PRESLAUGHTER MANAGEMENT OF PIGS AND ITS INFLUENCE ON THE QUALITY (PSE/DFD) OF PORK

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INTRODUCTION

Research on the influence of environmental stressors on the development of PSE and DFD in pork have led to the formulation of general principles concerning the handling and management of pigs immediately prior to slaughter (Jones et al., 1988; Warriss, 1987; Eikelenboom, 1985). Since the main body of this research was conducted in Europe under experimental conditions, there is still a need to verify these general principles, not only under commercial conditions, but particularly under conditions which are unique to the Canadian pork industry.

In the province of Ontario over 90% of the pigs slaughtered annually (5 M) are first delivered to a central assembly point by either the producer himself or by commercial truckers. Once delivered to the central assembly point, those pigs are grouped into lots of 200-230 which are then sold. Upon completion of a sale, these pigs (200-230) are reloaded into a large truck and transported to the abattoir for same-day slaughter or they are kept overnight, reloaded the next day and transported to the abattoir for slaughter (next-day slaughter).

Using the marketing system in use in Ontario, a series of experiments was conducted to evaluate the impact of this delivery system on the development of PSE and DFD in pork.

MATERIALS AND METHODS

Four environmental stressors were investigated: 1) the mixing of unfamiliar pigs, 2) the duration of transport of pigs from the assembly point to the abattoir, 3) the duration of the resting period at the abattoir and 4) same-day vs next-day slaughter.

Each stressor was studied independantly of the other three using a standardized handling schedule which is described in Figure 1. A total of 3100 pigs supplied by the same two producers were used for these investigations (Table 1). The impact of each stressor on the development of PSE and DFD was evaluated several times during the summer and winter months. The ambient temperature varied from (Table 1) 10° to 30°C during the summer months and from -20 to +4°C during the winter months.

Table 1. Number of replications[1]

Environmental Stressor	Season	Number of replications
Mixing	Summer	3
	Winter	2
Transport.	Summer	2
	Winter	2
Resting	Summer	2
	Winter	2
Same-day vs next-day slaughter	Summer	3
	Winter	2

[1]The average number of pigs/replication was 125 for producer A and 47 for producer B.

All pigs were slaughtered at a major commercial abattoir. Twenty-four hours postmortem, the carcasses were divided into primal cuts. The loins were further trimmed of fat and bones removed. The colour and structure of the longitudinal surface of the longissimus dorsi (LD) muscle were assessed by two

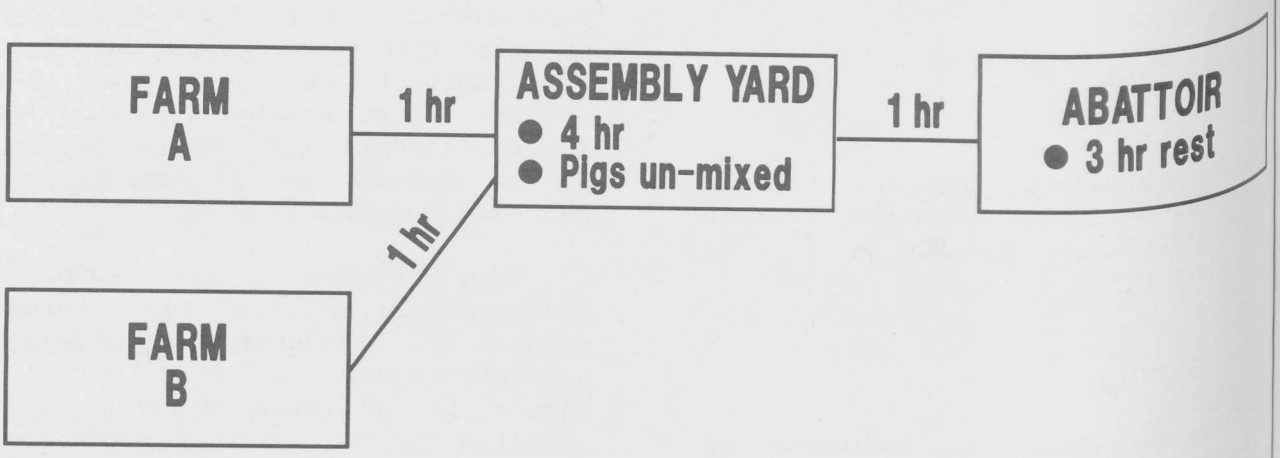

Figure 1. Experimental protocol used for handling pigs from the farm to the abattoir.

experienced evaluators according to the Agriculture Canada Pork Quality Standards (Agriculture Canada, 1984). Colour was described on a 5-point scale (1 - extrememly pale, greyish pink to 5 = extremely dark, purplish red). Structure was also described on a 5-point scale (1 = extremely soft, exudative, dough-like with an open and grainy texture to 5 = extremely firm, dry, sticky, with a closed and grainless texture.

The effects of season, replication, origin of pigs and treatment and their interactions on the quality score were evaluated using the CATMOD procedure for categorical data of the Statistical Analysis System Institute (SAS,1985).

RESULTS

Although statistical analyses were conducted on both the colour and structure scores, only the latter are reported since the impact of the various environmental stressors on the development of colour and structure defects was relatively similar. Furthermore, in the following discussion scores 1 and 2 for colour were combined.

Mixing unfamiliar pigs

The response to mixing unfamiliar pigs is illustrated in Figure 2 for producers A and B. During the summer months, mixing unfamiliar pigs resulted in an increase in the incidence of pale pork. For producer B, this increase was accompanied by a corresponding decrease in the incidence of normal pork whereas, for producer A it was accompanied by a decrease in the incidence of dark and normal pork.

The type and the magnitude of the response to mixing unfamiliar pigs was different during the winter months. For producer A, a minimal response was observed. On the other hand, for producer B, mixing unfamiliar pigs resulted in a large increase (22% +) in the incidence of pale pork.

Transport from the assembly point to the abattoir

Generally a longer transport period (2 hr vs < 1 hr) considerably reduced ($P<0.05$) the incidence of pale pork and conversely increased the incidence of normal pork (Figure 3). The response was more pronounced during the summer months, particularly for producer A. The

magnitude of the response to a longer transport period was also more important for producer B than for producer A (in the order of 20-30% vs 2-11% for producer A).

Resting period at the abattoir

As for the two previous environmental stressors, the response to various resting periods prior to slaughter was a function of the season and the origin of the pigs (Figure 4). Increasing the resting period resulted in a decrease in the incidence of pale pork and an increase in the incidence of normal pork; the magnitude of the response being greater during the summer months and for the pigs from producer B.

Generally, a 3 hr resting period gave the most favourable response for improved quality, whereas, a 6 hr resting period gave an intermediate response, the exception being for producer B during the winter months when a 6 hr resting period resulted in the greatest quality improvement; largest reduction of pale pork and largest increase in normal pork.

Same-day vs next-day slaughter

In this study, same-day slaughter and next-day slaughter corresponded to a 9 hr and 30 hr period without feed, respectively. However, because of the practice in the Ontario assembly yard system of floor feeding pigs kept overnight, the next-day slaughter pigs were also given a small amount of feed at the beginning of the evening.

During the summer months, next-day slaughter resulted in a higher incidence of pale pork and lower incidence of normal pork for producer A but only a trend ($P>0.05$) was detected for producer B. On the other hand, during the winter months, next-day slaughter reduced the incidence of pale pork. This reduction was accompanied mainly by an increase in dark pork for producer A and by a corresponding increase in normal pork for producer B.

CONCLUSIONS

Most of the research on the influence of pre-slaughter stressors on the development of PSE and DFD in pork have dealt with situations when pigs were delivered directly from the farm to the abattoir. In this study, additional handling, i.e., delivery of pigs to a central assembly point, was incorporated in order to duplicate commercial conditions found in the province of Ontario. Furthermore, and contrary to most of the research already published, this study was conducted under commercial conditions. Pigs were supplied by two successful commercial producers. They were delivered through the marketing system in place in the province of Ontario and slaughtered at a commercial abattoir.

The varied response to the manipulation of the different pre-slaughter stressors illustrates very well the complexity of the development of PSE and DFD in pork. Pigs from producer A appeared to be less responsive, irrespective of the season, to the manipulation of pre-slaughter stressors than pigs from producer B. The overall incidence of pale pork in pigs from producer A was approximately twice as low as that of pigs from producer B. These two producers also represented two managerial systems: one producer had predominantly white breed crosses, the other had white and coloured breed crosses; one producer fed his pigs twice a day (floor-fed), the other fed his pigs ad libitum.

These results, although it is not possible to quantify the various components of management which might be responsible for the various responses observed, tend to confirm the findings of Murray et al. (1989) and others suggesting a genotype:environment relationship.

In this study, four pre-slaugh-

ter stressors were investigated; each of them occurring at different times prior to slaughter. Based on the results of this study, one can conclude that the timing of the imposition of a stressor in relation to slaughter is critical. For instance, the duration of the resting period was more critical than mixing or not mixing unfamiliar pigs (8 hr prior to slaughter). Similarly the duration of transport was less important than the that of the resting period but more important than mixing or not mixing unfamiliar pigs in altering the quality of pork.

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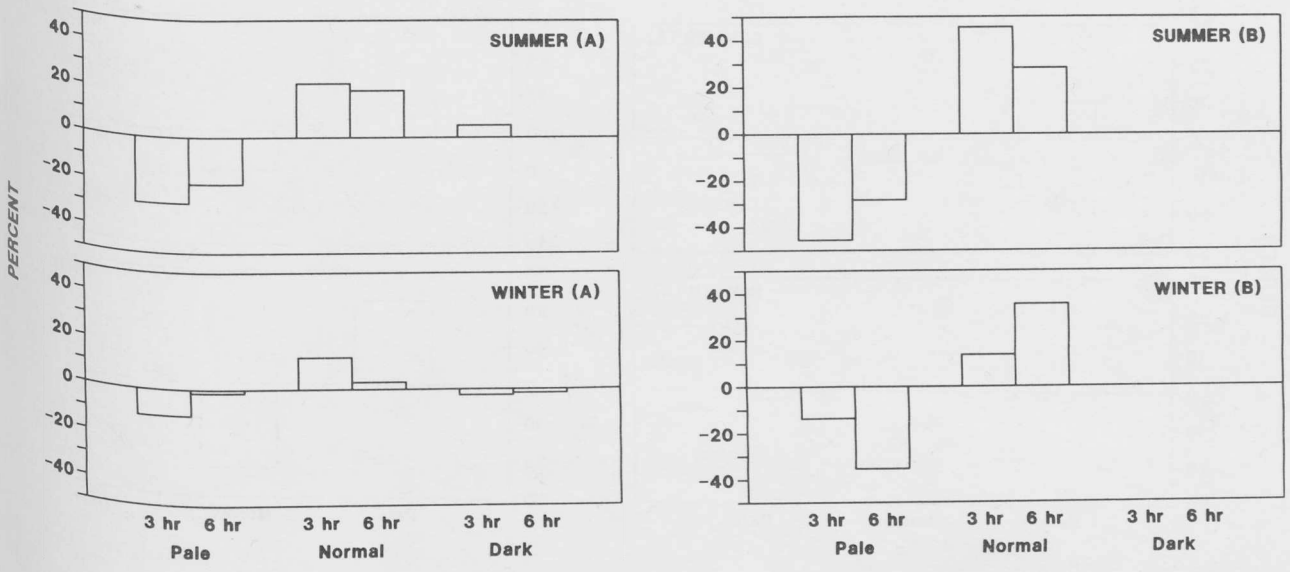

Figure 4. Effect of the resting period at the abattoir (< 30 min, 3 hr or 6 hr) on the incidence of pale pork - deviation relative to the incidence observed when pigs were rested at the abattoir less than 30 minutes.

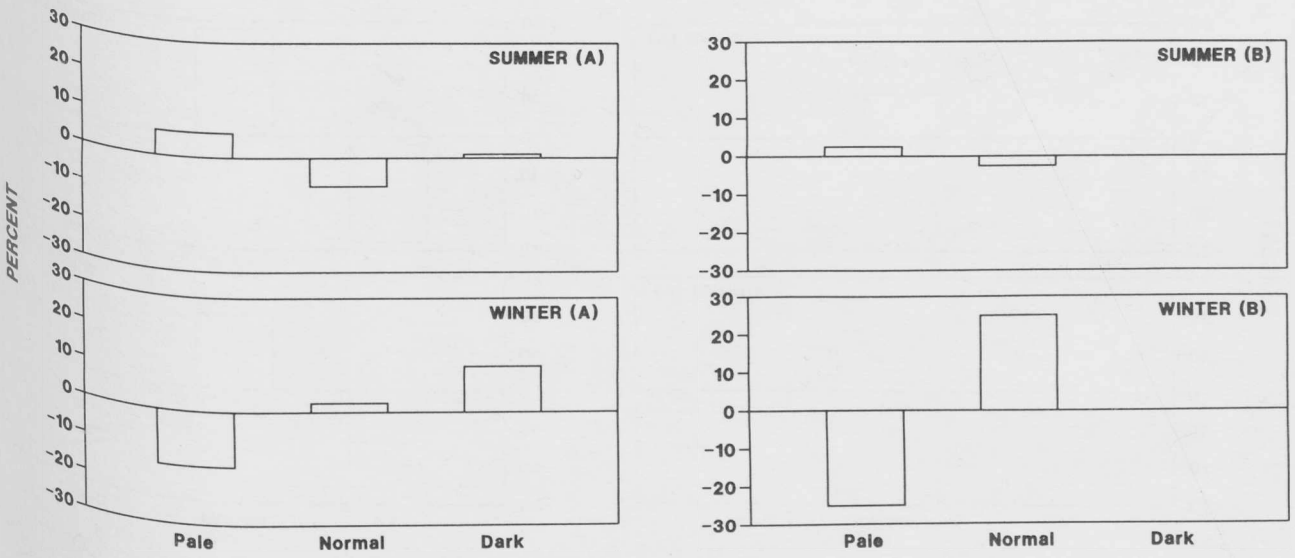

Figure 5. Effect of same-day vs next-day slaughter on the incidence of pale pork - deviation relative to the incidence observed when pigs were slaughtered on the same day.

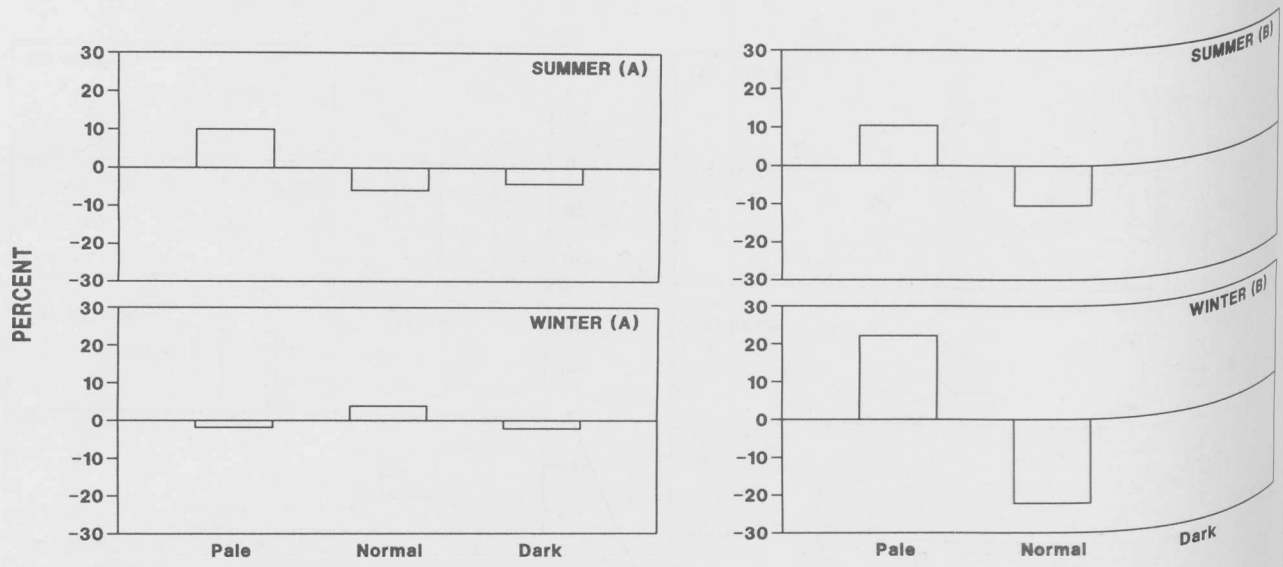

Figure 2. Effect of mixing vs not mixing unfamiliar pigs on the incidence of pale pork - deviation relative to the incidence observed when unfamiliar pigs were not mixed.

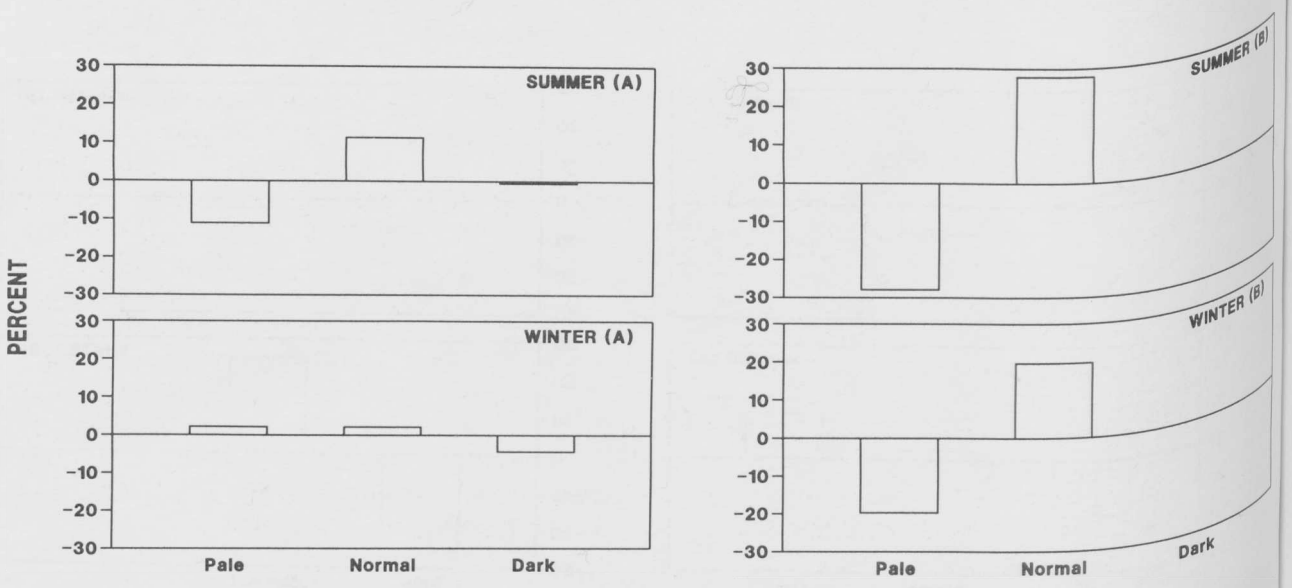

Figure 3. Effect of the duration of transport (2 hr vs < 1 hr) on the incidence of pale pork - deviation relative to the incidence observed when the duration of transport was less than 1 hour.