

A floor overlay for reducing leg abrasion injuries on piglets

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Phillips, P.A. and Pawluczuk, B. 1995. A floor overlay for reducing leg abrasion injuries on piglets. *Can. Agric. Eng.* 37:231-233. Piglet leg abrasions were reduced by using strips of 6 mm-thick, polyester pile, latex-backed material as a floor overlay in the suckling areas of the farrowing pen. Carpel joint injuries in 20 litters offered the overlay were significantly lower ($P < 0.001$) than in 20 litters with no overlay on a mostly concrete floor (mean injury score 9.5 vs. 93.4, respectively). While seeming to offer only a small improvement in floor resilience, the overlay greatly reduced knee abrasion injuries on piglets.

Les éraflures aux pattes de porcelets ont été réduites en utilisant des bandes de matériel en polyester recouvert de latex, d'une épaisseur de 8 mm, pour recouvrir le plancher dans les zones d'allaitement des cases de mise bas. Les blessures aux articulations du carpe pour les 20 portées situées dans les cases où le plancher était recouvert des bandes ont été significativement moins élevées (p) que pour les 20 portées situées dans des cases sans bandes, où le plancher était essentiellement en béton (les scores moyen pour les blessures étaient respectivement 9.5 et 93.4). Alors que le matériau de recouvrement n/a semblé offrir qu'une petite amélioration au niveau de la résilience, il a largement réduit les blessures par écorchures aux genoux des porcelets.

INTRODUCTION

Leg abrasion wounds that are frequently seen in suckling pigs are undesirable for several reasons: they presumably cause discomfort to the animals; they provide an entry point for infection; they could result in lameness later in life (Penny et al. 1971). Floor surfaces that cause leg abrasions also tend to cause abrasion and subsequent necrosis of the anterior teats, thus greatly reducing the animals' usefulness in breeding (Stevens 1984). Floor properties that contribute to such wounds are surface roughness (Christison and Farmer 1983), coefficient of friction, and surface temperature (Phillips et al. 1992). In a recent study, cushioned flooring substantially reduced knee abrasion injuries compared to a non-resilient floor of the same material (Phillips et al. 1995). The cushioning distributed body weight over a larger area of the carpal joint, hence reducing pressure per unit area and risk of skin structural failure. Two practical aspects that also emerged from this study were: (1) resilient flooring need only be provided in limited areas near the farrowing crate where piglets suckle and (2) a durable material would be required to withstand abuse from the sow and litter.

In this study, a polyester pile was used as floor overlay in

farrowing pens. The pile was chosen for its low cost, availability, and durability but the level of resilience or cushioning it offered was minimal, casting doubt on its ability to protect piglets against abrasion. The main purpose of these tests was to establish if such modest levels of resilience could provide acceptable protection. Such findings might stimulate product design work with new materials that could benefit the industry and the welfare of confined pigs.

MATERIALS AND METHODS

The product selected consisted of a 5 mm polyester velour pile attached to a 1 mm thick latex base (Instant-Turf Co.). Rectangular pieces of this material (1.0 x 0.3 m) were laminated to similar sized pieces of glassfibre board (1 mm thick) using contact cement. The glassfibre board provided a base to support the polyester pile so the unit could be accurately positioned and fastened to the floor adjacent to the farrowing crate. The cost of the pile was about Can \$9.00 per pen.

The floor overlay was tested in 1.6 x 2.1 m farrowing pens equipped with 0.6 x 2.1 m farrowing crates with straight lower rails that could be adjusted to several heights depending on sow size. The crates were positioned 0.2 m off-centre in the pen leaving two creep areas 0.3 x 2.1 m and 0.7 x 2.1 m in size. One radiant electric heater 0.9 m above the floor was shared over the wide creep side of two adjacent farrowing pens. The pens were serviced by 0.6 m wide concrete wastewater pits to the front and rear of the sow. The pits were covered by galvanized steel slats consisting of 10 mm width parallel triangular cross-section rods separated by 10 mm width slots ("Tri-bar", Lammers Ind., The Netherlands). The area between the slats, where most suckling activity occurs, consisted of trowelled concrete. Each floor overlay was equipped with metal clips at each end that fastened to the steel slats, thus covering the concrete floor at the side of the farrowing crate (Fig. 1). A second overlay was positioned on the opposite side of the farrowing crate.

The study was conducted at our minimum-disease herd of York-Landrace sows in Ottawa, ON. Forty litters of pigs were tested from birth to 1 week age, 20 litters in pens with the floor overlay and 20 litters with no overlay (the control). The barn contained six identical temperature-controlled farrowing rooms (24-28°C), each room accommodating six litters. The rooms were managed on an all-in, all-out basis

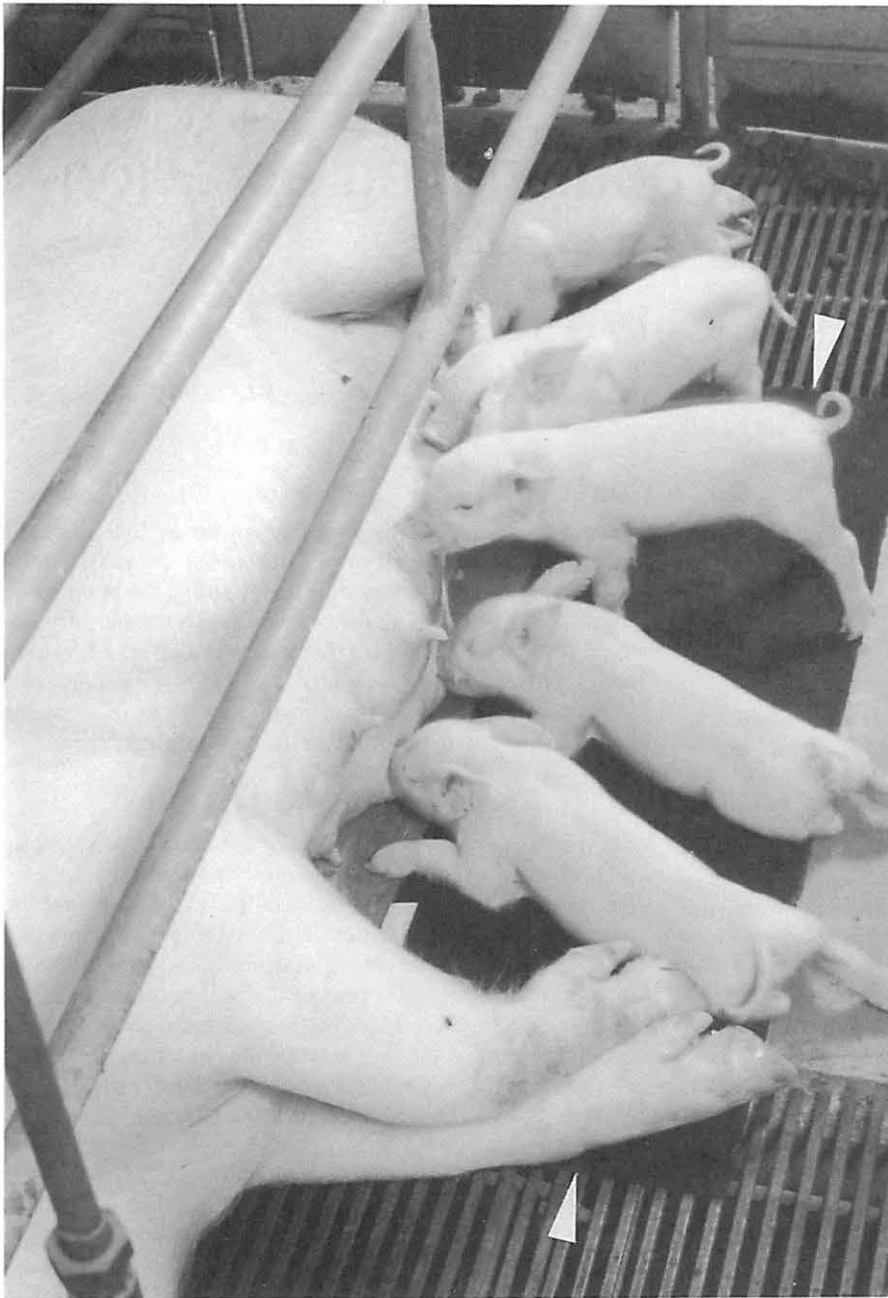


Fig. 1. The polyester pile floor overlay as installed over the floor in a farrowing pen. (Note: the carpet is black in colour: 2 arrows have been added to help identify its location.)

and the two treatments were randomly allocated among each pair of sows as they were moved into a room. Sow availability varied, but four farrowings per week were usual. Sows were fed a pelleted corn-soybean ration on an increasing scale beginning with 3 kg/d at farrowing. The overlay was installed in a pen one day before farrowing was expected.

The surface dimensions of wounds on the piglets' forelegs were measured by caliper on day 7 after birth and the total wound area (in mm²) estimated. Previous work (Phillips et al. 1995) indicated that wound size largely stabilized by 7 days age. Because individuals within a litter cannot be regarded as independent observation units, the litter's "wound score", the

mean wound area per foreleg averaged over all piglets in the litter, was used as the observation unit. The Student "t" test was used to determine the probability that the treatments means were significantly different (Steel and Torrie 1960).

RESULTS AND DISCUSSION

The floor overlay showed no loss in effectiveness after six 1-week trials, but its life-expectancy was not determined. The polyester pile was easily cleaned by hose and disinfectant soap could be applied if desired. The straight lower rails on the farrowing crate were important as they prevented sows from damaging the overlay.

The floor overlay significantly reduced knee wounds in piglets ($P < 0.001$). Litters with the overlay had an average wound score of 9.5 (Table I) with 7 litters having no damage. In the control, damage scores were 10-fold higher, averaging 93.4. A wound score of 93 corresponds to each piglets having one circular wound of about 11 mm diameter on each foreleg.

Mean litter size on day 7 tended to be larger for the overlay treatment (10.3 pigs) than for the control (8.7 pigs, Table I). There was no correlation between litter size and wound score in the overlay treatment ($r = -0.114$) or in the control ($r = 0.080$). Litter mortality to day 7 (excluding stillborns) averaged 1.9 piglets per litter in the control and 0.7 in the treatment, indicating no adverse effects of the floor overlay on piglet survival. Mean litter initial mass, 7-day litter mass gains, and sow parity distribution were similar for the two treatments (Table 1).

The findings were consistent with earlier work (Phillips et al. 1995) that showed a 90% reduction in foreleg abrasion on a cushioned neoprene surface compared to a hard neoprene surface. Teat damage was not assessed in the present study, however, other work indicates that the time course of teat and knee damage is very similar, as is the effect of floor type on these two types of injury (Furniss et al. 1986). If the origin of these injuries is the same, as the literature suggests, the protective aspects of the floor overlay could be relevant to teat necrosis.

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Table I: Knee damage scores and litter performance for the two treatments. Litter means were taken as one observation unit.

	Overlay			Control		
	Mean	SEM*	Range	Mean	SEM	Range
No. litters	20			20		
Sow parity	4		1 - 8	4		1 - 8
Litter size	10.3		7 - 15	8.7		5 - 12
Initial mass (g/pig)	1388	42		1442	33	
Mass gain, Day 0 - Day 7 (g/pig • d)	172	9		169	11	
Knee damage score	9.5	2.4	0 - 37	93.4	6.8	28 - 151

* Standard error of the mean.

in floor resilience could produce substantial reductions in abrasion injury. Designing some resilience into flooring products could restore some of the properties lost when confinement housing systems moved away from the use of bedding.

REFERENCES

- Christison, G.I. and C. Farmer. 1983. Physical characteristics of perforated floors for young pigs. *Canadian Agricultural Engineering* 25:75-80.
- Furniss, S.J., S.A. Edwards, A.L. Lightfoot and H.H. Spechter 1986. The effect of floor type in farrowing pens on pig injury. I. Leg and teat damage of suckling piglets. *British Veterinary Journal* 142:434-440.
- Penny, R.H.C., M.J. Edwards and R. Mulley. 1971. Clinical observations of necrosis of the skin of suckling piglets. *Australian Veterinary Journal* 47:529-537.
- Phillips, P.A., D. Fraser and D.J. Buckley. 1992. Simulation tests on the effect of floor temperature on leg abrasions in piglets. *Transactions of the ASAE* 35:999-1003.
- Phillips, P.A., D. Fraser and B. Pawluczuk. 1995. Effects of cushioned flooring on piglet leg injuries. *Transactions of the ASAE* 38:213-216.
- Steel, G.D. and J.H. Torrie. 1960. *Principles and Procedures of Statistics*. New York, NY: McGraw-Hill Book Co.
- Stevens, R.W.C. 1984. Neonatal teat necrosis in pigs. *Pig News and Information* 5:19-22.