factsheet

Pork Information Gateway

Authors
Jeff Hill, Premium Standard Farms
Nick Berry, Iowa State University
Anna K. Johnson, Iowa State University

Marketing the finisher pig: The impact of facility design

Reviewers
Mark Storlie, Iowa State University
Renée Bergeron, Laval University

Introduction

The general public, livestock producers and research scientist have shown an increasing interest in assuring proper animal care and handling [21]. There is a corresponding increase in efforts by research and educational institutions, government agencies, enterprise managers, health care providers and others in developing and accessing information that assists in creating appropriate management procedures and humane conditions for the transportation of farm animals [21].

Objectives

- Discuss a variety of on-farm design factors that can affect pig movement at the time of marketing.

U.S. Animal Welfare Committee Funded Workshop

In 2004 a group of renowned experts in the area of swine well-being came together to review the scientific literature pertaining to the fatigued pig and finisher pig transportation. From this workshop, the researchers and allied industry representatives noted that; "At the farm, major factors impacting behavioral and physiological responses of the pig during transport include genetics, slaughter weight, environmental conditions (temperature and humidity), health status, marketing strategy, time off feed, pre-transport experiences, facility design, and nature of handling during loading" [19]. Such factors can be stressful for any size and type of pig, and even under the "best" handling and transportation conditions may cause significant changes in the pigs' physiology, their behavior and consequently negatively impact pig performance and final meat quality". The researchers also challenged the industry to "improve finisher pig well-being at the time of marketing" through scientific research on facility design [18].

Handling and loadout: Improving Animal Flow

Animal "movement is accomplished by making the target location, or route to it, more attractive than the starting location" [4]. Pigs are motivated by many factors including natural curiosity, pig odors, pig sounds, conspecifics, food and fear [15].

Traditional handling and loading systems have been either poorly planned or not planned in the design and construction of a finishing facility. Therefore, during handling and marketing opportunities the industry is forced to rely heavily on negative motivators or repulsive forces, most notably fear and pain, to move the animal.

Instead, all production, transportation and processing facilities MUST be designed based on the behavioral and physiological attributes of the pig. The goal of any handling and loading system should be to provide a continuous unidirectional flow of pigs from the pen to the trailer, with minimal amount of stress on the animal. However, due to the inherent variation in production facilities, management styles, transportation systems and processor requirements there will never be a single ideal loadout design or handling procedure.

Additive Stressor Models: How Does this related to handling and load out?

In all methods of production, the pig is subjected to a constant barrage of internal and external stressors throughout its life. Stressors that impinge on an animal vary in time (i.e. frequency and duration), intensity (i.e. density an area), mode (i.e. visual, gustatory, emotional etc.,) and degree of novelty [2]. However the body has developed physiological mechanisms to adapt with both short (acute) and chronic (long-term) stressors, that are neutral, negative or positive in regards to animal well-being. It is only when the stress level exceeds the body's capacity to cope in a reasonable time frame that the pigs' well-being is compromised. The inability to cope will result in loss of efficiency and long term harm with the ultimate extreme being death [16]. Novelty (i.e. handling, loading and mixing) can be a profound stressor to pigs [5], this is especially so when the novel experience is aversive. How an individual pig copes with such aversive stimuli can affect its overall performance and meat quality [3,9,10,11].

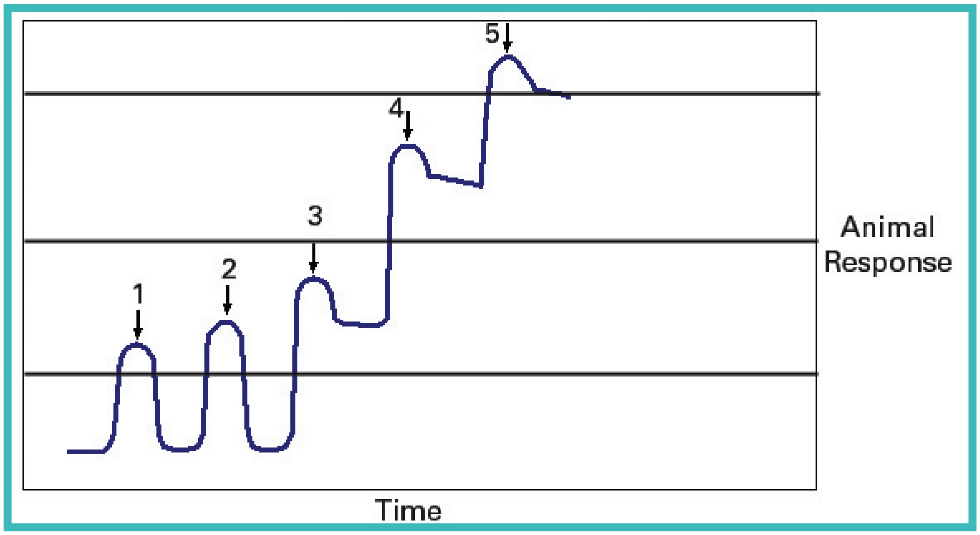

Figure 1. Adapted from Broom and Johnson [2]; Responses to a series of stimuli which, individually have moderate effects but which can be lethal in combination. 1 = Movement from home pen along alley way, 2 = Electric prod use 3 = Loading 4 =Transport 5 = Unloading.

The process of transportation can be visualized as "additive stressors" as proposed by McFarlane and Curtis [13] and McFarlane et al., [14]; and Broom and Johnson [2]. Over a given period of time, the pig is exposed to one stressor after another and the animal does not have time for its body to return to baseline. Each time a new stressor is added the stress response of the animal continues to become more intense. At some point, if the animal does not have time to recover, then the ultimate end-point can be death (Figure 1).

Alleyway and Loadout Design

Over 95 % of the market pigs in the U.S. are raised in confinement facilities with barren environments and limited interaction opportunities for environmental enrichment or human interaction. Pigs kept in barren environments have been shown to display a high degree of reactivity to novel stimuli and in some cases be disturbed by them [19]. Therefore pigs load best in a highly controlled, consistent environment that eliminates distractions and mimics the features of the home pen. This control should include all minor aspects of the animals' environment, such as wall coloration, lighting, flooring material, airflow patterns, etc.. Attempting to control all factors in the animals physical environment minimizes the impact of the one (or more) factor(s) that at the time of handling and loadout is undesirable, such as an unusual wind pattern in a naturally ventilated finishing barn, or rain on the top of the trailer creating high levels of noise.

Design Factors Impacting Animal Movement

Alleyways and loading chutes should be designed based on the desired size of the movement group and the space required to accommodate the shoulder width without resulting in pigs becoming jammed. For example, there must be no narrowing at doorways, entrance to chutes or trailer entrances. Current recommendations for 24 inch alleyways are based on group sizes comprising of three finisher pigs, and a 36 inch alleyways have been identified for group sizes of six finisher pigs [22]. However in contrast to earlier recommendations [6], finishing units are adopting technologies from processing facilities and incorporating wider alleyways (6 feet) that when paired with full (or split pairs) of loading doors on trailers have been very successful for movement of larger groups (i.e. 15+ pigs). This is supported by research indicating pigs moved 36 % faster in a wider alley that allowed for group movement patterns compared to single file alleyways [15].

In addition, facilities should be designed and built to minimize or eliminate the turning of corners during the loadout procedures. Warriss et al. [15] demonstrated that "the presence of a bend with an angle of 45 degrees slowed the pigs' progress by 10 percent, a bend of 90 degrees slowed progress by 19 percent and a bend of 180 degrees slowed progress by 44 percent." Due to time constraints, rarely is the animal allowed to slow to this degree. Instead the handler is forced to use more aggressive negative motivators to move the pigs.

Phillips et al. [17] demonstrated pigs reared in confinement would move up a ramp illuminated at 80 lux which was similar to their living quarters, but avoided dimly lit or brightly lit facilities. To take advantage of this concept that pigs move towards greater illumination, some facilities, slowly increase the illumination along the alleyways as this minimizes stress and encourages animal movement. However, the lighting system should provide a soft, even, diffuse illumination pattern that minimizes glaring and shadows. It is impossible to properly handle an animal on a slippery surface with poor footing [5]. Research by Applegate [1] demonstrated significantly increased slippage with flooring materials that had a British Pendulum Number (BPN) less than 60. However, in commercial animal handling systems contamination (i.e. manure or wood shavings) and the loading environment must be accounted for in selecting construction materials and flooring designs. Currently, to overcome animal slippage due to the use of poorly selected flooring materials a very aggressive cleat design is utilized in most loadout chutes, which unfortunately still allows for loss of footing between the cleats and under certain circumstances can result in injury to the dew claws.

In addition pigs will hesitate when forced to experience novel flooring materials or abrupt changes in flooring surface. Therefore to improve handling efficiency and reduce stress the flooring material should mimic the texture and color of the home pen flooring.

Loadout Chute Angle

It has been recognized that handling and loading is one of the most stressful aspects for the individual pig [3,19,13] because of the physical exertion required, the noise, and the effects of contact with people during handling.

Mayes and Jesse [12] reported that throughout the entire transportation process the highest heart rate was collected when pigs climbed loading chutes. Based on current recommendations the majority of load chutes range in angle from 20 to 25 degrees, and depending on the trailer design the chute may raise to the upper deck or utilize the internal truck ramp (normally 25 degrees) However, laboratory research has demonstrated that each degree increase in ramp angle results in a 4 percent increase in heart rate (Table 1.) and an increase in time to load of 4 percent per degree of angle above 20 degrees. Mayes and Jesse [12] reported that if the individual pigs' heart rate exceeded 220 to 240 beats per min-1 pigs would stop moving or lie down. Grandin [4] hypothesizes that for pigs the difficulty in climbing loading chutes is mainly psychological. Pigs can be seen refusing to try and can turn their sides towards "steep" ramps. It seems that to these pigs which have no previous experience with such surroundings a loading ramp with an angle of 30 degrees does not look accessible.

Table 1: The Impact of chute design on heart rate. (Information based on compilation of previous research

Chute angle	% increase over normal resting HR*	Observed Reactions
0-10	20	Increase due to human interaction/removal from home pen
15	40	
20	60	
25	80	
30	100	Many pigs refuse to attempt ascension (psychological) - require significant stimulation to ascend (i.e. use of the prod)
35	120	
40	140	
45	160	Majority of pigs refuse (physical)--result in multiple fatigued / deads on chute
50	180	
55	200	

Normal Resting Heart Rate (HR*) = 120 bpm for a finisher pig. [4,12,20,15].

Critical Loadout Chute Design Features *(as featured in PORK November 2006)*

1. Continuous Unidirectional flow of pigs from the pen to the trailer
2. Minimal loadout chute angle with properly spaced cleats and anti-slip flooring
3. Uniform proper width of alleyways and chutes for the age/weight and group size being moved
4. Mimic the critical features of the animals home pen, i.e. color, flooring, lighting, etc.
5. Eliminate distractions and balk points by maintaining uniform environment throughout the loading process i.e. lighting, flooring type, flooring texture, etc.

Summary

Animal handling and loading systems have significant impact on our employees, the animals, the quality of pork delivered to the consumer and our overall profitability. Some improvements have been made in the handling and load out of the finisher pig. For example some producers have implemented flat dock systems in new construction, and the utilization of enclosed chutes, either by incorporating them into the building structure or enclosing the framework of the chute itself. However, this is only a beginning step. To date little has been done eliminate distractions, understand lighting patterns and improve swine footing, which results in the majority of pigs in the industry continuing to be loaded utilizing low cost poorly designed open wooden or metal load chutes.

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