ENVIRONMENTAL ENRICHMENT REDUCES EXCITABILITY IN CONFINEMENT REARED HOGS

TEMPLE GRANDIN

Grandin Livestock Handling Systems
Suite 3, 1401 Silver St.
Urbana, Illinois 61801, U.S.A.

INTRODUCTION

Rough handling, excitement, and the excessive use of electric prods shortly before stunning can have a detrimental effect on meat quality, (Calkins et al., 1980; Barton-Gade, 1985; Grandin, 1986). Some groups of pigs are more excitable and difficult to drive than others. Balky, excitable pigs are more likely to be subjected to excessive prodding because they refuse to move forward in an orderly manner. Excitable pigs pile up more often.

Conditions at the farm can affect behavior relevant to handling. Warriss et al. (1983) found that pigs raised indoors with minimal contact with people were more excitable and difficult to load into a trailer compared to pigs raised outdoors with frequent contact with people. Young pigs raised outdoors with frequent contact with people and a variety of play objects were less fearful of a novel object or a strange man compared to pigs raised indoors in small barren pens (Grandin et al., 1983).

Observations at a pig abattoir in Australia indicated that pigs with previous experience with a single file race were more willing to enter the race to the stunner. Pigs which had been loaded onto a truck through a single file race were easier to drive up a single file stunning race compared to pigs which were loaded through a wide alley. The purpose of these experiments was to determine if small amounts of environmental enrichment would reduce excitability in pigs. Excitable pigs which balk and pile up are more likely to become stressed at the abattoir.

MATERIALS AND METHODS

In Trials 1 and 2, 128 Landrace-sired crossbred pigs weighing 42.5 kg (SD = 2.26) and 43.5 kg (SD = 2.60) were used. Four pigs were placed in 1.35 X 1.35 m partially slatted pens in an environmentally controlled building. Per standard U.S. commercial practice no straw was provided. During the last 5 weeks of the 60 day trials the following treatments were imposed: CONTROL-People never entered the pens but control pigs were able to observe all activity in the aisle and in adjacent pens, MINGLE (M)-a person entered each pig pen once a week and petted the animals for 5 minutes. Only pigs that approached the person were petted, DRIVE (D)-the pigs were walked in the aisle for 1 minute each week, TOY (T)-the pigs had continuous access to hanging rubber hoses. The treatments were applied in a 2 X 2 factorial. In trial 3, 184 Hampshire sired crossbred pigs were used in a 15 week trial. Enrichment treatments were applied five times during the last half of the trial. The treatments were: CONTROL-same as trials 1 and 2, ASSERTIVE MINGLE (AM)-a person petted all the pigs even if they ran away for 5 minutes, GENTLE MINGLE (GM)-a person entered each pen and petted pigs which approached, TOY (T)-same as trials 1 and 2.

Excitability was measured on a 1 to 4 scale at the end of each trial by two observers blind to experimental treatment. Each observer walked into the pens to make the ratings. Pigs with a rating of 1 were calm and approached the observer. Pigs with a rating of 4 avoided the observer and piled up. Each pen of four pigs was given a rating. The ratings of both observers were averaged.

RESULTS

Environmental enrichment treat- ments reduced excitability. Control pigs were rated the most excitable (Table 1) ($P<.003$). Pigs which had two treatments were calmer than pigs which had only one treatment. In trial 3, controls were significantly

Table 1. Excitability ratings for pigs reared with or without environmental enrichment

	Control	Drive (D)	Mingle (M)	Toy (T)	DT	MD	MT	MDT
Trial 1	3.25	2.50	2.75	1.25	1.50	1.25	1.75	1.00
Trial 2	2.75	1.00	2.75	2.25	1.25	1.75	2.50	1.50

Table 2. Excitability ratings for pigs reared with or without environmental enrichment

	Control	Assertive Mingle (AM)	Gentle Mingle (GM)	Toy (T)	MT	GMT
Trial 3	3.45	1.85	2.58	2.25	1.66	1.86

more excitable than pigs in assertive mingle, toy, and assertive mingle and toy (Table 2) ($P<.05$).

CONCLUSIONS

In all trials, environmental enrichment reduced excitability. Animals which received more than one treatment were the calmest. There was also a tendency in all trials for toys alone to reduce excitability.

Environmental enrichment had the greatest effect on pigs which were flighty and excitable at the beginning of the trial. It had less effect in trial 2 because the animals were calm and tame at the beginning of the trial.

The animals definitely differentiated between a person in the aisle and a person inside their pen. Control animals which never reacted to people in the aisle became excited when a person entered their pen.

In trial 3, the assertive mingle treatment was more effective than the gentle mingle treatment for reducing excitability. A possible explanation is that all the pigs in the assertive mingle treatments were petted. In the gentle mingle treatment only animals that approached the experimenter were petted.

Pigs in barren fattening pens may be showing neurological signs of sensory restriction. Toys, petting and driving would prevent the onset of the detrimental effects of sensory restriction.

Placing animals in a restricted environment will make them more excitable (Melzack, 1954; Walsh and Cummins, 1975; Korn and Moyer, 1968). Isolation increased reactivity and muscle tone in mice (Valzelli, 1973). Melzack and Burns (1965) found that sensory restricted dogs had highly excitable behavior and abnormal electroencephalograms (EEG) for as long as 6 mo. after release from restricted environment. A restricted environment definitely increases brain excitability. Rats housed singly in barren cages are more difficult to anesthetize with sodium pentabarbital than rats housed in group cages with many toys (Juraska et al., 1983).

Entering the pens, petting the pigs, and walking in the aisle had no effect on weight gain. The absence of an adverse effect on weight gain

may possibly be explained by the animal's perceptions of the person entering its pen. If an animal perceives a person as a threat weight gains may suffer. Gonyou et al. (1986) reported that pigs intimidated by a person walking through the pen in a threatening manner had reduced weight gain. Even though the experimenter petted pigs which attempted to escape, the animals were never slapped or hit. The experimenter always interacted with the pigs in a positive manner. Gonyou et al. (1986) also reported that if an experimenter shocked pigs when they approached, weight gains decreased. The pigs quickly learned to avoid the experimenter to avoid the shock, but they still perceived the experimenter as a danger.

Previous experiments with farm animals indicate that they can become accustomed to handling (Gross and Siegel, 1983; Reid and Mills, 1962; Hails, 1978; Hughes and Black, 1978; Thurley and McNatty, 1973; Grandin, 1987). Cattle readily adapt to daily weighing with no effect on weight gain (Peischel et al., 1980). Hens accustomed to handling had no decrease in egg production, but hens not accustomed to handling had lowered productivity when handled (Hughes and Black, 1976, 1976). Chicks accustomed to daily handling grew faster and had higher antibody titers than unhandled chicks (Gross and Siegel, 1983). Experiments by Ames (1974) indicated that continuous exposure to 75 dB of miscellaneous sounds (roller coaster, trains, horns, etc.) white noise, or music improved weight gains. However, excessively loud noise at 100 dB reduced weight gains. Pigs raised in a quiet environment will jump and become agitated in response to a sudden noise. Farmers have learned from practical experience that playing a radio in the barn will reduce the reaction of pigs to sudden noise. Maybe stress could be reduced at the abattoir by exposing pigs on the farm to abattoir and truck noises.

Providing more stimulation during fattening will reduce excitability. The mechanism of action is probably a combination of reducing fear and prevention of the detrimental effects of sensory restriction on the central nervous system. Simple environmental enrichment procedures may help reduce stress at the abattoir. Calm pigs would be less likely to become agitated during handling.

Observations also indicate that pigs and other animals can become too tame. This makes driving difficult. The goal is to produce a calm slaughter pig which is easy to drive, but not so tame that it wants to follow the person instead of being driven. The optimum amount of contact with people in the fattening pens is going to vary depending on genetic factors and piglet rearing methods. Breeding animals, however, will always benefit from large amounts of positive contact with people.

Genetics also plays a role in pig excitability and drivability. Groups of pigs with different genetic backgrounds have been observed at commercial abattoirs. Even though these pigs were raised in the same barn on the same farm, animals from certain genetic lines were more excitable and difficult to drive.

In conclusion, enriching the environment a pig is fattened in will change its behavior. Providing toys, a radio, and gentle contact with people in the fattening pens will eliminate the detrimental effects of sensory restriction and reduce excitability.

These methods may also make pigs easier to handle and drive. This may help reduce PSE because calm animals would be less likely to become excited at the abattoir. Calm animals which move easily would also require less prodding.

REFERENCES

Ames, D.R. (1974):
Sound stress in meat animals. Proc.

International Livestock Environment Symposium SP-0174, p. 324.

Barton-Gade, P. (1985):
Developments in the pre-slaughter handling of slaughter animals. Proc. of European Meeting of Meat Res. Workers. Paper 1:1, p. 1.

Calkins, C.R., Davis, G.W., Cole, N.A., and Hutsell, D.A. (1980):
Incidence of bloodsplashed hams from hogs subjected to certain antemortem handling methods. J. Anim. Sci. 50 (Suppl. 1):15 (Abstr.).

Gonyou, H.W., Hemsworth, P.H. and Barnett, J.L. (1986):
Effects of frequent interactions with humans on growing pigs. Appl. Anim. Behav. Sci. 16:269.

Grandin, T. (1986):
Good pig handling improves pork quality. Proc. European Meeting of Meat Res. Workers. Paper 2:12, 105.

Grandin, T. (1987):
Animal handling. In: E.O. Price (Editor) Veterinary Clinics of North America 3:323-338.

Grandin, T., Curtis, S.E., and Greenough, W.T. (1983):
Effects of rearing environment on the behavior of young pigs. J. Anim. Sci. 57(Suppl. 1): 137 (Abstr.)

Gross, W.B. and Siegel, P.B., (1983):
Socialization, the sequencing of environmental factors, and their effects on weight gain and disease resistance of chickens. Poult. Sci. 62:592.

Hails, M.R. (1978):
Transport stress in animals: A review. Anim. Reg. Stud. 1:289.

Hughes, B.O. and Black, A.J. (1976):
The influence of handling on egg production, egg shell quality and avoidance behavior in hens. Brit. J. Poult. Sci. 17:135.

Juraska, J.M., Greenough, W.T., and Conlee, J.W. (1983):
Differential rearing affects responsiveness of rats to depressant and convulsant drugs. Physiol. and Behav. 31:711-715.

Korn, J.H. and Moyer, K.E. (1968):
Behavioral effects of isolation in the rat: the role of sex and time of isolation. J. Genetic Psych. 113:263.

Melzack, R. and Burns, S.K. (1965):
Neurophysiological effects of early sensory restriction. Exp. Neurol. 13:163.

Peischel, A., Schalles, R.R. and Owenby, E.E. (1980):
Effect of stress on calves grazing on Kansas Hills range. J. Anim. Sci. 24(Supl 1):25 (Abstr.).

Reid, R.L. and Mills, S.C. (1962):
Studies of the carbohydrate metabolism of sheep. XVI. The adrenal response to physiological stress. Aust. J. Agric. Res. 13:282.

Thurley, D.C. and McNatty, K.P. (1973):
Factors affecting peripheral cortisol levels in unrestricted ewes. Acta Endocrinologica 74331.

Valzelli, L. (1973):
The isolation syndrome in mice. Psychopharmacologia (Berl.) 31:305.

Walsh, R.N. and Cummins, R.A. (1975):
Mechanisms mediating the production of environmentally induced brain changes. Psych. Bull. 82:986.

Warriss, P.D., Kestin, S.C. and Robinson, J.M. (1983):
A note on the influence of rearing environment on meat quality of pigs. Meat Sci. 9:271.