**Reduction of Salmonella prevalence in finisher pigs with Fysal®**

In recent decades acidifiers have been reported as having the potential to reduce salmonella prevalence in pigs. Research has shown positive effects with dietary acidifiers in improving growth rate and feed efficiency.

Organic acid supplementation was initially targeted for weaned piglets. There is growing evidence that dietary acidification may also be beneficial in the performance of fattening pigs. Recent results have indicated that in fattening pigs organic acids improved the apparent ileal digestibility of protein and amino acids and absorption of minerals. This contributes to improved performance.

C.M. Tung and J.E. Pettigrew have done a critical review of acidifiers. In the review it is stated that acid products significantly increase growth rate of pigs, on average more than 12.0% and 6.0% for 0-2 and 0-4 week post-weaning periods, respectively. The addition of acids to the diet also improves the performance of growing (3.5%) and finishing pigs (2.7%). Under stressful or disease conditions acids appear to be an effective measure to reduce scouring rate and mortality and to sustain a good growth performance.

Several mechanisms through which dietary organic acids work includes i) reducing the digesta pH value in the gastrointestinal tract (GIT) ii) regulating the balance of microbial populations in the gut, stimulating the secretion of digestive enzyme and promoting the growth and recovery of the intestinal morphology and iv) direct killing of microorganism.

The efficacy of organic acids depends on (1) chemical formula, (2) pKa value of the acid, (3) chemical form (esterified or not, acid, salt, coated or not), (4) molecular weight, (5) the micro-organism related MIC-value of the acid, (6) the nature of the micro-organism, (7) animal species, and (8) the buffering capacity of the feed (Gerard Huyghebaert et al. 2011). It is thus clear that each acid has its own spectrum of microbial activity related to differences in both specific pH ranges, membrane structure and in-cell physiology of the microbiota species. Blends of acids represent additional benefits by generating an array of pKa values and are used because of the broader spectrum of activity. The coating or micro-encapsulation of acids with a progressive ‘slow release’ matrix is essential for their antimicrobial activity throughout the distal part of the gastro-intestinal tract. There are indications that the medium chain fatty acids (lower absorption rate because of the higher molecular weight) may improve the efficacy of the short chain fatty acids. In the field, mixtures of organic acids are mainly used, which makes their spectrum broader and combines the good qualities of the different acids.

**Fysal®** is a non-corrosive synergistic blend of the most potent organic acids with their ammonium salts. **Fysal®** has been designed and manufactured by carefully considering the above factors which make the product very successful.
A trial was conducted in Australia recently to assess the efficacy of **Fysal®** to control Salmonella under conventional housing and to improve the growth performance of finisher pigs.

Salmonella infection in growing pigs is associated with reduced growth performance and a reduction in the number of full value pigs sold out of a batch. Research has shown infection with *Salmonella* in pigs can result in higher Lawsonia and Brachyspira infections and more signs of illness, such as colonic ulceration, scouring and deaths.

Recent trial conducted using **Fysal®**: 3258 pigs (1641 females and 1617 Improvac vaccinated males, Large White x Landrace, 13 weeks of age) were housed in a finisher facility of a large integrator in pens of approximately 38 pigs per pen (84 pens in total). Pens were allocated within sex to one of four treatment groups (see Table 1). A grower diet was fed from day 0 to day 21 and finisher diet from day 21 to 56.

<table>
<thead>
<tr>
<th>Experimental group</th>
<th>Grower diet (day 0 - 21)</th>
<th>Finisher diet (day 21 -56)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Commercial grower feed</td>
<td>Commercial finisher feed</td>
</tr>
<tr>
<td>Fysal® 1.5 kg/ton</td>
<td>Control feed + 1.5 kg / ton Fysal</td>
<td>Control feed + 1.5 kg / ton Fysal</td>
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<tr>
<td>Fysal Fysal® 3.0 kg/ton</td>
<td>Control feed + 3.0 kg / ton Fysal</td>
<td>Control feed + 3.0 kg / ton Fysal</td>
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<tr>
<td>Fysal Fysal® step down group</td>
<td>Control feed + 3.0 kg / ton Fysal</td>
<td>Control feed + 1.5 kg / ton Fysal</td>
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</tbody>
</table>

The experiment was started over four days to accommodate logistical constraints both at the piggery and slaughter house. Animals had ad libitum access to feed and water. Every two weeks a pulse of 20 mg/kg Tylan was added to the drinking water for Lawsonia control.

Body weight was measured per pen at day 0, day 21 and day 56. Feed intake and feed efficiency were measured per pen and for the grower period and the finisher period separately. Faecal samples were collected from 5 individual pigs in each pen at day 0, day 21 and day 56. Samples were analysed for Salmonella presence. Deaths and removals were recorded from each of the pens over the test period.

**Results**

Average daily feed intake of the pigs fed the **Fysal®** diets significantly (*P = 0.006*) increased compared to the control group from day 21 to day 56 of the trial. Feed conversion ratio was numerically lower for pigs fed the **Fysal®** diets compared to the control group during the complete trial.
Figure 1 shows the effect of *Fysal*® supplementation on *Salmonella* presence in the pens. Percentage of negative pens was highest for the control group at day 0. At day 21 the percentage of negative pens for the control group was increased with almost 4.8% compared to day 0. However, a bigger increase in number of negative pens was found at day 21 for the *Fysal*® 1.5 kg/ton treatment, *Fysal*® 3.0 kg/ton treatment and *Fysal*® step down treatment with an increase of 19%, 15.8% and 14.3% respectively.

![Fysal® reduces Salmonella prevalence in pens](image)

Figure 1. Influence of Fysal on the prevalence of *Salmonella* in pens at day 0, day 21 and day 56 of the trial.

At day 56 of the trial *Salmonella* pressure was clearly higher compared to day 21 for all treatments. The number of *Salmonella* negative pens was the lowest for the control group (9.5%). All *Fysal*® treatments showed a lower number of *Salmonella* positive pens compared to the control. For the *Fysal*® 3 kg/ton treatment the decrease in number of negative pens was lowest, resulting in the highest percentage of *Salmonella* negative pens at the end of the trial (57.9%).

The total mortality over the test period was 1.8%. There was a trend for a reduced number of deaths ($\chi^2=6.35$, $P=0.096$) when pigs were offered diets containing Fysal at a rate of 1.5kg/ton compared to the control group. When the deaths and removals are combined, pigs offered diets containing Fysal at a constant rate (either 1.5kg/ton or 3.0 kg/ton) displayed a lower rate of mortality/removal compared to the pigs that were not offered the acid ($\chi^2=9.02$, $P=0.029$) (Figure 2).
Discussion

This trial gives an insight into the effect of Fysal® on Salmonella prevalence in pens during a cycle. At day 56 Salmonella pressure is much higher compared to earlier in the trial and Fysal® at 3 kg/ton shows the highest number of negative pens. This indicates that the dosage of 1.5kg/ton of the Fysal® 1.5kg/ton treatment and the second part of the Fysal® step down treatment might not be sufficient to suppress the higher Salmonella pressure at 56 days. However, all Fysal® treatments reduce Salmonella compared to the control group.

Conclusion

Addition of Fysal® in feed results in;

- Significantly increased feed intake from 16 weeks of age
- Numerically lower feed conversion ratio
- Lower number of Salmonella positive pens
- Significantly lower mortality rates

References:

Critical Review of Acidifiers C.M. Tung and J.E. Pettigrew Department of Animal Sciences, University of Illinois

An update on alternatives to antimicrobial growth promoters for broilers. Gerard Huyghebaert a, Richard Ducatelle b, Filip Van Immerseel b