Factors influencing pig behaviour during unloading from a transport

Photo: T. Grandin.

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Swedish title: Faktorer som påverkar grisars beteende vid avlastning
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Husdjursvetenskap - Examensarbete 15hp
Litteraturstudie
SLU, Uppsala 2009

Abstract

Transportation of pigs might be a welfare problem. Stress during and after transportation can negatively affect the meat quality or cause carcass damages, which leads to major economic losses every year. The transportation chain can be divided into several stages; loading, transport and unloading. This literature review focuses on unloading of pigs from a transport. When arriving at an abattoir pigs can be fatigued and need to be as smoothly unloaded as possible. The unloading ramp is a major obstacle for pigs and a high angle of slope causes elevated heart rate and longer unloading times. Unloading system, noise, shadows and darkness can cause pigs to stop or hesistate. Pigs refusing to move can lead to rough handling by electric goads from personnel. Electric goad use is very stressful for pigs and cause elevated heart rate and negative changes in blood parameters, which results in carcass damage and bad meat quality. Improvement of pigs´ welfare can be accomplished through design adjustments of unloading systems, unloading facilities or development of new equipment like the container system. Less handling moments together with unloading at ground level implies that the container system is better for pigs´ welfare. In order to develop unloading systems there is a need for further research together with education of personnal to better understand the behaviour of pigs.

Sammanfattning

Transport av grisar kan skapa problem. Stress under och efter transport kan påverka köttkvalitén negativt eller leda till skador på slaktkroppen. Kassering av kött med dålig kvalité eller slaktkroppsskador orsakar branschen stora ekonomiska förluster varje år. Transportkedjan kan delas in i flera moment; lastning, transport och avlastning. Denna litteraturstudie fokuserar på avlastningsmomentet. När grisar anländer till ett slakteri kan de vara utmattade efter transporten och avlastningen behöver ske så snabbt och enkelt som möjligt. En stressande faktor för grisar är avlastningsrampen, en brant lutning (såväl uppåt som neråt) orsakar höjd hjärtfrekvens och längre avlastningstider. Svårigheter associerade med avlastning orsakas främst av grisar som stannar eller rör sig för sakta. Avlastningssystem, ljud, skuggor och mörker kan orsaka avbrott i avlastningen genom att grisar blir skrämda. Grisar som stannar kan utsättas för hård behandling med elektriska pådrivare, vilket är mycket stressande och leder till ökad hjärtrytm, negativa förändringar i blodparametrar, dålig köttkvalité och slaktkroppsskador. Grisars välfärd vid avlastning kan förbättras genom designförändringar av avlastningssystem och avlastningsområde eller utveckling av ny utrustning som containersystemet. Färre hanteringsmoment och avlastning på marknivå antyder tillsammans att containersystemet är bättre för grisars välfärd jämfört med konventionella transporter. För att vidareutveckla avlastningssystem finns ett behov av fortsatt forskning tillsammans med utbildning av personal för att öka förståelsen av grisars beteende.

Introduction

In the year 2008, about 255 million pigs were slaughtered in the EU (EC, 2009). The main part of these slaughter pigs have to be transported to abattoirs. Transportation of pigs is known to be an animal welfare problem, pigs are easily stressed and often difficult to handle. Stressful situations often occur when animals are handled by humans, for example moved from their home pen or during unloading from transports.

During transportation to abattoirs or in lairage before slaughter, pigs from different social groups i. e. unfamiliar individuals, are often mixed. Mixing causes fights to determine the social hierarki, fights stress pigs and leads to skin blemishes, which result in poor carcass

quality scores. Stress or exhausting transportations before slaughter can result in pale, soft and excudative (PSE) meat post-mortem. PSE classification of the meat is regarded as meat of poor quality and is characterised by its softness and low water binding capacity. PSE is caused by protein denaturation post-slaughter, when the temperature in the carcass remains high. This happens when the rate of postmortem glycolysis is high, resulting in low muscle pH (Bowker et al., 2000). It is of most importance to reduce stressful situations before slaughter as much as possible, not only because of economic interests, but to ensure the best animal welfare.

During unloading from a transport, events that occurred prior or during the transportation, may influence the behavioural responses from pigs. Transportation affect animals in a negative way, pigs show an elevated heart rate (Geverink et al., 1998a). Vibrations from the vehicle can cause motions sickness in pigs (Bradshaw et al., 1996a). The loading density of the vehicle also affect the welfare of pigs, if the density is too high, pigs cannot lie down and rest without being on top of each other. The pigs then continuosly change position and can therefore not rest. At a very high density (~ 0. 31m^2/100 kg), pigs show a clear evidence of physical stress (Warris et al., 1998). Hot weather conditions are also a problem during transports, heat increases body temperature and heart rate which can result in hyperthermia and ultimately lead to death. Together, all of these named factors influence how pigs behave during unloading from a transport.

Transportation of animals can be divided into several different stages; loading at the home farm, the transportation itself and finally unloading. This litterature review will focus on defining some of the problems occuring when pigs are unloaded at an abattoir after transport; what are the stressful factors for pigs when transporting and unloading? Which factors are most stressful for the pigs, and is there a solution to the problem. What can be done to reduce stress during transportation and unloading? Can transporters by just making small adjustments improve pigs´ welfare when unloading?

Stressparameters

To assess animals stress response both behavioural and physiological parameters are used. Commonly used blood parameters are cortisol-, lactate-, glucose- and vasopressin levels. Cortisol is specially associated with level of stress and vasopressin with travel sickness (Knowles & Warriss, 2000). Other measurements used are heart- and respiration rate together with body- or skin temperature (Knowles & Warriss, 2000). Behavioural assessments of stress response, or reduced welfare, could be vocalization, attempts to run away or just stop moving forward (Broom, 2000). Blood acid-base balance is useful when assessing animal responses during handling, parameters like pH, lactate, HCO_3 and base-excess values can be used (Bertol et al., 2002; 2005). These clinical parameters are associated with physical impairment and can be used to compare downer pigs to non-downer pigs (Ivers et al., 2002). Downer pigs are in a state of metabolic acidosis and are defined as individuals that express signs of exhaustion and who are unable to rise or walk.

Transportation vehicle

Unloading ramp

In general pigs have more difficulties descending a loading ramp, than they have ascending it. This is supported by the findings of Warris et al. (1991), who tested pigs´ stress response to

different angles of loading ramps (0, 10, 20, 25, 30, 35, 40 and 45˚) and two different sets of cleat spacing (150 and 300 mm). The angles from 0˚ to 20˚ had little effect on pigs ability to climb down the ramp. Shortest time to descend a loading ramp was recorded when the angle of slope was 20˚, and the cleat spacing 150 mm. Time recorded to descend increased linearly together with increased angle of slope. Above the angle of 35˚ time taken to descend increased considerably. Descending a steep ramp in a controlled matter was difficult for pigs, regardless of cleat spacing. These findings are supported by Van Putten & Elshof (1978) who found a positive correlation between the steepness of a ramp and how much pigs´ heart rate was increased; the steeper ramp, the higher heart rate. In the referred study it was found that a 30˚ ramp angle looked unaccessible for pigs, they turned their side towards the ramp and simply refused to climb or descend. If animals refuse to climb a ramp this can lead to unnecessary rough handling to get them moving. The solution to the problem would be to use smaller angles by extending the loading ramps, longer ramps did not cause as high heart rates on pigs as steep ramps (Van Putten & Elshof, 1978).

Warris et al. (1991) indicated that pigs do not get used descending an unloading ramp even after repetition of the trial during several days, this because there were no decrease in time recorded to descend. On the other hand, trained pigs are unloaded twice as fast as non-trained pigs (Krebs & McGlone, 2009). Trained pigs were moved out of their home pens for ten days in a row. They were pushed up a ramp (30˚ slope) and onto a trailer. When pigs reached the inside of the trailer they were left to walk freely for ten minutes. Non-trained pigs were not handled at all before the testing day. Pigs allowed to move freely out of their home pen twice a week, for nine weeks in a row, moved faster out of their home pen after the testing period (Geverink et al., 1998b). Nevertheless, trained pigs show less fear of humans and have to be more driven with a paddle or electric goad, compared to non-trained pigs (Geverink et al. 1998b; Hemsworth et al., 2002; Krebs & McGlone, 2009). Pigs that been regulary handled by humans try to maintain physical contact, although beeing chased or catched (Tanida et al., 1994). This implicates that handling and training of pigs reduces their fear of humans (Tanida et al., 1994; Geverink et al. 1998b; Hemsworth et al., 2002; Krebs & McGlone, 2009).

Unloading system

Multi-storey vehicles are often supplied with hydraulically operated tail-lifts, or submersible floors. These systems have been developed to facilitate loading or unloading, and reduce time required to handle the animals. When comparing three different loading systems, the so called modular or container system seemed to be most easy to handle for both pigs and stockpersonnel (Brown et al., 2005; Van Putten & Elshof, 1978). The module can be placed near pigs´ rearing pens and loading is done at ground level. When loaded with animals the module is lifted onto a flat bed lorry and then transported. The module can be totally self-contained, animals can be provided with food and water and urine and feaces can be collected, thus reducing the risk of contamination between animals and farms. The aim with the modular system is to reduce handling moments to a minimum. The modules are mechanically unloaded and can be held in lairage until slaughter of the animals. When comparing the module system to a tail ramp (18˚ slope) and a hydraulic tail-lift, the ramp was most difficult for pigs (Brown et al., 2005). The ramp made pigs reluctant to leave the lorry and take the first steps down, time recorded for unloading was longer than with the other two systems. The ramp caused highest increase in skin temperature compared to the tail-lift or module, and also affected the heart rate of the pigs. Using the ramp or hydraulic tail-lift resulted in higher heart rate, but the module caused highest levels of saliva cortisol during the whole experiment, which in turn is an implication of stress (Brown et al., 2005).

Pigs in the module did not seem to settle after beeing loaded, they remained active, which is a response to the new environment (Brown et al., 2005). This could be problematic during longer transportations if pigs does not settle and rest. However, Van Putten & Elshof (1978) found the most difficult thing with the container to be unloading. The animals stayed overnight in the containers, seemed to regard it as a familiar place, and were very reluctant to leave it. This contradicts the findings of Brown et al. (2005) who found no problems with unloading animals from the module. When comparing containers to conventional vehicles with a loading ramp, conventional transport systems caused more transport losses and animals emergency slaughtered upon arrival (Van Putten & Elshof, 1978).

Pot-belly vs. straight deck trailers

Trailer design is of great importance when measuring how easy pigs are to unload. Pot-belly trailers (Figure 1) have internal ramps, which straight-deck trailers do not. (Figure 2).

Figure 1. Pot-belly trailer (K. Thorell).

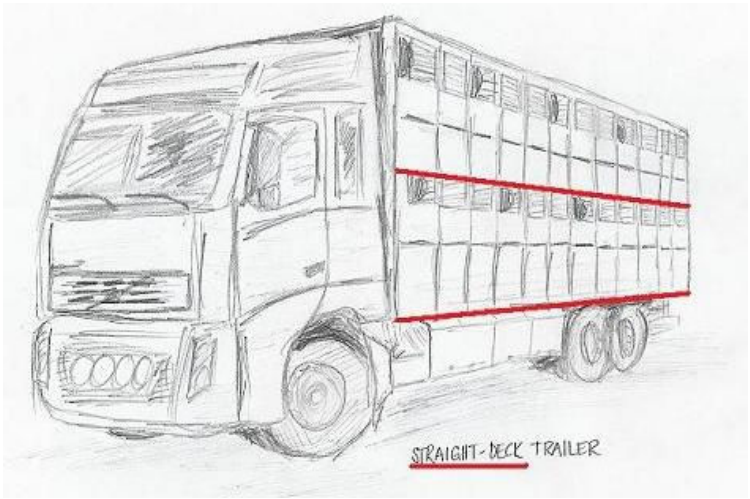

Figure 2. Straight-deck trailer (K. Thorell).

More ramps are potential stress elements for pigs. When comparing pigs´ stress responses between a pot-belly and straight-deck trailer, pigs unloaded from a pot-belly trailer had a greater incidence of open-mouth breathing and more skin discoloration (Ritter et al., 2008a). Duration time for unloading was longer for the pot-belly trailer, compared to the straight-deck trailer. Electric goad use during unloading was higher for the pot-belly trailer, where pigs in 7, 3 % of the compartments required some use of electric goad, compared to non in the compartments of the straight-deck trailer. Unloading pigs from a pot-belly trailer is more difficult compared to a straight-deck trailer and pigs transported in pot-belly trailers show greater signs of stress during unloading (Ritter et al., 2008a).

Width of ramp/passageway

Unloading of pigs is facilitated if the passageway is wide enough. According to Lambooij (2000) the width is sufficient when four to five animals can walk side by side. It then depends on the size of the pigs, and would be around 2 m if using a space of 40 cm/animal and letting 5 animals pass at the same time. Grandin (1980) claims that the width should be about 1, 8 – 3 m wide and straight, this to ensure that animals see an escape path ahead of them, which make them move easier. When using the tail ramp to unload, the whole width of it should be used. If this is not possible and the ramp is more narrow than the vehicle, it is best to have at least two entrances to single-files for prevention of jamming (Grandin, 1980; 1990). The use of a funnel is not to prefer since it is difficult for animals, they want to go through at the same time and will get stuck (Van Putten & Elshof, 1978). Pigs try to stay together if they are stressed and prefer body contact with each other (Van Putten & Elshof, 1978) Single-file ramps with solid partition should be avoided, but single-file races with “see through” partition is a better choice (Figure 3)."See-through” partition promotes following (Grandin, 1982; 1987; 1990) and prevents animals from baulking and turning around. The outer partitions should be solid to avoid disturbances (Grandin, 1982; Lambooij, 2000). Pigs able to see people ahead of them often stop and hesitate to move forward (Grandin, 1982; Atkinsson, 2000). If pigs start to turn around and hesitate to move forward when being unloaded, this will even more complicate the procedure.

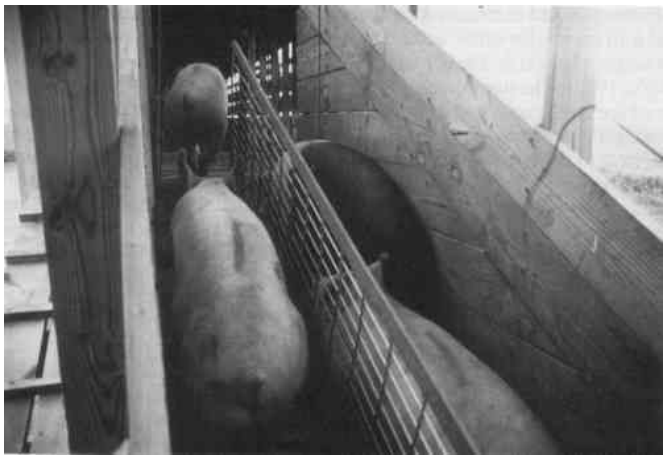

Figure 3. Single file ramp with ”see-through” partition (Photo: T. Grandin).

Surroundings

Light inside/outside the transport

Pigs often have an aversion towards darkness, and move easier from darkness towards a more brightly illuminated area (Van Putten & Elshof, 1978; Grandin, 1990; Tanida et al., 1996). Since it often is dark inside transport-vehicles, one could take advantage of this fact by manipulating with the lights, and hence make unloading easier.

Pigs behave differently when entering an unknown dark area compared to an unknown illuminated area (Van Putten & Elshof, 1978). Unknown dark areas cause pigs to hesitate and turn around several times before going in, when inside pigs are more quiet and move slowly in contact with their group-mates.

Grandin (1982; 1990) claimed that lamps never should shine into the eyes of animals. This contradicts the findings of Tanida et al. (1996), who studied pigs´ responses to different lights and shadows. Pigs were moved between two areas, exposed to light beams towards their eyes and from behind. No significant time difference was recorded when moving pigs between the two areas. However, there was a significant difference in time if the two areas were dark. Therefore the unloading area should not be completely dark, rather have some kind of flash

light than no light at all. Pigs that spend their fattening period in a dimly illuminated building have been seen baulk and show aversion to sunlight when driven straight towards it (Grandin, 1982; 1990), probably because their eyes are not used to such bright light.

If unloading occurs outside in daylight, there may be shadows along the unloading ramp or that extends into the transport. Shadows may disturb animal movement. Grandin (1982; 1990) claims that shadows are to be minimized and that pigs´ hesitate when moving through a dark shadow. However this statement is contradicted by Tanida et al. (1996), who found no significant difference in time for pigs to move through an area with different shadows or patterns across the floor. The pigs showed a tendency to walk more on the black shadow areas than the light. There is a suggestion that three-dimensional objects are more fearful than shadows on the floor. Pigs pass shadows as fast as possible (Tanida et al., 1996).

Sound

Sound is a stressful factor for pigs; novel sound will activate the animals´ defense mechanisms, such as enhanced heart rate, increased ambulation and change in activity to escape behaviour (Talling et al., 1995). The increased level of heart rate and arousal will return to normal first after the sound is decided to be no immediate threat. It is suggessted that it is the loudness of the sound that pigs react to, not the content (Talling et al., 1995; Lippmann et al., 1999). By decreasing the sound pressure by 50 % and substaintially reducing the sound intensity by isolation, pigs were less aroused and moved more easily without the use of driving aids (Lippmann et al., 1999). This is consistent with the findings of Talling et al. (1995) who displayed that piglets exposed to high sound levels had a significantly higher heart rate compared to the control group. However the response to the source of the sound is not as clear as the loudness. When exposing pigs to different sounds (farm, transport, abattoir and white noise), there are no clear signs of what is more distressing. White noise is a type of sound caused by some electronic equipment at a frequency range of 200-20 000 Hz (e.g. a TV set at standby mode). This sound lack biologic meaning (Geverink et al., 1998a). Talling et al., (1995) found the most enhancement of heart rate of pigs exposed to transport and white noise treatments. While Geverink et al., (1998a) found no change in heart rate when exposing pigs to machines, pigs squeeling and white noise, although the machines and white noise treatment caused the pigs to stay close to their group-mates. Spensley et al. (1995) found that transport sound caused the highest raise in pigs´ heart rate, followed by white noise, farm and abbatoir.

Pig behaviour

Mixing of groups

When pigs from different groups are mixed there will directly be interactions to determine the social hierarki. These interactions occur as aggressions towards other individuals or fighting inbetween (Bradshaw et al., 1996b). The quantity of fighting can be predicted by assessing the aggressive behaviour shown in the pigs´ home pen (Geverink et al., 1998c). Large differences in pigs´ individual aggression behaviour have been observed after mixing pigs in lairage (Geverink et al., 1996).

When pigs are mixed in a transport, the space is very small and there is no room for an individual to get away from others. Mixing of more animals (~200 animals) results in less fighting compared to mixing 6-40 pigs unfamiliar to each other (Grandin, 1990). This however, would be difficult to apply on trailers, since they only can carry a certain number of

animals on each deck. Most fighting occurs during the first 30 minutes after pigs have been mixed (Geverink et al., 1998c). Although when studying pigs at Dutch and Belgian abattoirs it was found that the highest incidence of aggressive interactions occurred after the first half hour following mixing of unfamiliar individuals (Geverink et al., 1996).

Pigs have sharp teeth and these can cause skin damage if fighting occurs. Skin damage is commonly used to identify welfare problems (Grandin, 2003). Another problem if pigs are fighting during unloading, is that they struggle with one another and may bump into the walls of the vehicle or the solid walls of loading ramps, which can lead to falling.

Human behaviour

Handling intensity

Driving pigs with electric goads is more stressful than using moving board, paddle or hurdle (Hamilton et al., 2004). In the study, pigs were driven through a handling course, subjected to either high- or low-intesity handling. The high-intensity handling included use of electric goad (16 shocks/pig) and a moving board. Pigs on the low-intensity handling were moved using only a paddle or moving board and allowed to move in their own pace. High-intensity handling resulted in higher lactate-values together with lower pH-, HCO_3- and base-excess levels compared to low-intensity handling. There was also a trend of the animals on high-intensity handling to have a higher posthandling rectal temperature. However the high-intensity handling did not result in any downer animals. In severe cases stress can cause downer animals. This is due to increase in body temperature, higher production of lactic acid together with lower pH in the muscles and blood stream. Handling pigs with a frequent use of electric goad result in downer pigs (Benjamin et al., 2001). Downer individuals display higher rectal temperature and more skin discoloration, compared to pigs on a gentle handling method.

Bertol et al. (2002; 2005) conducted similar studies as Hamilton et al. (2004) to evaluate the effect of handling intensity on blood acid-base response. Their results confirm that using electric goad to move pigs has a large impact on blood acid-base balance. Pigs handled intensively had higher lactate values together with lower pH, HCO_3 and base excess. The decrease in base excess and HCO_3 is seen as a consequence when the buffering bicarbonate system takes action to neutralize the increase in lactate (Sjaastad et al., 2003).

When comparing physical responses of pigs loaded with electric goad or hurdle, it was found that pigs loaded with the use of electric goad had a significantly higher heart rate, rectal temperature and activation level then those loaded with a hurdle (Brundige et al., 1998).

The use of electric goads can affect the meat quality post-mortem. Use of electric goad prior to slaughter has a positive correlation with light scatter score of the ham and is negatively correlated with plasma glucose level (Hemsworth et al., 2002). In this study, 23 % of pigs who received intense use of electric goad before slaughter were classed as having PSE ham (Hemsworth et al., 2002).

Electric goad use, transportation, unloading and mixing of unfamiliar individuals are potential stressors for pigs. When exposed to several stressors pigs show the highest values of rectal temperature, blood lactate and the lowest pH, compared to pigs exposed to less stressors (Ritter et al., 2008b). In the referred study it is implicated that by removing only one stressor these levels will decrease/increse, and this reduce the number of fatigued, downer animals.

Discussion

Transporting pigs and other animals can be problematic concerning the welfare of the animals. As shown in a number of studies, ramps is one very stressful factor for pigs during unloading (Van Putten & Elshof, 1978; Warris et al., 1991; Brown et al., 2005). After a long transport pigs can be exhausted and smooth unloading is necessary. The angle of slope of the ramp shall not be too steep; the use of slopes over 20˚ is very difficult for pigs to handle (Van Putten & Elshof, 1978; Warris et al., 1991). There are several suggestions how to reduce stress during unloading. Van Putten & Elshof (1978) suggest that extension of the unloading ramp is a potenial solution to decrease steep slopes. However this can be difficult to carry out because unloading areas or trailers have to be rebuilt in order to construct extendible ramps. Instead of using steep ramps hydraulically tail-lifts can be used (Brown et al., 2005). The positive aspects of such lifts are that pigs do not have to descend ramps at all and they can be moved in their solid groups. However tail-lifts can prolong the unloading time, since it has to be moved up and downwards and this has to be taken into account. Yet another option instead of unloading ramps is the container system (Van Putten & Elshof, 1978; Brown et al., 2005). Brown et al. (2005) suggested that this system could be developed to create a totally automatized transportation and slaughter system. The containers can be self-contained with food, water and have a feces collecting system. At the abattoir the containers can be transported unsealed and continue into a gaseous stunning area, without humans having to handle the pigs at all until they are properly stunned. This would minimise the stress on the animals from humans and surroundings. If these containers are routinely used somewhere remains unclear and there is a need for further research and development.

Steep loading ramps make pigs hesitate before going down (Van Putten & Elshof, 1978; Warris et al., 1991). If pigs start to hesitate and try to turn around this can lead to rough handling by electric goads from personnel. Use of electric goads is an extremely stressful factor for pigs and lead to increased heart rate (Van Putten & Elshof, 1978; Brundige et al., 1998; Benjamin et al., 2001), negative changes in blood parameters (Hemsworth et al., 2002; Hamilton et al., 2004; Bertol et al., 2005ab), carcass damages and bad meat quality post mortem (Geverink et al., 1996; Hemsworth et al., 2002). Together this demonstrates that in order to minimize stress on pigs during unloading and improve meat quality, the use of electric goads shall be avoided unless in exceptional cases.

This literature review shows that the need for use of electric goads implicates that the unloading area is of poor design. If the area is well-designed, the animals would unload and keep moving without hestitation. Holdbacks to movement are not just ramps or unloading systems. There are many potential stressors or holdbacks to pigs´ movement: noise (Spensley et al., 1995; Talling et al. 1995; Geverink et al., 1998a; Lippmann et al., 1999), shadows or dark areas (Van Putten & Elshof, 1978; Grandin, 1982; 1990; Tanida et al., 1996) and narrow passages (Van Putten & Elshof, 1978; Grandin, 1990; Lambooij, 2000). By small improvements of the unloading surroundings these holdbacks can be removed. For example modifications in order to minimize shadows, reducing the noice by isolation and broaden passageways to facilitate movement. This together with education of stockmen could further decrease the use of electric goads and other rough handling methods.

Pigs that in some way have been trained or extra handled by humans are less fearful and more often need to be driven with electric goads in order to move (Geverink et al. 1998b; Hemsworth et al., 2002; Krebs & McGlone, 2009). In contrast, pigs that have been used to novel surroundings, but not handled by humans, are easy to move without electric goads. This because they are still afraid of humans but used to novel surroundings (Krebs & McGlone,

2009). This implicates that pigs used to new environments do not get stressed as much as pigs that never have left their home-pen. Training pigs to new surroundings by moving them around at the home farm could therefore be a way to reduce their stress response when transported to abattoirs. This is though probably difficult to accomplish since it takes time and work effort from farm personnel.

High sound levels are yet another stressful factor for pigs during unloading. High sound levels are more stressful to pigs compared to more moderate levels (Talling et al., 1995; Lippmann et al., 1999). Transport, machines and white noise cause more stress responses when comparing them with farm or abattoir sound (Spensley et al., 1995; Talling et al., 1995; Geverink et al., 1998a). Farm and abattoir sound often contain pigs vocalizing, for example pigs squeeling in a abattoir restrainer (Geverink et al., 1998a). This implies that sound from other pigs, even squeeling, is not as stressful to pigs as more industrial sounds. Together this suggests that unloading areas that is silent or at least only have moderate sound levels is good to reduce stress on pigs´ during unloading.

The width of passageways and unloading ramps is somewhat questioned, and of course it depends on the size of the pigs. What is clear is that pigs should be moved in group or at least two side by side to promote following (Grandin, 1982; 1987; 1990; Lambooij, 2000), pigs want to stay together when stressed (Van Putten & Elshof, 1978). Funnels cause pigs to jam (Van Putten & Elshof, 1978; Grandin, 1990) and if the unloading ramp is less wide then the transport, there should be at least two entrances to single file races. If single-file races must be used they should be side by side with see-through partition, so pigs can see and smell each other. Contact with other pigs can act comforting and reduce stress response during unloading. Races should be wide enough for one pig otherwise animals will try to walk side-by-side.

In conclusion it is clear that loading, unloading and transportation is generally very stressful for pigs. There is no clear answer to the question which is the most stressful event occuring when slaughter pigs are unloaded at abattoirs; the situation is complex with several influences. Stressful factors that affect pigs during transportation and unloading are steep unloading ramps, electric goads, noise, shadows and narrow passageways. However, in todays production transportation is a must. Therefore the need for improvement of equipment, routines and logistics are essential for reducing stress during transportation and unloading. Improvement can be accomplished when results from research lead to legislation changes or development of new equipment such as the container system. Such a system could very well be the best for slaughter pigs that have to be transported to abattoirs. The system requires no human handling after loading at the farm, and this can be done by the farmer who is familiar with the pigs. If the containers are well designed and provided with good ventilation pigs can be held for a longer time in comparison with transportation vehicles. However if such a system shall be used there have to be rebuilding at abattoirs, together with research to evaluate how the system functions in practical situations. This must be financed in some way and in the long-term perspective the system could repay itself. A better system could decrease transport associated losses and improve pigs´ welfare during unloading.

Acknowledgements

Special thanks to supervisor Maria Andersson and the writing group for valuable comments on the manuscript. Thanks to T. Grandin for kindly permission use of photos.

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