POSSIBLE GENETIC EFFECT ON PIG'S REACTION TO CO_2 STUNNING

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SUMMARY

One hundred and thirty-six crossbred pigs from three different producers were observed in a compact CO_2 plant in a commercial slaughter plant. Predominantly Yorkshire pigs had a milder reaction compared to other cross breeds. There was a wide variation between individual animals. Some animals jerked and struggled violently and others exhibited little or no movement. Genetic differences may partly explain the conflicting results between different studies on the onset of unconsciousness during CO_2 stunning.

INTRODUCTION

There has been continuing controversy about the humaneness of CO_2 stunning. Hoenderken (1978) reports that the excitation phase of CO_2 induction starts prior to the onset of unconsciousness. Forslid (1987) found that in the Yorkshire breed, myoclonic jerks started 28 seconds after exposure to the CO_2. Unconsciousness as indicated by the development of neocortical delta waves had been induced prior to the onset of the jerks. Neocortical delta waves are typically seen during second stage barbituate anesthesia. Dodman (1977) and Grandin (1980) both reported that individual pig reaction to CO_2 varied. Forslid (1987, personal communication) stated that the onset of jerking often occurred within 15 seconds in a commercial slaughter plant. Barton-Gade (1987, personal communication) maintains that it is important to keep pigs calm during entry into the compact plant. Excitement during handling may increase adverse reactions to CO_2. The purpose of this study was to make preliminary observations of the various factors which influence the variability of pig reaction to CO_2 stunning.

EXPERIMENTAL METHODS

One hundred and thirty-six crossbred pigs from three different farms were observed as they descended into the CO_2 gas in a Wernberg compact plant. The observations were made during production in a commercial slaughter plant located in North America. The inside of the plant was brightly illuminated and the pigs could be easily observed as they descended into the gas. Pig reaction to immersion in the CO_2 was rated on a 1 to 4 scale: 1 - No Movement, 2 - Slight Movement, 3 - Spasmodic Jerking, 4 - Violent Jerking and Struggling (shook the gondola). Squeals were also recorded. All pigs were handled gently and entered the compact plant quietly at a line speed of 100 animals per hour. Lot 1 - consisted of 80 head of crosses of Landrace, Duroc, Hampshire and Yorkshire, Lot - 2 consisted of 8 head of predominantly Yorkshire pigs, and Lot 3 - consisted of 48 head of crosses of Landrace, Hampshire, and Yorkshire.

RESULTS

The results are shown in Table 1. Pigs in Lot 1 had 29% with a mild reaction (rating of 1 or 2) and 71% with a strong reaction (rating of 3 or 4), Lot 2 pigs had 87.5% with a mild reaction and 12.5% with a strong reaction. The one animal that reacted strongly to the CO_2 was the only pig in this lot that had dark colored spots. Lot 3 had 10 % mild reactors and 90% strong reactors.

The incidence of squealing was variable. Squealing incidence after descent into the gas was Lot 1 - 25% (20 animals), Lot 2 - 12.5% (1 spotted animal), Lot 3 - 17% (8 animals).

DISCUSSION

There were large individual differences in pig reaction to CO_2. Pigs with a rating of 3 or 4 were definitely reacting to the gas. The animals laid quietly in the gondola when it started its descent. They did not start reacting until the gondola had descended into the gas. Pigs with a high movement rating often attempted to rise up in the gondola to avoid the gas.

Pigs with Hampshire breed coloration often had a stronger reaction than the other animals. The group of predominately Yorkshire pigs had the lowest movement ratings. The only animal in this group which had a strong reaction had a few dark spots on him. This indicates that he was a cross with one of the colored breeds. Exact breeding of the observed animals was unknown. Breed determination was made visually.

The author also had the opportunity to observe pigs descending into the CO_2 in compact plants in Sweden and Ireland. The animals were not formally rated. The reaction of the Swedish pigs appeared to be more uniform than the North American pigs. Almost all animals exhibited some movement, but no animal would have been placed in rating 4. The breed was mainly Landrace and York, with some dark coloration from an unknown third breed.

The overall reaction of the Irish pigs was stronger than the Swedish pigs, but milder than the North American pigs. York-Landrace crosses had a milder reaction than animals with obvious coloration of the Hampshire breed. Handling of the Swedish pigs was very gentle and quiet. Irish handling was good, but some of the Hampshire colored pigs were hard to drive.

CONCLUSIONS

It is likely that pigs with a rating of 1 or 2 were unconscious prior to the onset of jerking. Pigs with a rating of 3 or 4 often started to react strongly 5 to 10 seconds after the gondola passed below the level of the gas. They appeared to be conscious when the reaction started. Predominantly Yorkshire pigs had a milder reaction than crossbreds of Hampshire, Duroc, Yorkshire, and Landrace.

Another variable which needs to be studied is the effect of genetic stress susceptibility on CO_2 reaction. Possibly, CO_2 may be acceptable from an animal welfare standpoint for some breeds or genetic lines within a breed and not acceptable for other breeds or genetic lines within a breed. More research is needed to verify these preliminary observations. Excitement and rough handling prior to entry into the compact plant may also affect the animal's reaction. The possibility that handling interacts with genetics in a complex manner needs to be studied. There is a possibility that rough handling may

Table 1. Variation in Pig Reaction to CO_2

Lot Number and Description	Rating	Number of Animals	Percent	Mild Reactors 1 or 2 Rating	Strong Reactors 3 or 4 Rating
Lot 1 Crosses of Hampshire, Landrace, Duroc, and Yorkshire (80 Head)	1	10	13%	29%	71%
	2	13	16%		
	3	16	20%		
	4	41	51%		
Lot 2 Predominantly Yorkshire (8 Head)	1	1	12.5%	87.5%	12.5% (Animal had dark spots)
	2	6	75%		
	3	0	0%		
	4	1	12.5%		
Lot 3 Crosses of Landrace, Hampshire and Yorkshire (48 Head)	1	1	2%	10%	90%
	2	4	8%		
	3	12	25%		
	4	31	65%		

Ratings: 1 - No Movement, 2 - Slight Movement, 3 - Spasmodic Jerking, 4 - Violent Jerking and Struggling

have a large effect on pig reaction in one breed and little effect on pig reaction in another breed or genetic line within a breed.

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