



On-farm pig dispatch methods and stockpeople attitudes on their use

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ABSTRACT

This study surveyed the on-farm dispatching methods used at pig farms, the characteristics of stockpeople operating them, in terms of training and management, and their opinions and attitudes about the efficiency and safety of the applied procedures. Independently of the pig type, the most used dispatching methods at the surveyed Brazilian farms were concussion (90%) and electrocution (5%). Both methods were reported as being efficient and safe for on-farm pig dispatching by most stockpeople (83%). However, 33% of all stockpeople reported they would prefer to use alternative methods, i.e., anesthetics (23%) or electrocution (32%). Only 7% of the stockpeople received training resulting in a more efficient application of the method ($P < 0.05$). Most stockpeople (96%) declared to feel uncomfortable with the dispatching procedure they use. This discomfort lasted for half a day or longer in 22% of them. The results of this survey suggest that the application of dispatching methods at pig farms may result in animal welfare issues related to the effectiveness of the methods and the attitudes of stockpeople.

1. Introduction

Brazil is the fourth largest producer and exporter of pork in the world (ABIPECS, 2017). Based on its important position in the international pork market with over 3731 tonnes of pork produced in 2016 (ABIPECS, 2017), the Brazilian pork sector has to respond to the increasing worldwide concerns about animal welfare from consumers and markets.

During the pig production cycle, there are inevitable situations that require animals to be dispatched. On commercial pig units, it is impractical and financially unfeasible for a veterinarian to be available to perform every emergency killing. Therefore, stockpeople need to be able to decide the most appropriate and humane method and the moment to perform the procedure based on their experience and training.

The humane dispatching of pigs on-farm is a subject of much debate within the pig farming (Campler et al., 2018; Spooner et al., 2014) considering the potential impact of this production practice on public opinion, the image of the pork sector and stockpeople mood. In the choice of the method used to dispatch pigs at the farm, factors, such as ease of application, level of effectiveness, safety for stockpeople and cost must be taken into account (Woods et al., 2010). However, outside

the industry little is known about the methods that are presently in use, and their consequences on animal welfare and safety of the farm staff.

A recent Brazilian survey reported that 90% of dairy farmers rejected the practice of dispatching a newborn male calf independently of the method (Cardoso et al., 2017). However, to our knowledge, there is no such information on producer's attitudes toward the on-farm dispatching practices at pig farms in Brazil.

The objective of this study was to survey the on-farm dispatching methods used for pigs and stockpeople characteristics, and get opinions from the users about their efficiency, safety, feasibility and the effects on their attitudes and feelings while performing pig dispatching.

2. Material and methods

This project was approved by the Human Ethics Committee from UNESP-FOA (Protocol number 2.247.274).

2.1. Data collection

The survey was carried out in Southern Brazil in 2017 (from June to December) in a total of 370 commercial pig farms belonging to two

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Table 1

Mean size of the herds farm unit evaluated and the number of questionnaires completed by the stockpeople according to each production phase.

Herds	Number of questionnaires (n)		Number of animals per farm	
		Mean \pm SD	Min	Max
Nursing piglets	154	650 \pm 755	15	4500
Weaned piglets	130	1700 \pm 1828	4	10,500
Finisher	171	699 \pm 499	210	2500
Sows	152	353 \pm 389	20	2600

Table 2

Dispatching frequency by production phase at the farms.

Respondents	Nursing piglets	Weaned piglets	Finishing pigs	Sows
	(n = 137) %	(n = 125) %	(n = 170) %	(n = 133) %
Daily	8.0	1.6	0	6.8
Weekly	26.3	40.8	0	3.0
Monthly	65.0	57.6	26.5	26.3
Every 6 months	0.7	0	72.9	49.6
Rarely ¹	0	0	0.6	14.3

¹ Interval longer than 6 months.

companies, representing 42% of the national pig production. On each visit, the stockpeople responsible for dispatching pigs were interviewed. Before the start of data collection on-farm, stockpeople were informed about the purpose of the study and were asked to provide their agreement to participate. Data were collected by two trained interviewers through a questionnaire (supplementary material). Regardless of the pig type (nursing piglets, weaned piglets, finishing pigs or sows), questions (9 multiple-choice and 4 open-ended) were related to the dispatching methods in use, their management, effectiveness and their psychological impact on the users. Stockpeople characteristics were described by age, gender, occupation, length of time in on-farm practices, method of dispatching routinely used, frequency of animals' dispatching, level of training or attendance of preparation courses on how to deal with the effects of the dispatching procedure on their feelings, and comfort in performing the dispatching act. Information about the farm system, i.e., vertical or horizontal production, was also noted. The questionnaire used was translated into English and is provided as supplementary material on the journal's website.

The farm units that were visited were all indoor production systems with farrowing only, farrowing-nursery, nursery only, or growing-to-finish phases of the overall pig production cycle. In farms with more than one animal type (sows and piglets or sows, suckling and weaned pigs), two identical questionnaires were used for the same stockpeople, one regarding the dispatch of piglets and the other one that of sows.

Table 3

Decision strategy applied by stockpeople at the time of dispatching.

	Nursing piglets (n = 153) %	Weaned piglets (n = 129) %	Finishing pigs (n = 171) %	Sows (n = 151) %
Dispatching is performed:				
At the moment poor prognosis is identified	b	b	a	b
After unsuccessful veterinary treatment	22.2	14.0	1.2	15.2
When a group of animals with poor prognosis has accumulated	71.9	82.2	98.8	77.5
When a group of animals with poor prognosis has accumulated and after unsuccessful treatment	2.0	1.6	0	1.3
Never (no culling at all)	2.0	0.8	0	5.3
	2.0	1.6	0	0.7

a,b Within a column frequencies followed by a different superscript differ by Fisher exact test ($P \leq 0.05$).

2.2. Statistical analysis

A descriptive analysis of the data was performed by tabulating the frequency of the categorical variables and calculating the mean, median, standard deviation, minimum and maximum of the quantitative variables. Due to the high number of different techniques/procedures used, responses were pooled according to the methods (concussion, electrocution, concussion and electrocution, chest stab, left them to die without performing any killing procedure). Also descriptive feelings defined as *angry* and *like yelling at someone*; *bad*, *sad* and *cried*, and *guilty* and *sense of failure* were grouped together. The Fisher exact test was applied to evaluate the independence of the variables' profile studied. The FREQ and MEANS procedures of the statistical software SAS (2012) were used for the data analysis. A probability level of $P \leq 0.05$ was chosen as the limit for statistical significance in all tests.

3. Results

3.1. Description of the farms and interviewed stockpeople

Data were collected from a total of 371 stockpeople in 607 questionnaires, in terms of one questionnaire per interviewee per pig type. The herd size at the time of the visit and number of questionnaires are presented in Table 1. Most interviews (218) were only related to one animal type, while 153 stockpeople responded about two and three production phases ($n = 70$ about sows and suckling piglets and $n = 83$ about sows, and suckling and weaned piglets, respectively). Stockpeople were mostly men (94%), aged 49.5 (± 10.8) years old and with an average of 21.4 (± 13.9) years of experience in the field.

Most stockpeople (93%; $n = 370$) had not attended any organized training event or received veterinary orientation on dispatching methods. Among those who had received some form of training (7%), 74% of them attended orientation sessions held by a company veterinarian and 19% participated in a specifically organized training event. Seven percent did not specify the type of training received. There were no differences between genders and level of training and between age and training ($P > 0.05$; data not shown).

3.2. Distribution of dispatched pig type and stockpeople decisions

At the surveyed farms, dispatching procedure was more frequently performed on piglets than finishing pigs and sows ($P < 0.05$; Table 2). Furthermore, for all in pig categories, dispatching was only carried out as the last resort in the case of ineffective previous veterinary treatment (Table 3). One percent ($n = 6$) of stockpeople reported that due to their personal discomfort in killing an animal, they preferred to leave the animals to die. There was no effect of farm size on frequency of dispatching for all production phases ($P < 0.05$; data not shown).

Table 4

All methods of dispatching reported as being used in the different phases of pig production by respondents.

	Production phase			
	Nursing piglets (n = 153) ¹ %	Weaned piglets (n = 129) %	Finishing pigs (n = 171) %	Sows (n = 151) %
Striking the head with a hammer	41.8	53.5	95.9	78.1
Striking the head against a wall	43.1	35.7	0	0
Striking the head with a hammer or against a wall ¹	3.3	3.9	0	0
Striking the head against a wall or chest stab ¹	0.7	0	0	0
Striking the head with a rock	0.7	0	0	0
Electrocution (ear and tail)	3.9	5	0.6	7.9
Electrocution (ear and tail) or striking the head against a wall ¹	1.3	0	0	0
Chest stab	2.0	0	3.5	9.9
Chest stab or Firearm	0	0	0	0.7
Captive bolt gun	0	0	0	2.0
Firearm (rifle)	0	0	0	0.7
Leave animals to die	3.3	2.3	0	0.7

¹ These responses were given together by the same interviewee.**Table 5**

Reclassification of on-farm dispatching methods according to the mechanism of death for different phases of production.

Methods	Nursing piglets % n = 153 b	Weaned piglets % n = 129 b	Finishing pigs % n = 171 a	Sows % n = 151 c
Concussion	89.5	93.0	95.9	80.8
Electrocution	3.9	4.6	0.6	7.9
Concussion or Electrocution ¹	1.3	0	0	0
Cardiac stab	2.0	0	3.5	10.6
Leave animals to die	3.3	2.3	0	0.7
Post-stunning exsanguination	n = 145 a	n = 126 b	n = 165 ab	n = 133 c
Yes	3.4	9.5	6.7	39.1
No	96.6	90.5	93.3	60.9

a,b,c Within a column frequency followed by a different superscript differ by Fisher's exact test ($P \leq 0.05$).¹ These responses were given together by the same interviewee.

3.3. Dispatching methods and stockpeople opinions

Table 4 presents the dispatching techniques used on the surveyed farms in each phase of production. Table 5 reclassifies these methods

Table 6

Stockpeople opinions about their on-farm dispatching methods applied in the different phases of production.

Questions	Nursing piglets	Weaned piglets	Finishing pigs	Sows
Do you feel comfortable with dispatching practice? %	n = 154	n = 130	n = 171	n = 152
Yes	5.2	3.1	4.1	3.3
No	94.8	96.9	95.9	96.7
Is it an efficient method? %	n = 151 ab	n = 129 b	n = 171 a	n = 150 b
Yes ¹	59.6	57.4	57.3	46.7
Reasonably ²	37.7	37.2	42.1	50.0
No ³	2.6	5.4	0.6	3.3
Did you have accidents during the application? %	n = 154	n = 130	n = 171	n = 151
Yes	0	0	1.2	1.3
No	100.0	100.0	98.8	98.7
What is the degree of safety of the method you apply? %	n = 142 a	n = 123 a	n = 171 a	N = 139 b
Low	14.1	9.8	13.4	28.8
High	85.9	90.2	86.6	71.2
Where do you apply it? %	n = 151	n = 128	n = 171	n = 149
Indoor	23.8	14.1	17.5	15.4
Outdoor	74.2	85.2	80.7	82.6
Indoor/Outdoor	1.3	0	1.8	1.3
Specific room/pen	0.7	0.9	0	0.7

a,b Within a column frequency followed by a different superscript differ by Fisher's exact test ($P \leq 0.05$).¹ Based on absence of consciousness signs.² Presence of some consciousness signs.³ Presence of consciousness signs.

according to the mechanism of death. Based on the stockpeople responses, the most used dispatching procedure across pig types was concussion (90%; Table 5), mainly performed by striking the head with a hammer or against the wall (Table 4), followed by electrocution and chest stab. Additionally, most pigs (81%) were dispatched outside the pig shed.

At the visited farms, electrocution was carried out using an homemade electrical device plugged to a power outlet (110/220 V; 60 Hz), without an electrical current (Amp.) control, and featuring two metallic clips, one applied on one ear and the other on the tail for at least 5 s. Chest stab, defined as direct stab in the heart with a knife, was mainly used for sows and was the second most used method (16%) after concussion for this pig type. Most stockpeople did not bleed animals after the application of the dispatching procedure (86%; Table 5). However, training increased the proportion of stockpeople performing this practice (from 6 to 27%; $P < 0.001$).

Most stockpeople considered the dispatching methods they used as efficient and safe (55 and 83%, respectively; Table 6). Independently of the production phase, 33% of stockpeople reported their preference for an alternative method instead of those currently used, including the use of anesthetics (26%) and electrocution (36%; Table 7). Two stockpeople (1%) reported that a chest stab without prior stunning was their preferred dispatching method as it reduced convulsions when compared with the other methods.

Table 7
Frequency of alternative methods suggested by the respondents.

Method	n (n = 203)	%
Anesthetics	53	26.1
More efficient electrical stunning	36	35.5
Chest stab	1	1.0
Captive bolt gun	1	0.5
Undefined more efficient method	8	8.4
Any other method, except for electrical stunning	2	1.5
No knowledge of any alternative method	27	27.1

3.4. Effects of dispatching practice on stockpeople attitudes

Most stockpeople (96%) declared they felt uncomfortable with the act of dispatching pigs at the farm and 24% of them felt both uncomfortable and depressed while and after performing the procedure (Table 8). However, these feelings were short-lived for most stockpeople (60%). Furthermore, this uncomfortable feeling was greater ($P < 0.05$) in those stockpeople who had attended training sessions for the correct application of on-farm methods of dispatching compared with those who did not. No negative feeling was reported by stockpeople who practiced chest stab and by 89% of those performing concussion. Independently of the method applied, no significant effect of the age, gender and training on the psychological impact of the dispatching procedure was found in this study ($P > 0.05$).

4. Discussion

The greater need for dispatching piglets compared to finishing pigs and sows can be attributed to their greater fragility, abnormalities, low economic value per unit and locomotory problems caused by sow crushing and poor flooring (Mullins et al., 2017). Instead, based on their greater economic value and larger interval between batches, stockpeople usually invest more in treating finishing pigs and sows.

Blunt force trauma, which was the most common dispatching procedure at the farms, is accepted by some organizations as a humane method for on-farm dispatching of piglets as it is easy to perform, and, if done correctly, results in instantaneous death considering the piglet's skull fragility (AVMA, 2001; Woods et al., 2010; CFMV, 2012). However, these methods are no longer considered acceptable for piglets with a bodyweight of more than 5 kg, finishing pigs and sows (AVMA 2001; Council Directive 1099/2009; Woods et al., 2010). The stockpeople mainly explained the choice of this method by the low cost of the procedure and/or to the lack of knowledge about alternative methods. Besides being difficult to accept by the society and the repulsive appearance, the efficiency of this dispatching method depends

Table 8
Emotional effects produced when undertaking a dispatching procedure and time lapse for their disappearance in the interviewed stockpeople.

Variables	n	%
Duration of discomfort (n = 302)		
No discomfort	47	15.6
Momentarily	182	60.3
One day	39	12.9
Longer than one day	30	9.9
Not answered	4	1.3
Feelings about the dispatching procedure (n = 332)		
Uncomfortable	49	14.8
Depressed	31	9.3
Sad	5	1.5
Angry	4	1.2
Guilty	12	3.6
Relieved	7	2.1
Indifferent	24	7.2
Feelings not described	200	60.3

on human factors, such as skill and training, influencing the striking force employed, precision, impact head site, strike speed and fatigue (Gibson et al., 2015; Oliveira et al., 2017, 2018).

The electrocution method used by stockpeople at the surveyed farms was not a conventional one as the electrodes, instead of being positioned on the head and chest allowing the electrical current to span the brain and the heart resulting in unconsciousness and cardiac arrest, are placed on one ear and the tail. This method of electrocution may produce cardiac arrest without inducing rapid unconsciousness (Denicourt et al., 2010). To produce rapid unconsciousness and cardiac arrest electrical stunning needs to be performed through the head (Head-only) and head-to-chest electrical current application (AVMA 2001; Council Directive 1099/2009; CFMV 2012). Furthermore, the equipment did not allow any control of the electrical parameters (voltage [V], current [A] and frequency [Hz]), which could potentially jeopardize operator safety and efficiency. Anyway, ear and tail electrode placement does not fulfill the requirement of minimum current (1.3 Amp; Council Directive 1099/2009, 2009). For these reasons, this method is not accepted as an acceptable by the current legislation (CFMV, 2012; Council Directive 1099/2009, 2009).

The EU and Brazilian legislations require that during on-farm dispatch and before commercial slaughter all animals must be rendered unconscious (IN 3/2000; Council Directive 1099/2009, 2009; CFMV, 2012). However, in the current study the practice of dispatching through a knife stab in the heart of conscious animals was surprisingly still reported at some farms. This method was common in the old times (Dalla Costa O. A., personal communication). However, chest stab is still used based on the belief it is a more welfare-friendly procedure compared with striking the head with a hammer as it minimizes convulsions. Pigs usually convulse after the application of concussive methods that are mistakenly considered a sign of consciousness as reported by some stockpeople (Verhoeven et al., 2015). These respondents also declared to have not received any form of training or orientation on-farm animals' dispatching methods, which highlights the importance of training and education for the correct implementation of this practice. The discontinuing of the chest stab practice on conscious animals is essential for improvements in animal welfare, reputation and survival of pig farming.

In this study, pigs were reported as usually being dispatched in the farm yard outside the barn to facilitate the transport of the carcass to the compost treatment facility. This procedure implies the handling of sick or non-ambulatory animals out of the barn, which must be very cautious to avoid unnecessary suffering and worsen its health conditions. According to the legislation (CFMV, 2012), animals should be dispatched in a quiet and adequate environment, respecting the behavior of the species in question. This is also important for the society viewpoint such as reported by Chinese citizens in general (74%) who judged the practice of dispatching animals near pen mates (inside the pen) as *extremely or somewhat inappropriate* (You et al., 2014).

The decision of some stockpeople to leave animals to die may be a sign of their discomfort when performing the act of killing (Rault et al., 2017). However, this is not an acceptable practice as it causes unnecessary animal suffering (CFMV, 2012; Council Directive 1099/2009, 2009). Based on the records, these people only received orientation on how to perform the practice through their own initiative, with no psychological support from professionals. Again, training can help this people to cope with this emotional discomfort (Campler et al., 2018) and reduce the psychological impact of this practice on them (Lowery and Stokes., 2005; Maunder, 2008; Maunder and Maguire, 2017). However, the greater reported frequency of uncomfortable feelings in trained stockpeople could relate to the fact that they received only orientation on how to perform the practice and did not report any orientation or psychological support by professionals. The adoption of the methods and the strategy used in dispatching procedures were determined mainly by the stockpeople and were not influenced by any recommendations from the companies or information that dispatching

sick pigs with poor prognosis is an issue of animal welfare. However, it could be expected that large companies have defined rules for dispatching in their monitoring and QA-programs.

Depression and remorse after the dispatching act were the predominant feelings reported in the interviewed stockpeople. Mental depression, mostly reported in piglet production in this study, results from the repeated performing of the dispatching procedure (Fogle and Abrahamson, 1990; Telner and Singhal, 1984). These effects may get worst over time if no training/orientation and psychological support are provided (Campler et al., 2018; Fogle and Abrahamson, 1990; Matthis, 2004; Rawnsley, 1985; Woods et al., 2010). Woods et al., (2010) reported that when stockpeople were exposed to poor welfare practice during dispatching in the early stages of their training, they were more likely to feel uncomfortable performing the practice themselves. Additionally, stockpeople with less than 2 years of experience in animal production are more likely to be unconfident and empathic with dispatching procedures (Campler et al., 2018). With time some stockpeople may develop their own coping mechanisms to minimize or avoid the emotional effects of these stressful events in their working lives. However, a rotation of the personnel responsible for performing this practice is recommended to avoid emotional exhaustion (CFMV, 2012; Spooner et al., 2014). The results of this study may suggest a likely model for psychology research using stockpeople and livestock production with the objective to study the cumulative effects of this practice on human mental conditions.

Overall, although the methods reported in this survey were considered as highly safe by all interviewed stockpeople, they were considered as inefficient or inconsistently efficient in protecting animals from unnecessary suffering by almost half of them. This opinion supports the need for alternative methods (i.e., captive bolt, use of anesthetics or improved electrical stunners) and training as requested by some stockpeople in this survey, and confirms the Brazilian stockpeople concerns about animal welfare issues recently reported by Yunes et al., (2017). Depending on the method used (such as blunt force trauma, head-only electrical stunning and penetrating captive bolt for mature pigs), exsanguination or pithing (for penetrating captive bolt gun stunning) is necessary to ensure pigs are properly dispatched (CFMV, 2012; Council Directive 1099/2009, 2009). Thus, the lack of knowledge on how to correctly perform and monitor on-farm dispatching may negatively affect animal welfare during dispatching.

5. Conclusions

The results of this survey showed that some methods used for on-farm dispatching of sick or non-ambulatory animals, such as knife stabs in the chest of conscious animals, striking the head of piglets with a bodyweight of more than 5 kg or deliberately leaving pigs to die, do not meet the legal and society requirements in terms of animal care and protection, and should be discontinued. The development of training, extension activities and psychological support programs for operators in charge of on-farm animals' dispatching should be envisaged to improve the welfare conditions of pigs on farms and the reputation of the pig farming, and avoid economic losses.

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Conflict of interest statement

There are no conflicts of interest issues concerning this submission.

Supplementary materials

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