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Logo Design

Ruth Cronje, and Jan Swanson;

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The use of pig behavioral principles to improve efficiency of handling and sorting

Rebecca Morrison, B. Agr. Sci (Hons), Ph.D.

University of Minnesota, West Central Research & Outreach, 46352 State Hwy 329, Morris, MN 56267

A knowledge of pig behavioral principles is critical when handling and sorting pigs during the pig marketing process or attempting to achieve optimum performance in any pork production system. Currently, trim loss associated with bruising resulting from poor handling prior to slaughter accounts for a \$48 million profit loss per annum in the United States pork industry (National Pork Producers Council, 1997). Furthermore, pale soft exudative pork (PSE) and dark firm dry pork (DFD) resulting from poor handling prior to slaughter account for additional financial losses. These losses can be minimized by handling and sorting pigs with knowledge of the pig's behavior and using minimum contact and stressors prior to slaughter. The following behavioral principles of the pig need to be considered when handling pigs:

- social behavior
- vision and hearing
- intelligence or learning
- fear of unfamiliarity (neophobia) and humans

Social behavior

The social behavior of growing pigs has been defined by Kelley et al. (1980), McGlone (1984, 1985), and Stolba and Wood-Gush (1989), and in group-housed gestating sows by Jensen (1980, 1982). The social behaviors of pigs can be categorized into social tactile interactions, agonistic behaviors, sexual behavior, and social grooming. Pigs are extremely social and will tend to form groups with stable social hierarchies (Signoret et al., 1975). An important dimension of this group behavior is communication between pigs. In order for a group of animals to establish effective competitive and cooperative social relationships it is necessary for the animals within the group to promptly identify and communicate with each other (Stricklin and Mench, 1987). Cues of social recognition and communication are essential for the survival of individuals and, ultimately, the species, because these behavioral cues relate to reproduction, maternal behavior, protection, and learning (Ewing et al., 1999). The scientific literature is still somewhat unclear on how the mechanism of individual animal recognition operates in pigs, although it is evident that different cues of social

recognition exist. These cues of social recognition include auditory, olfactory, tactile, and visual cues (Hart, 1985; Stricklin and Mench, 1987; Fraser and Broom, 1998). Therefore, vision and hearing are essential for communication between pigs and should be understood and taken into consideration when interacting with pigs.

The two components of pig social behavior that are particularly important when handling and sorting are herding and following. Pigs are social animals and, therefore, prefer to be around other pigs. With these behaviors in mind, stockpeople should slowly move pigs as a small group and minimize isolation of pigs. Sight of other pigs at the end of race or pen will promote movement of pigs through an alleyway or handling facility. Pigs will synchronize their behavior such as walking, running, and lying down and will follow the leader of the social grouping. Stockpeople should allow pigs to follow the leader and not rush them. If the animals crowd together and are not moving, the stockperson should concentrate on moving the leader instead of pushing all the pigs from the rear.

Vision and hearing

Vision is well developed in pigs as they have cones (duplex retina) and rods in the eyes which gives rise to high sensitivity and high acuity and suggests the capability for color vision (Ewing et al., 1999). In addition, pigs have a wide visual field of 300 degrees (Prince, 1977). However, pigs have a poor depth of vision; therefore, they will balk if they encounter some unfamiliar feature such as change in flooring type, penning, and lighting—especially dark areas, extremely bright areas, and contrasting light patterns. Facility considerations are important in this situation. Alleyways and loading chutes should have covered sides to prevent visual distractions outside the chute or alley. Visual distractions should be eliminated from the path in which pigs are being moved, and an unobstructed view towards an exit or loading ramp will promote movement. Furthermore, shadows or discontinuities on the floor, drains in the floor, changes in chute construction material, or changes in floor type (e.g., slats to concrete) will inhibit animal flow and encourage balking. Lighting is also important. In areas where pigs are handled, lighting should be uniform and diffuse without shadows or

bright spots. Pigs will move from a dimly illuminated area to a brighter area, provided the light does not glare into their eyes (Damron, 2000). To promote pig movement during loading, the loading ramp should be designed so that the pigs are in single file and should not exceed the recommended steepness, which is 15 to 20 degrees for market-weight pigs. In addition, the ramp should have stair steps to minimize slipping and should be free of sharp edges to avoid bruising (Grandin, 1989).

The auditory range in pigs is from approximately 55 Hz to 40 kHz and the pigs are most sensitive from 500 Hz to 16 kHz. More than 20 different auditory cues have been identified in the pig during social encounters such as resting, play, feeding, maternal, agonistic, and sexual behaviors (Ewing et al., 1999). Common auditory signals are grunts, barks, squeals, and screams. Longer grunts are expressed in response to a familiar sound, and shorter length grunts are typical in excited pigs. As the pigs become more excited, the grunting frequency increases. Squeals and screams are associated with high levels of fear and barks are expressed when the pig is surprised or expressing dominance behavior (Haupt, 1991). Pigs will react quickly to vocalizations of other pigs. Pigs are fearful of unexpected loud or novel noises and as a result will become agitated when these noises arise. Therefore, to minimize stress and encourage pig movement, pigs should be moved quietly in a calm environment. In addition, anecdotal evidence suggests that continuous playing of a radio with a variety of music and talking will reduce the reaction of pigs to novel and loud noises (Grandin, 1989).

Intelligence or learning

In general, farm animals have good learning ability, can be easily conditioned, acquire aversions, can learn simple mazes, and have good short and long-term memories. Pigs will remember painful or frightening situations for many months. Restraint should be minimized and all painful procedures should be conducted at one location. Providing rewards (i.e., feed rewards, positive interactions) after a negative procedure will reduce aversions to the procedure and will encourage the pig to enter the handling facility in the future.

Fear of unfamiliarity (neophobia) and humans

Fear has been defined by Gray (1987) as a form of reaction to stimuli that the animal works to terminate, escape from, or avoid. McFarland (1981) described fear as a motivational state that is aroused by certain specific stimuli and which normally gives rise to defensive behavior or escape. Pigs will be fearful of new environments (e.g., handling facilities, trucks) and humans, which should be a factor the stockperson considers. The pigs should be

moved quietly and calmly into new environments, providing the pigs with opportunities for exploration.

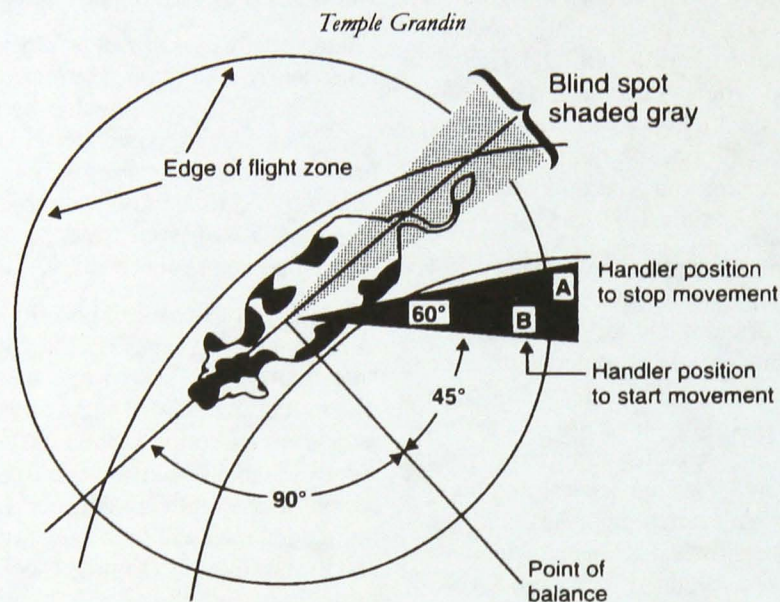
Characteristics such as fearfulness (Pearce et al., 1989; Jones and Waddington, 1992) and learning ability (Warren et al., 1982) are affected by environmental enrichment. Animals raised in barren environments may be more fearful during challenging situations (e.g., being loaded onto a truck) than those housed in an enriched environment, such as an environment provided with stimuli, e.g., straw, chains, or rubber hoses.

Knowledge of the flight zone of an animal is extremely important during handling. The flight zone is the animal's "personal space," and when a stockperson enters this space, the animal will react and move away. This fear response can be used as an aid to move livestock efficiently. Standing outside the flight zone will cause the animal to stop moving (**Figure 1**, point A). Standing in the shaded area within the flight zone will cause the animal to start moving (**Figure 1**, point B). Standing in front of the point of balance will cause the animal to back up (Grandin, 1989). Understanding the pig's flight zone will reduce stress imposed on the pig and reduce the risk of injury to the stockperson. The size of the flight zone will be reduced when the pig receives regular, gentle handling.

Intensively farmed animals have regular contact with humans through visual contact, handling associated with moving animals, and restraint associated with management procedures. High fear responses to humans may actually exacerbate handling problems. Reducing aversions to handling and treatment by humans will promote subsequent entry and movement in the handling facility. Electric prodders should be removed from the facility as they increase the fear response of the pig. Fearfulness prior to slaughter can lead to an acute stress response, which may affect meat quality. Rapid glycogenolysis as a consequence of acute stressors imposed on pigs immediately prior to slaughter will increase muscle temperature, increase lactic acid concentration, and increase rate of muscle pH decline post-slaughter (Moss, 1984), which, in turn, can lead to PSE pork (Guise and Penny, 1989; D'Souza et al., 1998). Pigs should be moved with minimum force, and slappers and panels should be used as an aid if pigs are difficult to move.

During handling and sorting, the risk of eliciting high fear of humans can be reduced by stockpeople *minimizing* their *negative interactions* whilst *maximizing* their *positive interactions* (Hemsworth and Coleman, 1998). A high percentage of negative interactions used by stock people, such as kicking and slapping, will increase the pig's fear of humans, which will make it harder to handle and sort the pigs at market. Ultimately this affects the pig's welfare, growth performance, and carcass quality. There is much to be gained from introducing stockperson training courses in the pig industry; such courses target the attitudes and

Figure 1. The flight zone.



behavior of the stockperson and develop positive interactions between the stockpeople and the pigs. One part of this process is ensuring that every effort is made to insure that stockpeople are treated as professionals and receive recognition for the important role they have in animal welfare and productivity (Hemsworth and Coleman, 1998). Providing training programs about pig behavior and stressing the importance of these behaviors when handling and sorting pigs is an essential step in this effort

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