Effect of dietary fat and fibre on pig-house odour

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Introduction: Pig odour can be offensive to nearby residents and odour emissions inhibit the economic growth of the pig supply chain.

The main compounds contributing to the odour from pig-house odours are acids, indoles, phenols, sulphur compounds and certain amines (Farmer et al, 2015). Many of the above compound classes are derived from microbial action in the intestine or faeces of the animal. Surprisingly, there is limited information on the effect of diet on pig-house odour. Reducing the crude protein content of the diet reduces ammonia emissions (Webb et al., 2014) but odour emissions can increase when crude protein levels are very low (Le et al., 2009). This study aimed to investigate the potential of varying fibre and fat composition in the diet to reduce pig-house odour.

Materials and Methods: Boar pigs (n=36) were housed in standard grower accommodation with standard starter and grower diets until 14 weeks of age. At 10 weeks, pigs were transferred to individual pens. At 14 weeks of age they were assigned to one of six treatment diets (2x3: high fat and low fat with high indigestible fibre, low fibre/high starch and high digestible fibre). At 17-19 weeks, pigs were moved to six individual environmental pig chambers. The allocation of treatments to chambers varied on a weekly basis for six weeks. The pigs were brought into the chambers on a Monday morning and slaughtered on a Friday morning.

Samples were taken from the air extract duct. Silsoe Odours collected one sample from each outlet to each of the 6 pens each week for 6 weeks. Odour samples were collected into Nalphan NA sample bags through a PTFE sampling pipe. The odour emission rate was determined by a panel of human subjects, expressed as a multiple (equal to the dilution factor at Z50) of one European Odour Unit per cubic metre [ouEm-3].

Samples of air from the chambers were also collected each week for volatile analysis in pre-conditioned Tenax tubes. A background collection was taken outside the chambers. Volatiles from each chamber were collected three times at approximately 2 hourly intervals. The samples collected were analysed the following day using thermal desorption-gas chromatography-mass spectrometry, using a Markes International Unity thermal desorber connected to an Agilent 6890 GC/5975B MS.

Results: There was no significant effect of fat content on the concentrations of compounds associated with odour from pig houses. Some compounds were affected by fibre; skatole and indole, were present in the low fibre diets at twice the levels from the pigs fed on digestible fibre ($P<0.05$). This level of increase could be perceptible to people. However, the same diet reduced the levels of short chain acids, albeit to a lesser degree. Thus a change in dietary fibre treatment changes the balance of odour compounds, which could affect the quality of the odour from the pig-house. However, there was no significant impact of either fat or fibre on the "odour emission" score.

Surprisingly, levels of skatole, indole, 4-methyl phenol, dimethyl trisulphide and the short chain fatty acids increased significantly over the 6 weeks as did odour emission scores. It is probable that odour compounds accumulated on to the fabric of the chambers as the trial progressed.

Conclusions: These results eliminate dietary fat as a variable affecting pig house odour. Whilst increasing dietary fibre could reduce some odour compounds (skatole, indole), other odorous compounds (acids) may be increased by the same measures. Overall, odour offensiveness was unchanged by dietary treatments.

Odours increased during the period of the trial suggesting that odour compounds on surfaces may have a considerable impact on the overall pig-house odour.

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