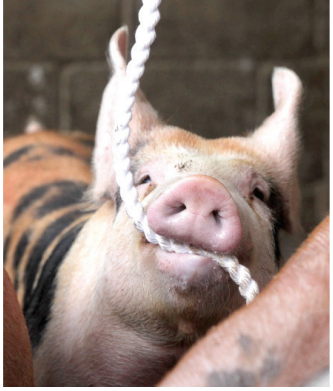
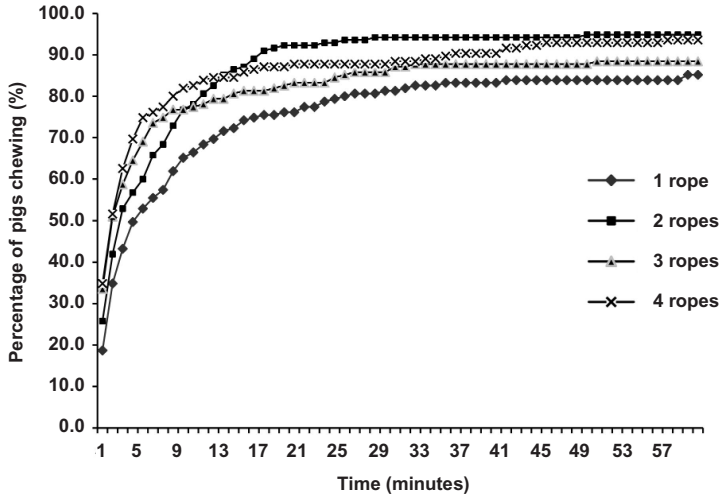


Development of improved disease monitoring tools: Measurement of Acute Phase proteins in oral fluid to help assess sub-clinical disease in pigs.

Poor health negatively impacts performance parameters of finishing pigs, reducing feed efficiency and daily live weight gain, increasing weight variability, veterinary treatment costs and mortality. Clinical and sub-clinical stages of disease both produce substantial compromising effects to growing herd performance, and in tackling disease problems, both should be addressed for effective control.

Figure 1 Cumulative percentage of pigs chewing rope within a 60 minute period of rope provision (1-4 ropes, in both housing systems)



- An increasing number of swine pathogens and relevant antibodies are now able to be detected in pooled oral fluid samples
- The use of a pooled oral fluid sample for disease surveillance was developed by researchers at Iowa State University
- Sample collection is performed by suspending a cotton rope over a pen for pigs to chew and deposit oral fluid
- The technique offers a low cost, non-invasive method of sample collection from groups of pigs, providing a viable method for regular disease surveillance to take place on farms.

Work at Newcastle University researched provision of 1–4 ropes to pens of pigs in fully slatted and straw bedded systems to explore how the representative quality of the oral fluid sample could be optimised. The results demonstrated that for groups of ≤25 pigs, provision of 1–2 ropes for 45 minutes is sufficient to optimise collection of a pooled oral fluid sample from the pen.

Of particular relevance to UK pig production, when sampling oral fluid from straw bedded pens, a lower percentage of the pen group chewed the rope (15% fewer pigs at 45 minutes presentation), and increasing the number of ropes had no effect on improving uptake.

A further study at Newcastle University then applied the use of pooled pen oral fluid samples to examine concentrations of acute phase proteins (APPs) in groups of finishing pigs as a possible marker of sub-clinical disease in pigs.

Trial details

- 80 finishing pigs were monitored from point of entry to a finishing building (53kg) until slaughter
- The pigs were housed in a continuous flow finisher building where sub-clinical disease was thought to be contributing to sub-optimal growth
- Symptoms of disease and treatments administered were recorded daily, cough, diarrhoea (scour) and sneeze scores weekly, pig weights and feed intake every two weeks and lung and stomach pathology scores from all pigs at slaughter

APPs are a group of immune components that alter in concentration in response to disease. As one of the first immune responses to disease, they offer a potential diagnostic indicator of sub-clinical disease.

The magnitude and duration of the APP response reflects the activation of the immune system, therefore providing a possible indicator of growth losses as a result of immune activation in pigs.

Trial details *(continued)*

- As the oldest pen group reached market weight (76kg), paired blood serum and oral fluid samples were collected from all pigs and analysed for concentrations of two APPs, Haptoglobin (Hp: a protein that increases in concentration in response to a wide variety of acute and chronic immune activation) and C-reactive protein (CRP: a protein that increases in concentration under acute inflammatory conditions)
- A pooled oral fluid sample was also collected per pen of pigs
- The paired samples were also analysed for antibodies and viremia levels of Porcine Reproductive and Respiratory Syndrome virus (PRRSv), known to be present at the study farm.

Trial results

- The growth rate of the pigs was sub-optimal at 0.65 kg per day, although there were few clinical signs of disease over the study (Table 1)
- The concentration of APPs in blood serum correlated to the levels in oral fluid, indicating the use of oral fluid for APP testing is a feasible non-invasive method
- Investigation of predictive factors that were related to the concentrations of APPs in individual pigs revealed that the duration of time the pigs had been housed in the continuous-flow finisher building was related to the concentrations of the APPs, demonstrating that pigs were experiencing infectious challenge upon entering the building
- The average daily gain in the finisher period negatively related to the concentration of oral fluid CRP, whilst the lifetime growth performance of the pigs was negatively related to the concentration of oral fluid Hp detected, providing evidence that the pigs were experiencing growth depression as a result of immune activation at this time
- The concentration of CRP from pooled oral fluid samples collected from each pen was positively correlated to the pen average gain/day.

Application

Whilst research is continuing to improve detection and sensitivity of different swine pathogens in oral fluid, in the future the use of pooled oral fluid samples could offer a low cost option for disease surveillance. This would prove very useful for regular sampling that may be required to establish disease circulation patterns within a unit. The sample collection would also be able to be performed by stock people, removing the risk of disease transmission between farms.

The measurement of APPs in oral fluid could provide a convenient, low stress method to objectively assess the level of immune activation associated with sub-clinical disease that could be contributing to sub-optimal growth in pigs.

This study provides initial evidence that there is potential for the use of a pooled oral fluid sample to assess APPs, which would greatly reduce diagnostic costs. Further work should be conducted to explore this area. Work to assign the degree of lost production relative to a change immune activation in APP concentrations is a necessary further step to enable this technology to be put to use for industry. In the long term, the use of APP measurement could also provide a tool to benchmark herds in terms of health status and performance.

Table 1 Productivity and health ailments of all pigs studied (n = 80, pen mean and range)*

	Finisher ADG (kg)	FCR	Total pigs seen coughing	Cough score	Lung score	Scour score	Stomach score
Mean	0.65	3.31	0.05	1.50	3.30	1.32	3.45
Range	0.59–0.72	2.51–3.93	0–2	0–4.5	0.9–6.5	1–1.8	2.6–4.1

* Cough score: total number of pigs observed coughing within five minutes of observation. **Scour score** (faeces 1–4): **1** – firm, **2** – soft, spreads slightly, **3** – spreads readily; **4** – water like. **Lung score**: lobes of lungs graded for area affected by disease on 55 point scale. **Stomach score** (pars oesophagea region 0–5): **0** – normal, **1** – parakeratosis beginning, **2** – slight parakeratosis, **3** – moderate parakeratosis, **4** – severe parakeratosis, **5** – ulcer.

References

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