Effects of Farm Handling and Transport on Physiological Response, Losses and Meat Quality of Commercial Pigs

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Introduction

Transport can be a stressful phase of the pre-slaughter period of pigs. This situation is more critical for pigs depending on handling procedures at loading, farm facilities, vehicle types and weather conditions. If animals are stressed during this period it may force producers, transporters and packers to cope with major economic losses coming from dead pigs during transport and at the slaughterhouse, trimmed and condemned carcasses due to contusions, bruises, fractures, etc., as well as poor meat quality arising from stressful conditions. Additionally, upon arrival at the slaughterhouse, some non-ambulatory pigs may need to be euthanized, increasing the losses and compromising animal welfare standards.

In Canada, mortality rate caused by transport conditions is 0.11 % (CFIA, 2008) and incidence of non-ambulatory pigs is approximately 0.40 % (an estimate of 80,000 pigs upon arrival, every year). These numbers suggest that we need to better understand the factors that are causing stress to the pig in the period surrounding and including transportation, but also to find solutions. Such solutions will contribute to improving the welfare of the animals, reducing useless and costly losses for producers and packers and improving meat quality for consumers. Therefore, it is important to collect the information on standard transportation conditions in diversified regions of Canada, especially under extreme weather conditions. Moreover, alternative instruments and techniques for handling pigs at the farm have to be examined in order to explore less stressful methods for pig transportation. This text will illustrate some research results applied under commercial conditions resulting in an improvement in animal welfare and avoiding losses to the industry including dead animals, and carcass and meat quality.
- **Animal Welfare Focus on Farm Handling and Transport**

Animal welfare is defined as the status of an animal considering its experiences, its needs, its feelings and its ability to cope with its physical and social environment. The definition of Broom (1987) refers to the notion of adaptation which says that animal welfare is being associated with a state of the animal with regards to its attempts to cope with its environment. These definitions complement each other and are essentially summarized in five recognized animal freedoms (FAWC, 1992):

- A physiological freedom: absence of hunger, thirst and malnutrition.
- Environmental freedom: adequate housing and physical comfort.
- Health freedom: absence of disease or injury.
- Behavioural freedom: expression of its specific behaviours.
- Psychological freedom: absence of fear, anxiety or pain.

Production systems must ensure the respect of these freedoms in all stages of the animal’s life from birth to slaughter. Therefore, during handling on farm and transport the freedoms of the animals must be respected.

- **How animal welfare can be measured during loading and transport phase?**

Abnormal behaviour patterns from animals typically indicate how environments compromise animal welfare, and they may even reflect specific physiological dysfunctions. Thus, the first and basic method to measure animal welfare is animal behaviour. Ethology is the scientific study of animal behaviour. Animal behaviour is a non-invasive measurement that can be assessed by systematic observation or even by recording devices. For example, during pig loading or unloading, measuring slips and falls, reluctance to move forward, slow movement, overlapping, going backwards, stopping, running away are signals indicating that something in the environment (facility design, handling equipment, type of floors, handler training, etc.) is affecting the normal movement of animals. Likewise, pigs express their discomfort via vocalization, which according to the intensity and duration can show the degree of distress during the preslaughter activities.

Some physiological methods to measure the stress of pigs during the preslaughter conditions have been used to evaluate animal welfare. Indirect measures, such as heart rate, body temperature and breathing rhythm, or direct measurements from enzymes and hormones released into different
body fluids (blood, saliva, urine, feces or meat juice) are accurate measures able to assess the extent of animal stress.

Percentage of animal losses during transport such as dead on arrival, non ambulatory pigs (injured and fatigued), dead in lairage and condemned carcasses by transport causes (contusion, congestion, fracture, dead in lairage, etc) are a measure of how pigs have been handled and transported. Transport losses are presently an animal welfare issue and an economical challenge to the swine industry.

The type of bruises on the carcasses can indicate how animals behaved or were treated during transport. For example, mounting-type bruises on the carcass (claw marks in loin and flanks) suggest that animals have overlapped each other. Other bruises such as lacerations and scratches, can be an evidence of narrow alleys, doorways or ramps at the farm, or handling tool marks, may show the abuse of handlers with the equipment.

Finally, the impact of poor animal welfare is reflected in detrimental meat quality. As a result of stressed animals, high percentages of exudative and pale meats (PSE) might be produced by pre-slaughter conditions or a high proportion of dry, firm and dark (DFD) meat may be caused by exhausting journeys accompanied by stressful handling.

- **Effect of Farm Handling on Animal Well-Being and Pork Quality**

**Feed Withdrawal before Transport**

The effects of feed withdrawal prior to transport have been underestimated and sometimes its negative effects are neglected by some producers. Pigs with no fasting period before transport have a higher risk of fatigue and are more laborious to handle (Eikelenboom et al., 1991). Likewise, feed withdrawal before transport reduces the symptoms of travel sickness such as dizziness, hyperventilation and vomiting, which decrease the risk of death during transit (Guardia et al., 1996; Warriss, 1998). The proportion of losses in transport is doubled when pigs are fed before transport (personal observations from 2006 to 2009 in F.Ménard by Jorge Correa). On the other hand, a higher risk of gastro-intestinal tract lacerations during evisceration and carcass contamination is observed with pigs fed before transport. In practical experiences, Jorge Correa found 77% of carcasses condemned due to contamination came from farms with no feeding withdrawal at loading. This was in agreement with Schoonderwoerd (1997) who stated that feed withdrawal accounts for 71% of the variation in the carcass contamination rate. Furthermore, feed withdrawal before slaughter can potentially improve
pork quality by increasing ultimate pH, increasing water holding capacity, improving color and reducing the incidence of PSE (pale, soft and exsudative) pork.

**On Farm Facility Design**

In the last 5 years in Canada, slaughter weight has increased from 113 to 130 kg of liveweight. These bigger pigs are no longer 14-15 inches wide; they are now 17-18 inches wide. In fact, two pigs used to pass through the alleyway door, but today those two pigs are blocking. This factor has a direct effect on the movement of a group of animals during loading and may affect their well-being. Poor pig movement in alleyways and ramps increases stress and fatigue of pigs and contributes to a loss of patience of handlers who may then overuse or misuse the handling equipment (boards, paddles, electric prods, etc.). As a result, fearful and stressed pigs are more difficult to handle, their skin is damaged and bruised and they are prone to produce a poor meat quality.

**Equipment Used to Load Pigs**

A combination of electric prods and boards or paddles and boards are the most commonly used equipment to handling pigs during loading. Other acceptable equipment such as flags and toreador capes are also used in wider areas within the abattoirs. Correa et al. (2010) compared the use of electric prods and paddles combined with a board at loading. There was a higher use of paddles per pig than electric prods, however the use of electric prods produced higher numbers of slips and falls, pigs overlapping and higher numbers and durations of vocalizations. Heart rates of pigs loaded with electric prods were high from loading to just before slaughter (**Figure 1**). Lactate concentration at exsanguination, a blood indicator of stress, was also higher in pigs loaded with electric prods. Higher skin damage (lacerations, scratches) proportion, higher ultimate pH in Semimembranosus and Adductor muscles (ham muscles), and higher proportion of blood splash on hams were noted in pigs loaded with electric prods.
Figure 1. Heart rate from loading at the farm to slaughter in pigs handled with 2 moving devices (PD = paddle and EP = electric prod).

The significant differences are from the least square mean in every event, where Loading: P < 0.001, with EP > PD; Wait at loading: P < 0.001, with EP > PD; Transport: P = 0.057, with EP > PD; Unloading: P < 0.05, with EP > PD; Lairage: P < 0.05, with EP > PD.

Enhancing Farm Facilities and Handling to Improve Pig’s Welfare and Reduce Losses to the Meat Industry

F. Ménard-AGROMEX (farm, transport and processing enterprise in Quebec) has implemented an animal welfare program to enhance farm facilities and introduced a training program for transporters with no electric prods from the farm to slaughter. Correa started the program in January 2008 at unloading without electric prods with 2 truck doors open when possible and noticed a decrease in fatigued animals at arrival from 0.23 to 0.11%. A couple of months later, the program was implemented on the farm and the percentages of fatigued animals at arrival decreased to 0.04 % and the dead on arrival pigs decreased from 0.11 to 0.04%. In 2009, a new program of payment with
incentives encouraged handlers and transporters to slow down (100 pigs/hour) resulting in a decrease in fatigued pigs to 0.01%. During those changes, a reduction of condemnation carcasses proportions caused by handling and transport prior to slaughter (congestion, contusion, fracture, hematoma, euthanasia and dead in lairage) from 0.13 to 0.03% was noticed. In conclusion, the total of animal losses diminished from 0.41 to 0.08% which indicates that an improvement in animal handling had an economical impact on the company. However, the most important change during this program was the reduced stress on pigs coming to the slaughter house which has a huge effect on meat quality (higher pHs, lower drip loss and darker color) that could have an even larger economical impact. Unfortunately, this impact could not be measured because in those years the slaughter house had multiple modifications but always maintained a high meat quality production.

- **Effect of Transport on Animal Well-Being and Pork Quality**

**Vehicle Effect**

Most of the vehicles used for pig transportation in Canada are equipped with ramps in order to optimize the space into the trailers having bigger loading capacities. However, some transporters have begun to use vehicles with hydraulic decks. Some studies have demonstrated that trailers equipped with ramps increase the use of electric prods (Ritter et al., 2008), the proportion of pigs with open-mouthed breathing and splotchy skin signs (fatigued pig; Kephart et al., 2010) and dead on arrival pigs (Sutherland et al., 2006). Correa et al. 2008, comparing a vehicle with ramps and a vehicle with hydraulic decks, found a numerically higher number of animal losses in the vehicle equipped with ramps. Likewise, pigs transported in the vehicle with ramps had higher concentrations of lactate and creatine phosphokinase (CPK) (blood stress indicators) indicative of a more significant stress in those animals. Considering the pig location in the truck, the pigs negotiating ramps showed higher values of lactate and CPK than those entering the straight decks. As a result, the meat from pigs transported in the vehicles with ramps showed higher values of ultimate pH and darker colors which are characteristics of muscles with depleted glycogen reserves or in general, a more exhausted animal.

- **Conclusion**

In brief, animal welfare in the last phase of pig production starts at the farm. Feed withdrawal before transport, good facilities and appropriate handling are
essential for pig’s well-being and may affect meat quality. The use of hydraulic
deck vehicles is an alternative to consider for transporting pigs in Canada
because it can improve animal welfare and pork quality.

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