

RISK FACTORS ASSOCIATED WITH ADVENTITIOUS BURSTITIS IN GROWING-FINISHING PIGS

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La prévalence et les facteurs de risque potentiels de bursite chez le porc à l'engrais ont été étudiés dans une étude transversale réalisée dans 17 unités de production.

Les informations sur les porcs et leur environnement ont été collectées pendant la période d'août à novembre 1995. Une analyse bivariée des relations entre bursite et facteurs environnementaux a été réalisée, suivie d'une régression logistique inconditionnelle des facteurs de risque sélectionnés ($P \leq 0,25$) selon une procédure ascendante pas à pas.

La prévalence de la bursite chez le porc à l'engrais était de 63,4% (578/912) et variait de 6,2% à 95% d'une unité de production à l'autre.

Un risque accru de bursite était associé avec l'existence d'un sol métallique étendu (OR = 14,21) en comparaison avec un sol entièrement solide. Plus la durée de séjour des porcs dans la case était longue, plus le risque de bursite était élevé (OR = 1,15). Une film liquide de lisier dans l'aire de déjection (OR = 2,01) et une différence de hauteur entre l'aire solide et le caillebotis de béton de plus de 3 cm (OR = 2,70) étaient aussi liés statistiquement à une augmentation de la prévalence des lésions des bourses. Une litière couvrant la case entière était associée statistiquement avec un risque diminué de bursite (OR = 0,34).

INTRODUCTION

A bursa is a fluid filled sac which arises in the subcutaneous connective tissue as a result of pressure and exudation of fluid from lymphatic vessels and capillaries after trauma. Adventitious bursitis (AB) of the hock is a commonly observed blemish in finishing pigs (Penny and others, 1974). Previous reports in the UK estimated AB to range from 73.4% (Penny and others, 1974) to 85% (Smith, 1993).

AB is considered a problem with economic and welfare implications. It is thought to be responsible for economic loss because of tissue trimmed at the abattoir and failure of breeding gilts and boars to pass selection tests (Smith, 1993). Although bursitis itself does not appear to cause lameness it is not observed in pigs moved in natural habitats. AB of the hock is more frequent in pigs kept on hard floors without bedding than bedded floors (Smith, 1993) and 25% of variation in bursitis prevalence is considered genetic in origin (Smith and Morgan, 1994).

This study was designed to estimate the prevalence of AB in growing-finishing pigs and to identify environmental risk factors associated with this lesion.

MATERIALS AND METHODS

Study population

Seventeen pig units were convenience selected from a list of farmers provided by a large specialist abattoir in south west England. Selection was based on farmers willingness to co-operate and that they contracted to supply 50-200 pigs per week to the abattoir.

It was estimated that examining 4% of the total pig population from the seventeen farms would provide information on approximately 400 preweaning, weaning and growing-finishing pigs, with an infinite herd size and an expected prevalence of 50%, the prevalence of lesions could be estimated with +/- 5% accuracy (Epi Info, 6.0, 1990). The exact number of pigs kept on the farm at the time of visit was obtained from the farmer and a list of random numbers to identify 4% of the pigs for examination, selected using Minitab (Minitab Inc.).

Data collection on the farm

Data on the farm were collected by examining the selected pigs and their environment.

On farm examination of pigs: The pigs limbs were examined for the presence of bursal lesions. The date of birth, date of entry in the growing-finishing accommodation and sex were also recorded.

Data collected from the pen: The following definitions were used:

Wet floor: Surface covered in water, urine or wet food. This was scored in the lying area, dunging area and in front of the drinker.

Difference in height between the solid and the concrete slats: A difference in the height between the solid and the concrete slats was measured in cm.

Wet slurry film: A watery mixture of faeces and urine covering the floor surface. This was scored in the lying and the dunging area.

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Data Input and Analysis

The data were loaded onto a database (Foxpro 3.2, Microsoft) when the farm visits were finished. Errors were checked by running frequency distributions of the variables, unusual values and obviously incorrect coding were rechecked from the recording sheets and corrected where an error was found.

Univariate and bivariate analysis were performed in Epi Info 6.0 (Dean and others, 1990).

A pig was defined as affected with AB, if it had at least one bursa on either hock. The proportion of pigs with bursitis was calculated as follows: $\text{proportion of pigs with bursitis} = \frac{\text{number of pigs affected with at least one bursa}}{\text{total number of pigs examined (912)}}$

The association between possible risk factors and the likelihood of a pig having bursitis during the growing-finishing period was assessed by using unconditional forward stepwise logistic regression in EGRET (EGRET, 1991). All the explanatory variables that were significant at $P \leq 0.25$ in the bivariate analysis, were tested in the model. For the multiple analysis the critical probability for significance was set at 0.05 for a two-tailed test.

RESULTS

A total of 912 pigs kept in 644 individual pens were examined and of these 420/912 (46.1%) were male and 492/912 (53.9%) female pigs.

Description of the farms

Seventeen farms with a total of 19 finishing systems were visited. There were 2 nucleus, 3 multiplier and 11 commercial units (8 breeder to finishing, 1 weaning to finishing and 2 finishing only). The growing-finishing population ranged from 873-7489 pigs. The age of the pigs involved in this study ranged from 8-28 weeks (mean age: 17 weeks, s.e. 0.14 weeks). In 6/19 (31.6%) units, pigs were kept on solid concrete floor, 5/19 (26.3%) on solid concrete and concrete slats and 1/19 (5.2%) units on totally concrete slatted floor. There were 7/19 units which had more than one finishing house with different floor types (3 units used solid and part solid concrete and concrete slats, 1 unit solid concrete and part solid concrete and expanded metal, 2 used part solid concrete and totally concrete slats and 1 unit used all 3 floor types: solid concrete, part concrete and concrete slats and totally slatted concrete floor). Bedding was provided in all the units that housed pigs on solid concrete floor (4 of those used sparse and 7 deep bedding) and also in 4/11 units that used part solid concrete and part concrete slats (sparse bedding).

Prevalence and distribution of bursitis

The prevalence of bursitis by unit ranged from 6.2% to 95.0%. There were 578 (63.4%) with at least one bursa and of these 263/420 (62.6%) were male pigs and 315/492 (64.0%) females. There was no significant difference in the prevalence of bursitis between sexes.

Logistic regression analysis (Table I)

An increase in the prevalence of bursitis was associated with expanded metal floors (OR 14.21) when compared with totally solid floors. The longer period the pigs spent in the pen, the more likely they were to have bursitis (OR 1.15). A wet slurry film in the dunging area (OR 2.01) and a difference in the height between the solid area and the concrete slats of > 3 cm (OR 2.70) were also associated with an increased prevalence of bursal lesions. Bedding which covered the whole pen was associated with a reduced prevalence of bursitis (OR 0.34).

Table I
Logistic regression model of factors associated with adventitious bursitis

Variable	Coefficient	Odds ratio (95% CI)	P value (LRS)
Constant	-0.74	0.48 (0.16-1.45)	
Age (week)	0.014	1.01(0.95-1.08)	
Time spent in the pen (weeks)	0.14	1.15 (1.10-1.25)	<0.001 (132.14)
Part solid and concrete slats	0.41	1.51 (0.75-3.05)	
Part solid and expanded metal	2.65	14.21 (2.88-70.23)	
Totally slatted floor	0.47	1.61 (0.75-3.47)	<0.001 (82.66)
Bedding in the lying area only	-0.36	0.70 (0.35-1.41)	
Bedding in whole pen	-1.09	0.34 (0.15-0.76)	<0.001 (23.58)
Wet slurry film in dunging area	0.70	2.01 (1.42-2.83)	<0.001 (14.97)
Difference in height 1-3 cm	-0.35	0.70 (0.40-1.21)	
Difference in height > 3 cm	0.99	2.70 (0.91-8.10)	0.026 (7.32)

(LRS) = Likelihood Ratio Statistics

DISCUSSION

The overall prevalence of AB in this study was 63.4% with a range between units of 6.2% to 95.0%. This is a decrease in prevalence if one considers the results from previous studies which estimated AB to range from 73.4% to 84.0% (Penny and others, 1974; Smith, 1993).

Bursitis was more prevalent in pigs kept on expanded metal and less prevalent when bedding provided in the pen. Part solid and expanded metal floor was associated with a high prevalence of bursitis in both the bivariate and the logistic regression analysis. The fact that bursitis was more prevalent in pigs on slatted floors than those on totally solid floors supports the hypothesis that bursal lesions are associated with the void: solid ratio and the shape of the slats.

The pressure patterns, contact areas and the total force between pig's foot and the ground have been described in previous reports and methods for predicting the maximum acceptable void ratios of slatted floors have been developed (Webb, 1984). It is clear that a pig needs an adequate contact area of support when is walking. Similarly, when a pig is lying its weight is distributed on its legs, thus it is important that the legs have adequate contact with the floor. When lying on slats, a pig has to support its weight on a smaller area compared with a totally solid floor and this increases the force that the weight bearing point of the legs take and therefore increases the risk of trauma of the superficial lymphatic vessels and capillaries which results to bursae formation. This is exacerbated when the slats have sharp edges as in the case of expanded metal floor. Pigs in bedded accommodation spend more time in locomotion than those on slatted floors, while the mean percentage of time pigs spend sleeping within a 24h period, is greater in pigs kept on slats than those on solid concrete floors with or without bedding (Lyons and others, 1995). The extended time that the pigs spend lying down on slatted floors during the daytime may also promote the development of the bursae.

Bedding provides a resilient and non abrasive substrate for the pigs to rest, walk and play upon. In this study, bedding (straw or sawdust or compost) which covered the whole pen was associated with a lower prevalence of AB. It is possible that the pressure on the weight-bearing points of the legs when a pig is resting is less when pigs lie on bedding than on hard solid surfaces without bedding. Housing pigs with bursitis on deep straw for the final finishing period resulted in a marked decrease in severity of bursitis at slaughter while in pigs kept on hard floors all their lives there was a steady and rapid increase in the prevalence and severity of bursitis (Smith, 1993). So, not only the environment but also the time spent in a specific environment is important in the development of AB. In this study 13/19 (68.4%) of the units used bedding and of these 5/13 (38.4%) provided bedding during the whole growing to finishing period, while the rest 8 units (61.5%) used bedding only during the first stage of the growing phase. It was also clear from this investigation that pigs spent a longer period in the finishing pen were significantly more likely to have bursitis.

The requirements for safe walking for humans as well as pigs are that slipping does not occur. When a lubricant, such as slurry is covered the surface, the friction may become very small and results in slipping. A floor surface covered with a wet slurry film in the dunging was associated with a higher prevalence of AB, in this investigation. It is possible that under conditions with absence of slip resistance such as in the case when slurry covers the floor surface, pigs slip and fall more frequently resulting in bruising the legs especially at the point below the hock and damaging the superficial capillaries and lymphatic vessels causing exudation of fluid and bursa formation the subcutaneous connective tissue. Furthermore, a difference in the height between the solid area and the concrete slats was significantly associated with a higher prevalence of bursitis possibly because of an increased incidence of slipping and knocking the limbs when stepping.

The UK Welfare Codes (MAFF, 1991) recommend that all buildings should be designed, constructed and maintained so as to avoid discomfort, distress or injury to pigs. This study has shown that bursitis is not only associated with the type of floor used during the finishing phase but also with certain floor characteristics. This should assist in advice on floor designs and to fulfill a pig comfort needs.

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