = 0.04$ , with no differences in MN ( $P = 0.41$ ) or UP ( $P = 0.53$ ). Neither religion nor country had any significant or close to significant effects on PI, MN or UP scores ( $P > 0.10$ ).

**Table 6** Significant or close to significant effects of ordinal variables on the levels of acceptance and concern about transport and slaughter of livestock. Effects are indicated as an increase (+) or a decrease (-) for acceptance or concern.

Demographic	Measure	Issue	Change	OR <sup>†</sup>	Lower CI <sup>‡</sup>	Upper CI <sup>‡</sup>	P-value
Age	Level of acceptance	Livestock transport by ship	+	0.85	0.73	0.98	0.03
		Livestock transport by road	+	0.84	0.72	0.98	0.02
	Level of concern	Exporting livestock from a developed country to developing countries	+	0.85	0.75	1.00	0.05
Transporting animals from a country with extensive animal welfare legislation to one with limited/no such legislation		+	0.85	0.74	0.98	0.03	
University cohort (Year 1–PhD)	Level of acceptance	Killing young animals that are still depending on their parents	+	0.80	0.65	0.98	0.03
		Using animals that have died naturally for products	–	1.30	1.08	1.58	0.006
	Level of concern	Transporting animals from a country with extensive animal welfare legislation to one with limited/no such legislation	–	1.39	1.13	1.72	0.002
Residence (Urban–Rural)	Level of acceptance	Killing young animals that are still depending on their parents	+	0.87	0.75	1.00	0.05
		Killing animals when they are seriously injured or ill	–	0.86	0.75	0.99	0.03
		Regarding companion animals only, euthanasing healthy and unwanted pets (such as dogs and cats) due to overpopulation	+	0.86	0.75	0.99	0.04
Farm animal experience (None–Extensive)	Level of acceptance	Killing animals when they are seriously injured or ill	–	0.86	0.72	1.02	0.08
		Letting animals see each other getting slaughtered	–	0.79	0.66	0.96	0.01
		Livestock transport by ship	+	0.85	0.71	1.01	0.07
		Livestock transport by road	–	0.74	0.61	0.89	0.002
Time spent with pets (years)	Level of acceptance	Killing young animals that are still depending on their parents	–	1.02	1.00	1.05	0.04
		Letting animals see each other getting slaughtered	–	1.03	1.01	1.06	0.004
	Level of concern	The provision of food and water to animals before or during transport	+	0.97	0.95	1.00	0.02
		Transporting animals with sufficient space and proper facilities	+	0.97	0.95	1.00	0.02
		Transporting animals from a country with extensive animal welfare legislation to one with limited/no such legislation	+	0.97	0.95	1.00	0.02

<sup>†</sup> Odds Ratio determined by ordinal logistic regression.

<sup>‡</sup> Confidence interval determined by ordinal logistic regression.

**Table 7** Differences between mean Personal Interest (PI), Maintaining Norms (MN), and Universal Principles (UP) scores for Cases 1–3.

Case	PI	MN	UP	SED	P-value <sup>†</sup>
Case 1	11.7 <sup>b</sup>	16.9 <sup>a</sup>	16.4 <sup>a</sup>	0.29	< 0.001
Case 2	12.1 <sup>c</sup>	16.9 <sup>a</sup>	15.9 <sup>b</sup>	0.28	< 0.001
Case 3	12.1 <sup>c</sup>	17.0 <sup>a</sup>	15.9 <sup>b</sup>	0.28	< 0.001

<sup>†</sup> Means within rows with different superscripts are significantly ( $P < 0.05$ ) different by Tukey's test.

## Discussion

In the present study of students from Thailand, Vietnam, Malaysia and China, the students were more concerned about slaughter issues than transport issues. This greater concern for the slaughter process, rather than transport, is in accordance with views in Australia, where slaughter standards in Indonesia, in particular the absence of stunning, have caused major concern amongst the public (Tiplady *et al* 2013). However, a survey of stakeholders in the livestock industries in Australia found that road and ship transport were of greater concern than stunning before slaughter (Phillips *et al* 2009). This discrepancy probably relates to the difference in the respondent population. The public would be unaware of the major welfare issues that accompany road and ship transport, but death by exsanguination following a knife cut would appear barbaric. In contrast to this, stakeholders in the industry may be desensitised to death of a conscious animal, whereas the suffering during transport is prolonged and often accompanied by economic loss. Our students were future stakeholders but may well have responded like the public because of their inexperience.

The least acceptable practices involved killing animals, rather than transporting them. Most of these were ethical rather than welfare issues, although allowing animals to experience pain during slaughter was an exception. One of the major concerns was allowing animals to see each other being slaughtered, probably because it is discouraged in the Muslim religion (Masri 2007). Allowing this might make animals more likely to perceive the alarm pheromones in urine that are thought to exist in livestock experiencing stress (Boissy *et al* 1998), even if they are not able to recognise what is happening when an animal dies, which would be expected if they had not witnessed it before. However, social isolation of livestock is also likely to be stressful, and is often accompanied by high-pitched vocalisation (Rushen *et al* 1999; Deiss *et al* 2009).

## Gender

One of the major drivers of attitudes of the SE and E Asian students was gender, which is in line with studies conducted in Western countries (eg Phillips *et al* 2010). Overall, females are found to be more sympathetic and less accepting of animals' suffering (Herzog 2007), which is probably due their innate mothering personality. An alternative explanation is that women are more likely to be brought up in a way that encourages the expression of nurturing and bonding through doll-playing or exposure to anticipatory socialisation (Pifer 1994). In relation to slaughter of animals in SE Asia, a study has found that both men and women felt sympathetic towards inhumane treatment of cattle in Indonesian abattoirs but women were more likely to feel sad or angry (Tiplady *et al* 2013). Both genders found euthanasing companion animals unacceptable, but men tend to be more accepting of this practice as they have lower attachment levels (Cohen 2002). Women (especially those yet to bear children) tend to bond more strongly to their pets and potentially develop a mothering relationship (Amiot & Bastian 2015). Several variables were not significantly

affected by gender but they still demonstrated a difference in mean values that was similar to other variables, suggesting that in a larger survey these differences may have been significant. However, there was no evidence that concern for 'provision of food and water during transport' was affected by gender. This may be because of the high level of concern shown by both males and females, compared with other issues, and a possible reluctance by the latter to use the extreme end of the scale.

## Study major and year

Veterinary science students were more accepting of several welfare issues, but particularly killing seriously injured or ill animals, compared to animal science students. A survey of Eurasian university students previously found that 'agriculture' students, including agriculture, forestry, fishery and veterinary students had a much higher acceptance of killing animals than students in other disciplines (Phillips 2014). Although students sometimes choose a veterinary career because they want to help sick and injured animals (Verrinder & Phillips 2014), their more regular exposure to, and training in, conducting euthanasia compared with animal scientists may encourage acceptance of this practice. Animal scientists deal more with farm animals that are rarely euthanased. Veterinary students also have a deeper knowledge and understanding of companion animals' anatomy and behaviour, and thus would rather choose 'mercy-killing' if they think the animal is in too much pain and distress (Martinsen & Jukes 2005). Euthanasia is routinely taught as an acceptable endpoint in the veterinary profession if the animal is deemed to be too ill or still treatable but with unjustifiable cost.

Veterinary science students were also found to be more accepting of exporting livestock from developed to developing countries with no or little animal legislation, which conflicts with other research that found that veterinary faculty members were more emphatic toward farm animal welfare than animal science faculty members (Heleski *et al* 2006). However, veterinary students utilised personal interest reasoning less than animal science students in the moral reasoning tests, suggesting a lower interest in and awareness of animal welfare in animal science students (Heleski *et al* 2006) and supporting the view that veterinary science students choose this career mainly to help animals (Verrinder & Phillips 2014).

Year of study had limited influence on attitudes, but greater acceptance of killing young, dependent animals and reduced concern about transporting from a developed to a developing country in later years suggests declining empathy. This has been observed previously in veterinary students, as they progressed through their curriculum and prepared themselves for practice (Paul & Podberscek 2000; Pollard-Williams *et al* 2014). In the former study, the declining empathy was limited to male students; in Pollard-Williams *et al*'s study, it was statistically the same for both genders, but numbers were limited. In our investigation, year of study effects were independent of gender by virtue of the modelling process used for analysis. The numbers of



students (511 female, 227 male) was not considered sufficient to determine gender  $\times$  year interactions. Students' greater rejection of using animals that have died naturally for products as they progressed in their course probably reflects a more advanced understanding of the risks of acquisition of zoonoses via this practice.

### Country

Malaysian students tended to be less accepting and more concerned about animal slaughter and transport as compared to the Chinese, Thai, and Vietnamese students. They were less accepting than at least one other country for seven issues and more concerned for three out of four. By contrast, they were only significantly more accepting than at least one country for four variables. This finding is in agreement with the Animal Protection Index (API) country rating by World Animal Protection (2014) (A, the best to G the worst). Malaysia ranks highest of the four countries in this study, with a rating of 'C', China and Thailand achieve 'E' and Vietnam is last with 'F'. Malaysia has laws to protect animals from suffering, and has moderate protection for farming animals, whilst Vietnam ranks poorly in these categories. The focus on animal welfare in Malaysia is also reflected in the differing availability between countries of a university course on this topic. The likelihood that students had completed an animal welfare course was greatest in Malaysia, intermediate in Thailand and China and in Vietnam very unlikely.

Therefore, it could be that the governmental interest in animal welfare and education play a crucial role in shaping the attitudes of the future stakeholders toward animal welfare and ethics. China is a developing country that has recently been increasing her economic power and status. A Protection of Animals act is still a relatively new concept and still in its early developmental stages, and hence the level of animal welfare interest and action against animal suffering or cruelty are not comparable to other developed countries (Zu *et al* 2005). However, due perhaps to their rising affluence, a study found that the younger generations with higher levels of education tend to be the ones that express most interest and are more concerned with fair treatment of animals (Davey 2006).

Vietnamese students were more accepting of livestock transport by ship and importing animals from a developed country than Malaysian students. This opinion is not reflected in any major differences in livestock importations from the major exporter to these countries, Australia (mean annual number of livestock imported between 2010 and 2014 was for Malaysia 177,000 and Vietnam 183,000; Livecorp 2015).

### Religion

Respondents differed in their attitudes according to their religions, over and above any national differences, which is contrary to other research with primarily European university students that showed that religion had no effect on attitudes to animal welfare (Phillips *et al* 2012). This may be because in that survey most students were from developed countries where the level of religiosity is low. Poor nations

tend to have high religiosity (Pew 2002), although Vietnam and possibly China may be outliers to this trend. Another possible explanation is that the majority of Western countries in the Eurasian survey are melting pots with varying culture and ethnicity fusing together, whereas many Asian countries have a predominant religion: Malaysia's population mainly consists of Muslims, Thailand's is mainly Buddhist, but China and Vietnam have significant proportion of the population (52 and 30%, respectively) that are unaffiliated with any religion (Pew 2012). Gallup poll data suggest that religiosity is very high in Malaysia and Thailand, with 95 and 94% of people saying that religion is important in their daily life, compared with China and Vietnam that have 32 and 30%, respectively, of people that say this (Crabtree 2010). Thus, in SE and E Asia religious differences played a role over and above national differences, even though the two were closely aligned.

Buddhist students were less accepting of euthanasing healthy pets, probably because of their belief in a potential for humans to be reborn as animals with both having a potential to attain enlightenment (Braarvig 2009). As a result, the sinfulness of the taking of a life of an animal is strongly engrained in the religion. Hindu students found killing seriously ill or injured animals unacceptable compared to the Muslim students. Hindu is a compassionate religion that believes all living creatures are just extensions and manifestations of God, and that people should possess the highest virtue *bhuta daya* or compassion for animals (Framarin 2014). To them, the highest virtue is non-violence, meaning that they should not interfere with animals' lives at all. Fair treatment of animals and not subjecting them to cruelty are highly valued morals. Hence, especially in a religion that reveres cattle (Harris 1992), such compassion in the Hindu students is likely to deter them from choosing to end animals' lives when they are ill or injured.

We found that students with a rural background were more tolerant of killing dependent and healthy livestock. This could be explained by their upbringing in villages that mainly grow and consume their own backyard poultry or farm animals, such as pigs or cows. Perhaps, to them, it is acceptable to kill these animals for personal consumption since they have already set these animals apart as food and not pets or family members.

### Limitations of the study

The study was limited by the number of respondents in countries other than Malaysia and, in particular, there were few Chinese respondents. In addition, the response rate varied markedly between countries, giving the possibility of bias due to selective responses. It is also possible that the universities selected in each country are not representative of the country as a whole, and that the level of animal welfare instruction varied between students in the different countries. The technique used to measure moral reasoning in relation to animal welfare scenarios was developed for students in Australia, and has not been tested in Asia (Verrinder & Phillips 2014).

### Animal welfare implications

An improved understanding of attitudes to transport and slaughter in knowledgeable people in SE and E Asia will assist in determining whether ethical treatment of livestock exported from developed countries to developing countries is likely to be upheld. We found that both the students' country and religion had major influences on their regard for many aspects of animal welfare and ethics. Greater concern for the slaughter process, rather than transport, is in accordance with views in exporting countries.

### Acknowledgements

We acknowledge the work of Michelle Sinclair, manager of a World Animal Health Organisation project involving the four partners that were engaged in this survey. R Ling was in receipt of a University of Queensland Faculty of Science Summer Scholarship.

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