

Calsporin[®], a cost efficient probiotic for fattening pigs

By: Pauline Rovers-Paap, Central Technical Manager at Orffa Additives

The practical use of probiotics in animal feed has gained more attention over the last couple of years, due to the beneficial role on farm animals' production and health. Also, in feed for fattening pigs, where cost price plays a major role, an investment in a probiotic might be worthwhile from an economic and animal health point of view. Calsporin[®] is a robust spore-forming probiotic authorized in feed for the complete swine production chain. The viable spores of *Bacillus subtilis* C-3102 (DSM15544) help to maintain an ideal balance of the microbiota in the digestive tract. The probiotic has been proven to be effective on animal health and performance with a very low dosage. The intention of this article is to give an overview of the scientific and practical experiences with the use of Calsporin[®] in feed for grower and finisher pigs.

Sustainability and cost efficiency

The challenge for our industry is to secure the supply of high-quality animal protein to a continuously growing global population, whilst minimizing the effect on natural resources, by optimizing land use and production efficacy. By working on sustainability, the animal production sector guarantees production efficiency, product quality and animal welfare, hence minimizing the footprint of animal products and controlling the inherent pollution output. Calsporin[®] fits in the sustainability concept, as the product is able to increase the efficiency of animal production by improving the feed conversion ratio. Besides improving feed efficiency, the probiotic is widely used preventively for animal health and wellbeing, as a kind of health insurance. Therefore, Calsporin[®] also fits in other aspects of sustainability, thinking about antibiotic reduction, improving animal health and welfare, and stimulation of organic farming, where Calsporin[®] is also allowed to be used.

Especially at a time of high raw material prices and increased use of multiple by-products in feed, it is worth investing in solutions able to improve feed efficiency. The low inclusion level of 15 ppm Calsporin[®] (corresponding with one hundred and fifty million viable *Bacillus* bacteria per kg of feed) in feed for fattening pigs makes the probiotic attractive. A return on investment for feed efficiency is quickly achieved due to the low cost price per 100 kg of feed.

Efficacy in fattening pigs

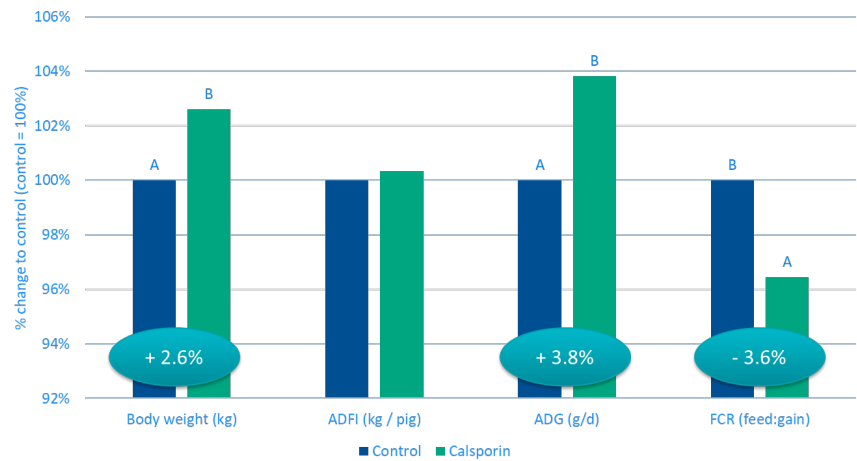
For the European authorisation as a feed additive, the efficacy of Calsporin[®] was evaluated in five trials in fattening pigs. The five trials covered four different European countries and were performed on locations with good pig health and low cull / mortality rates. In each study a different breed was used and both (castrated) males and females were included. In all trials, the pigs were divided in two groups and assigned to one of the two treatments: control or Calsporin[®] group. The diets fed to both groups were identical, apart from the supplementation of 15 g / tonne Calsporin[®] in the treatment group.

Four studies started in the growing period, directly after moving the pigs to the fattening barn, and pigs were followed till slaughter. Calsporin[®] was added in both the grower and finisher feeds. A total of 524 pigs were used in the four studies and the duration of the trials was between the 111 and 125 days. The data obtained were used for a meta-analysis, a statistical analysis that combines the results of the four scientific studies. Fattening pigs fed Calsporin[®] in their diets weighed significantly more at the end of the study (+ 2.6%), gained significantly more weight per day (+ 3.8%) and performed better in terms of feed conversion (-3.6%) compared to the pigs receiving the control diet (Figure 1). No differences in average daily feed intake (ADFI) were noted between the two treatment groups. Results of the four study meta-analysis show that the addition of only 15 ppm Calsporin[®] to grower-fattening pig feeds, improves growth and feed efficiency.

The fifth study was performed in a large commercial farrow-to-finish pig farm, including 3715 pigs in the fattening phase (Large White x Landrace), with an average initial body weight of 49 kg. As the pigs were older, this trial lasted only 88 days, till the moment of slaughter. Results show that the average daily weight gain in fattening pigs fed the Calsporin[®] diet, was significantly higher (+2.8%) than the pigs fed the control diet. This resulted in pigs from the Calsporin[®] group being, on average, 1.5 kg heavier than pigs from the control group at the trial end, based on the mean number of days on trial (88 days).

The removal of the animals from the trial, due to mortality or sickness, was in a normal range with a mean of 1.84%. Numerically,

Figure 1: Efficacy of 15 ppm Calsporin® in feed for fattening pigs, based on a four study meta-analysis. ^{A,B} indicates significant difference between the treatments (p < 0.05).



the Calsporin® group had a lower removal percentage compared to the control group (1.70% vs. 1.98% respectively). Interestingly, the number of reported sudden death fattening pigs in the Calsporin® group was half the number reported in the control group. During this trial, faecal samples were also analysed at different time points, for their microbial composition. It was observed that the number of *Clostridium* and *E.coli* species was reduced in the Calsporin® supplemented pigs (Figure 2).

Optimizing health and well-being

The lower number of reported sudden death cases and the reduced levels of *Clostridium* species found in the multiple faecal analyses are interesting findings. Probiotics are used to reduce potentially harmful bacteria in the digestive tract and improve the microbial balances in the intestine. Figure 3 shows the relation between a healthy gut and health and wellbeing of animals.

Shaping the intestine with a normal and stable microbiota, positively influences digestion and absorption of the feed. The stool is well-formed and there are lower incidences of diarrhoea or constipation. As 70% of the immune cells are located in the digestive

tract, it is clear that the composition of the microbiota influences the immune status of the animal. The phrase 'The gut is the second brain' refers to the brain-gut connection and links between digestion, mood and health. An interesting area for further research, as Calsporin® usage in swine feed receives really positive feedback from animal care takers in trials and farmers that 'animals are more easy to handle' and 'everything runs more smoothly'.

Stabilizing the microbiota and creating enough competition from beneficial bacteria, prevents the overgrowth of (opportunistic) pathogenic bacteria such as *Clostridium*, *E.coli*, *Salmonella* and *Brachyspira* species. A well-known strategy is the use of probiotics in the weaning period, when the microbiota is immature and stress factors create higher risks for microbial imbalances. As a result, opportunistic pathogens can easily cause intestinal infection (e.g. weaning diarrhoea caused by *E.coli*). Also in well-established mature microflora in adult animals a probiotic is able to optimise gut health. In sows, increased numbers of health related *Lactobacilli* and *Bifidobacteria* species were found while lower amounts of *Clostridium* clusters and bacteria from the *Escherichia* group were observed by using Calsporin®.

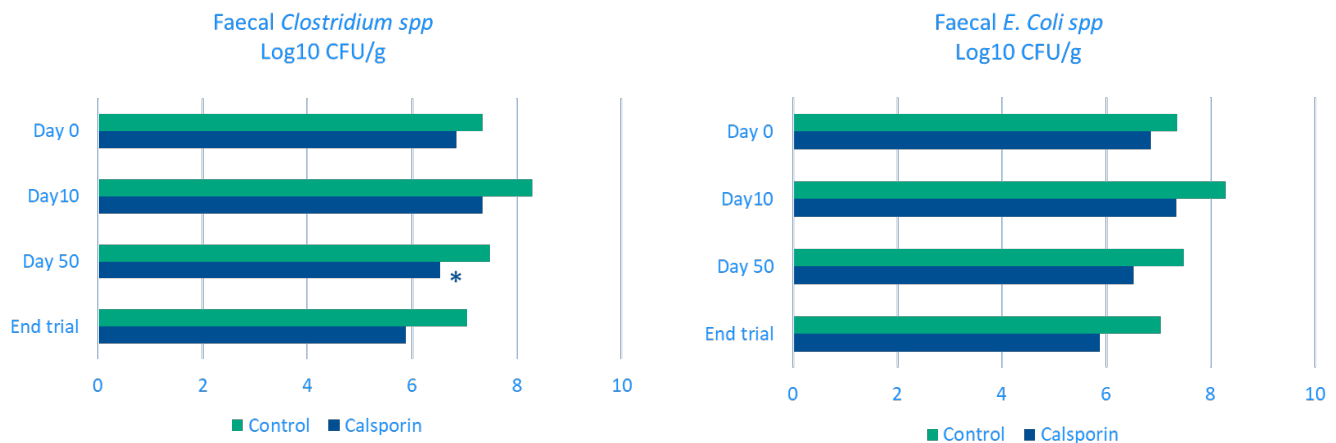


Figure 2: lower observation of *Clostridium* and *E.coli* species of Calsporin® treated fattening pigs. * indicates a near significant trend (0,05 < P ≤ 0,10).

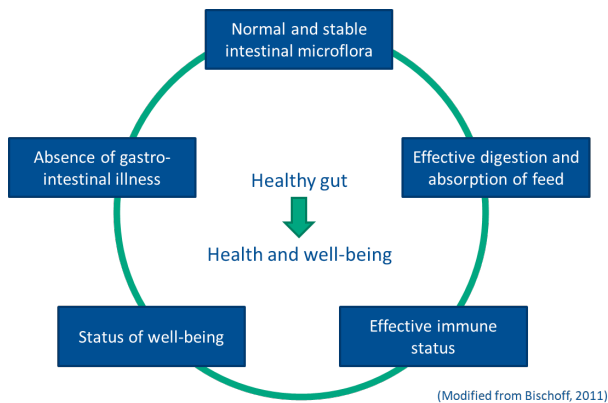


Figure 3: Stabilizing the gut flora optimizes feed efficiency, animal health and well-being.

On a farm with chronic swine dysentery infection, Calsporin® was tested over a six month period. At the start of the trial (before supplementation of the probiotic), 40% of the faecal samples tested positive on the presence of *Brachyspira hyodysenteriae*. At the end of the trial, all faecal samples came back negative for *B. hyodysenteriae* as well as *B. pilosicoli* (Figure 4). In his feedback, the farmer confirmed problems with swine dysentery on the farm reduced considerably approximately one month after supplementing the feed with probiotics. Consequently, the use of antibiotics was reduced during the 6-month trial period.

Probiotics are also often used in practice at farms with higher incidences of Haemorrhagic Bowel Syndrome (HBS) in growing and finishing pigs. HBS is characterized by sudden death, without any incidence of diarrhoea or other clinical signs in advance, in combination with a pale skin, abdominal distension and intense red colouration of the intestine. Although the causative agent is unknown, preventive stabilisation of the microflora with probiotics might support.

In conclusion, it is important that the environment of the large intestine is occupied with beneficial microbes in high enough numbers and with good stability. Adding probiotics in the feed, has exactly this purpose of stabilizing the gut microbiota.

Practical usage

A probiotic is most feasible when it can be used in different types of feed. Meaning, independent of the feed production process and allowed to be used in a broad range of feed for different animal species. The spores of *Bacillus subtilis* C-3102 (DSM15544) are robust and enable high stability and viability in heat treated feed. The natural shield of the spores supports the *Bacillus* strain to survive high temperatures during the feed production process, including pelletized and expanded feed.

A unique property of Calsporin® is the broad range of European registrations for the application in feed for different animal species. In the European legislation, a probiotic has to be authorised as a zootechnical additive for each individual animal species and for different life stages. *Bacillus subtilis* C-3102 (DSM15544) is approved in feed for the complete porcine production chain (sows, suckling and weaned piglets, pigs for fattening), all avian species (e.g. broiler and laying hens) and some pet / ornamental animal species.

Conclusion

The low inclusion level of 15 ppm makes Calsporin® a cost attractive feed ingredient, to lower feed cost and safeguard intestinal health in fattening pigs. The robust spores enable high temperatures during the feed production process and the broad range of European registrations as a dietary probiotic makes Calsporin® easy to implement in multiple feeds in a feed-mill. Calsporin® is a cost efficient investment to improve feed utilisation and secure animal health.

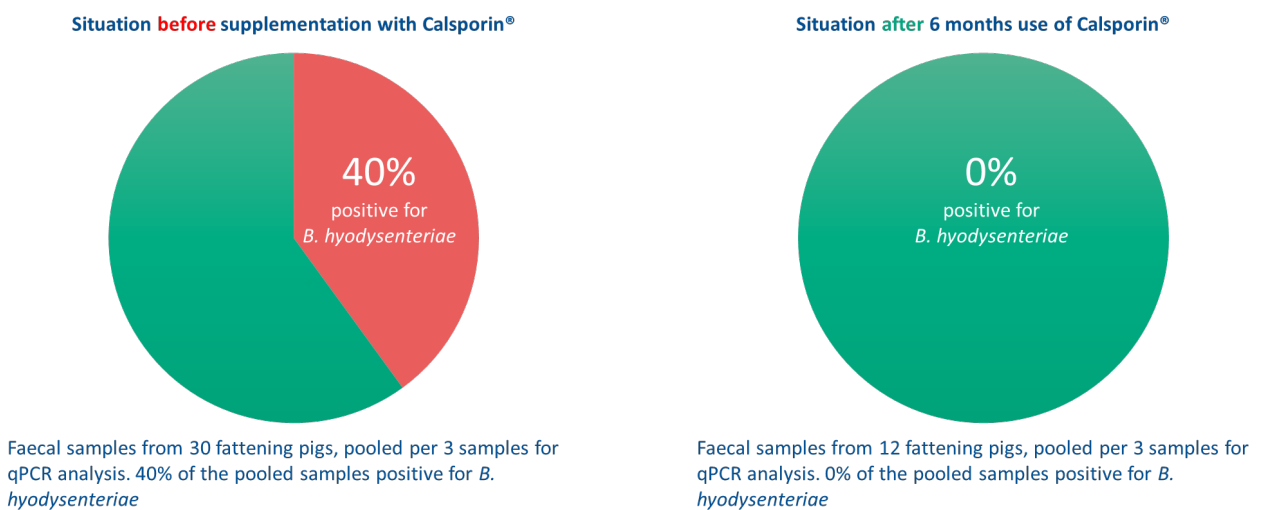


Figure 4: Reduction of *Brachyspira hyodysenteriae* by using Calsporin® on a farm with chronic swine dysentery