W LAIRAGE SYSTEM FOR SLAUGHTER PIGS - EFFECT ON BEHAVIOUR AND QUALITY CHARACTERISTICS

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MARY

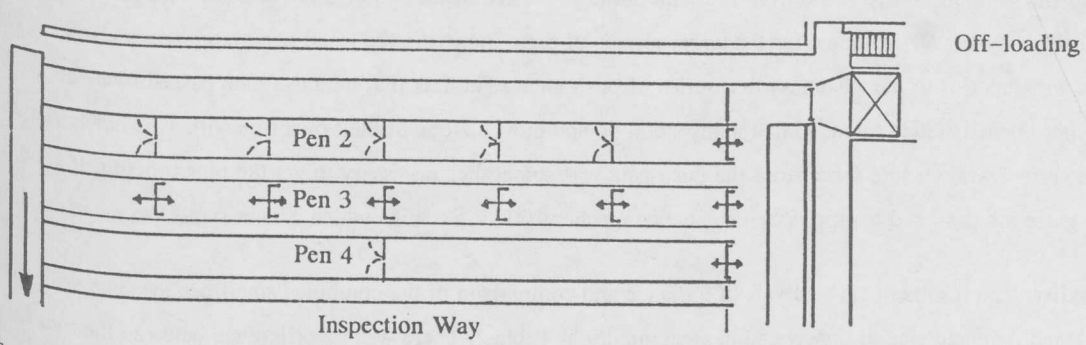
Danish Meat Research Institute has developed a fully automatic lairage system where groups of 15 pigs are held separately and the of this research was to investigate the effect of this system on pig behaviour and meat quality characteristics. The results showed that ing pigs in small groups reduced aggression, allowing pigs to rest more quickly and reducing skin damage significantly. Filling and ying the small group system was easy and could be carried out with the minimum of force. PSE-incidence on the other hand was fected by group size as was the incidence of DFD-meat and blood splashing. Compared to the original lairage system at the factory, ing pigs in small groups reduced the incidence of skin damage, blood splashing and DFD-meat. PSE incidence was, however, fected. The new lairage system leads to a much better welfare and gives some improvements in meat quality. It is now running ely on one Danish factory.

TRODUCTION

age design on pig abattoirs has, in general, evolved relatively slowly. Improvements, which have mainly been based on practical perience, have gradually occurred as new abattoirs have been built or existing lairages replaced. In Denmark, the Danish Meat Research titute has been instrumental in disseminating information, so that most Danish lairages have long, narrow pens with solid walls, watering ilities and mechanical ventilation systems. Some, but not all, use some form of showering in the summer. Stocking densities in lairages e mandatory i.e. 0.5 m^2/100 kg slaughter pig or at least 1.0 m^2/sow/boar. This general design combined with a moderate stocking density motes resting behaviour in pigs and allows thirsty animals access to water. It should perhaps be mentioned that lairage times are short Denmark, on average 1½ hours, so that in general feeding is not necessary. One of the disadvantages of the present system is that ages still hold large groups of pigs (up to 60). This makes it difficult for factory personnel to move pigs into and out of the lairage thout some force being used, simply because pigs causing a blockage cannot easily be reached. Moreover, fighting, which is caused by few very aggressive animals (Lydehøj Hansen et al. 1989, 1991) can involve many pigs, thus giving rise to an increased incidence of n damage as well as preventing resting behaviour. Another disadvantage is that lairage and truck sizes are not always compatible and leads either to overstocking or mixing different loads in lairages, neither of which is conducive to good welfare. These observations rmed the basis for the development of a fully automatic lairage system which aimed at keeping pigs in small groups (15), corresponding compartment sizes on most Danish transport vehicles, making overstocking impossible, preventing trauma from inventory and allowing slaughter rate of at least 600 pigs per hour. The aim of this work which was carried out by Blaabjerg in 1989 was to investigate the effect the new system on pig behaviour and meat quality and to get some indication of the improvement compared to the old lairage.

TERIALS AND METHODS

w Lairage: 3 of the 10 pens at the factory were used in this experiment, one holding 2x45 pigs (Pen 4), and two 6x15 pigs (Pen 2/3).



wo different designs of small pen systems were installed. In one (Pen 2) 15 pigs are moved from the offloading bay to the pen, the live pection removing any animals judged unsuitable for the system. A push gate automatically moves behind the pigs until a point is reached

that allows a flap gate to close. The push gate is then raised and moved back to collect the next 15 pigs and so on. As flap gates a trough is automatically lowered and water made available to the pigs. Vents at pig level optimise ventilation. Emptying is the re of this procedure. The other (Pen 3) which was designed by a Danish company, B.F. Manufacturing, consisted of a series of push g The first push gate automatically moves behind the group of 15 pigs as before until the last push gate (in the raised position) is rea This push gate is lowered and the first returns in the raised position to collect a further 15 pigs and so on. Watering, ventilation emptying are as in Pen 2. From all pens pigs were moved by a series of push gates along a runway to a double race leading to C stunning in the combi–equipment, where two pigs are stunned together without restraint.

A number of producers that could supply a minimum of 45 pigs per week were chosen. Similarly, the necessary number of hauliers chosen whose vehicles had good ventilation, a non–slip flooring and compartments holding 15 pigs. On arrival at the factory the 3 pigs from each producer were divided between the 3 pens in such a way that the first compartment of 15 was placed in Pen 2, the in Pen 3 and the last in Pen 4 and so on. Pens were filled and emptied during the 3 weeks of the experiment, as follows: – **Week 2** 2 → Pen 3 → Pen 4; **Week 21:** Pen 3 → Pen 4 → Pen 2; **Week 22:** Pen 4 → Pen 2 → Pen 3. In this way the influence of farm of ori transport conditions and lairage times was the same for the 3 pens under test. The average lairage time was 1 hour and 41 mins. behaviour of the pigs in the lairage was subjectively assessed. 45 mins. after slaughter. Skin damage was evaluated using a 4 point sc 1 = none, 2 = slight, 3 = moderate, 4 = severe, and the day after slaughter probe values (Barton Gade & Olsen, 1984, Borggaard & 1989) were measured in longissimus dorsi (lumbar region) and biceps femoris (center portion). Ultimate pH values were also measu at these points as well as in the semispinalis capitis muscle. Finally, the degree of blood splashing was assessed in the loin (Japan– and ham muscles (USA production) using a 4 point scale, as before.

Old lairage: The old lairage consisted of long narrow pens holding 60 pigs. Pens emptied into a runway leading to two single races two sets of CO_2–compact equipment. The runway/race system only held about 30 pigs so that pens could not be emptied at one time as the manual push gate system. Moving pigs through this system had the disadvantages referred to in the introduction but additionally, lighting in the race area was not optimal giving both reflections from inventory as well as shadows. Many pigs were unwilling to e this area and had to be forced forward. Stress levels were (therefore) much higher than in the new lairage. Pigs for measuremen chosed randomly over 5 days. Probe and pH_2–measurements were carried out on the same pigs, evaluation of skin damage and bl splashing on others. It was only the aim of this part of the investigation to get some idea of the quality level in the old lairage.

The results were evaluated using an analysis of variance (SAS, 1988) and for the comparison of small pen systems with the previous lai using a Students t–test.

RESULTS

Behaviour – new lairage: As expected, it was much easier to move groups of 15 pigs than the larger group of 45. Filling the small p systems gave no problems whatsoever. During the lairage itself fighting was reduced significantly in the small pen systems, even tho the 15 pigs did not necessarily come from the same farm pen. This meant that pigs lay down to rest much more quickly, normally w 20–30 mins. as against 60–90 mins. for the larger groups of pigs. Emptying the small pen systems was also easy and here the system w flap gates was superior to the system with a series of push gates. The fact that the push gate passed over the heads of the resting pigs the flap gates opened alerted them, so that many stood up and moved along of their own free will. This behaviour did not occur in the o small pen system where some force from the push gate was sometimes necessary to get the pigs moving. It should perhaps be mentio that push gates are designed to stop, when resistance reaches 100 kg, i.e. pigs which cannot stand can never be dragged using push g

Meat Quality: The results of the analysis of variance and comparison of the combined small pen systems with the old lairage are sh in Table 1 and the incidence of unacceptable meat quality in Table 2. There was no difference between the two small pen systems for a of the meat quality characteristics measured. Similarly, the incidence of unacceptable meat quality was the same. Keeping pigs in gro

s in the present lairage led to higher average scores for skin damage in the ham and shoulder and a higher incidence of unacceptable damage compared to keeping pigs in groups of 15. None of the other characteristics was affected by group size in the present lairage. paring the combined results of the small pen systems with the average values of randomly chosen pigs in the old system showed ter differences, being significant for most of the meat quality characteristics measured. The small pen systems reduced the DFD- dence and unacceptable blood splashing significantly. The incidence of unacceptable skin damage was reduced even more, from 17.7 5% in the ham, 21.3 to 3.3% in the middle and 38.2 to 15.9% in the shoulder. PSE-incidence on the other hand was unaffected.

CUSSION

ough the actual percentages can, of course, only give an indication of the expected differences between the new and old lairage, the ts do show that quality has been considerably improved by installing the new lairage and latest CO_2-equipment. There were, however, tively few quality differences between small pen systems and keeping larger groups of pigs in the present lairage. The reason for this tively small difference was due to a general improvement overall, where the latest knowledge has been incorporated into the new ge. Especially important has been an optimisation of off-loading and the race system as well as the use of CO_2-stunning without int. The removal of all animals judged not capable of being able to go through the system (these are slaughtered shortly after arrival pecial pens) has had the additional advantage of reducing mortality during lairage to 30% of what it was previously. In spite of the of difference in quality characteristics the small pen systems are much better welfarewise. Filling and emptying pens can be carried with a minimum of force and no electrical goads. Pigs rest more quickly and fighting and noise levels are reduced. Of the two small systems, the one with flap gates was to be preferred. It was easier to observe all pigs, overstocking was eliminated, emptying was easier there was less risk of damage from push gates. For this reason the factory equipped the remaining 7 pens with the flap gate system.

ing the problems in the lairage has emphasised those still occurring in the race area, especially at the entrance to the race. Work is going on in collaboration with the Swedish Meat Research Institute and BF Manufacturing to develop a system that completely minates the race. Combined with a small pen system, the new development will ensure that pigs can be treated optimally welfarewise e abattoir and will completely eliminate the use of force.

NCLUSIONS

e results showed that keeping pigs in groups of 15, corresponding to the grouping on transport trucks, considerably improved welfare. ling and emptying pens could be carried out without using any means of force, aggressive behaviour was reduced and resting behaviour proved compared to keeping pigs in groups of 45. Meat quality characteristics were in general not affected with only scores for skin mage being lower in the small group system. Compared to conditions in the old lairage system at the factory, the small pen system nsiderably reduced the incidence of skin damage, blood splashing and DFD-meat. PSE-incidence was, however, unaffected.

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Table 1 – Average Values for Meat Quality Characteristics

Average values with different superscripts are significantly different

Description		Pen 2 (15)	Pen 3 (15)	Pen 4 (45)	Significance	Pen 2/3 (15)	Old lairage (60)	Significance
No. of pigs		524	514	523	–	1038	1609	–
Proble value	b. femoris	81.3	80.1	79.5		80.7^{b}	78.1^{a}	***
	l. dorsi	47.1	46.1	47.9		46.7^{a}	51.4^{b}	***
pH_2–value	b. femoris	5.75	5.76	5.75		5.75^{b}	5.66^{a}	***
	l. dorsi	5.82	5.84	5.81		5.83^{b}	5.74^{a}	*
	s. capitis	6.01	6.04	6.04		6.02^{a}	6.04^{b}	***
Skin damage	ham	1.32^{a}	1.31^{a}	1.44^{b}	**	1.32^{a}	1.68^{b}	***
	middle	1.44	1.39	1.48		1.42^{a}	1.69^{b}	***
	shoulder	1.80^{a}	1.81^{a}	2.02^{b}	**	1.80^{a}	2.22^{b}	***
Blood splashing	l. dorsi	1.39	1.37	1.36		1.38^{a}	1.69^{b}	***
	b. femoris	1.08	1.14	1.14		1.11	1.14	
	semimemb.	1.17	1.14	1.18		1.16^{a}	1.29^{b}	**
	quadriceps	1.07	1.11	1.11		1.09^{b}	1.04^{a}	

Table 2 – Incidence of Unacceptable Meat Quality

For skin damage scores of 3 or 4 are considered unacceptable, for blood splashing scores of 4 only

Description			Pen 2 (15)	Pen 3 (15)	Pen 4 (45)	Old Lairage (60)
% PSE	b. femoris	probe ≥100	4.0	3.3	3.5	2.7
	l. dorsi	probe ≥ 80	1.4	1.8	2.1	1.9
% DFD	b. femoris	pH_2 >6.1	1.3	1.6	1.5	2.1
	l. dorsi	pH_2 >6.1	2.5	2.7	2.7	4.5
	s. capitis	pH_2 >6.3	8.3	8.3	9.2	19.9
% skin damage		ham	3.9	3.0	5.2	17.7
		middle	3.9	2.6	4.8	21.3
		shoulder	16.1	15.7	23.7	38.2
% blood splashing		l. dorsi	0.6	2.2	1.6	3.8
		b. femoris	0.0	0.0	0.0	1.3
		semimembr.	0.0	0.0	0.0	3.7
		quadriceps	0.0	0.0	0.0	0.8

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