Managing hyperprolific sows with live yeast

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Over the past 10 years pig production in Europe has faced a revolution, with important changes such as the ban on animal products in feed, EU regulation on animal welfare and loose gestating sows, environmental regulations, the decreased use of trace elements and the EU ban on antibiotic growth promoters.

Nevertheless, when looking at the impact of these numerous changes, it is easy to conclude hyperprolificacy in sows has had an even bigger impact at farm level.

It is estimated that, among the 2.9 extra piglets per litter obtained, thanks to genetic progress, only 1.12 piglets are weaned, and 62% of the genetic progress is lost.

Moreover, the heterogeneity amongst birth weights and the increased number of very small piglets (under 1kg at birth) has negative consequences. In this context, cross fostering has became more frequent and colostrum intake is affected due to longer farrowing.

Immune protection is thus unequal, in particular for piglets born from primiparous sows, which could help explain, for example, the emergence of new viral infections.

Longer term consequences have also been described, such as slaughter age and heterogeneity and increased veterinary costs etc. Farrowing is a crucial step in the management of hyperprolific sows.

The main goals for the farmer should be:

- To reduce farrowing duration (for optimal colostrum intake).
- To allow a rapid lactation setup.
- To insure a good digestive transit prior to farrowing, in order to limit dysfermentations in the gut.

Field results have been gathered showing how the use of specific probiotic yeast can represent an effective tool to help attain these objectives and optimise the farrowing process in a natural way.

Improving sow transit

The sow's digestive physiology around farrowing has been poorly studied, with limited literature available on the subject, while nutritionists and veterinarians have focused their efforts on the control of the frequent disorders linked to this period.

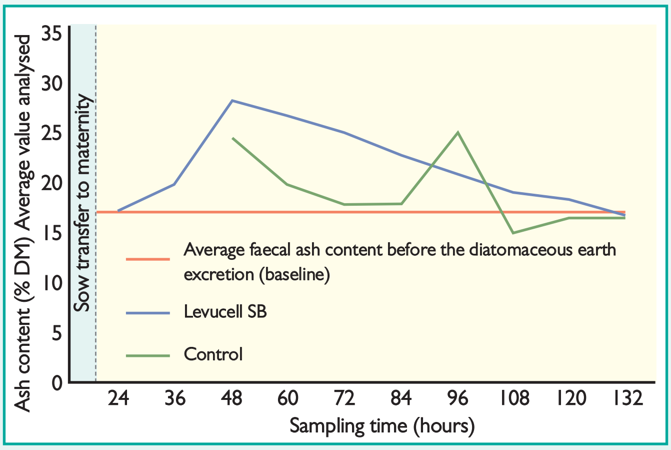
Before farrowing, and especially when animals are transferred from gestation to maternity building, their digestive transit slows down, resulting in what is often described as constipation.

Hormonal changes, increased volume of the litter in the last days of gestation, lack of activity, as well as changes in feed formulation are many sources of stress for the animal that will be translated into a slow down of its digestive transit. Poor digestive transit increases the risks of dysfermentation in the gut.

Dysfermentation, the uncontrolled growth of 'bad bacteria' in the gut, is the source of digestive discomfort for the sow, with the production of gases leading to dilatation and hypersensitivity, increasing the risks of partial torsions. It is also the source of microbial toxins.

An original study was designed in order to follow the sow's gut transit and evaluate the changes occurring around farrowing, as well as the effects of probiotic yeast supplementation.

Fig 1. Effects of S. boulardii yeast on digestive transit after sow transfer to the maternity building. The graph shows the variations of the average faecal ash content following the diatomaceous earth meal (in red, the baseline level before the diatomaceous earth meal).



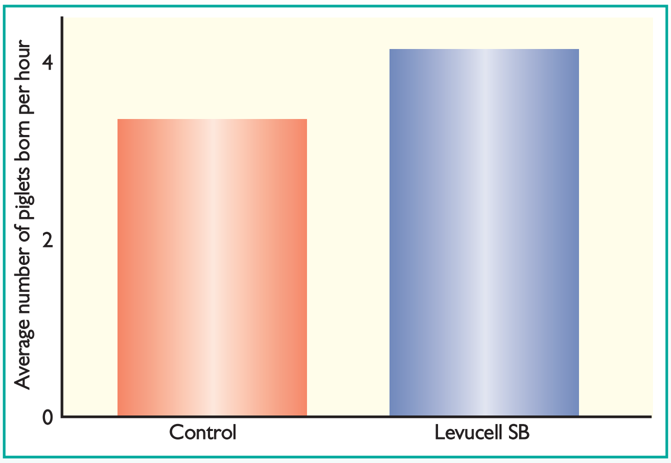


Fig. 2. Effect of Levucell SB live yeast on farrowing rate.

An original study

Some 20 Topigs sows, towards the end of their gestation period, were divided into two groups of 10 animals each, according to body condition and parity. During three weeks, the treated group received 0.15g/day of monogastric live yeast strain Saccharomyces cerevisiae boulardii I-1079 (Lallemand's Levucell SB20).

At 36 hours prior to their transfer to maternity, all the sows received 150g/sow of diatomaceous earth (Sillikil ND), mixed with their feed in a single delivery. Following this diatomaceous earth meal, the treated group received 1g/sow/day of Levucell SB20 for the duration of the trial.

Diatomaceous earth contains 99.5% (DM) of indigestible mineral matter, with very limited water retention capacity, which means no direct effect on gut motility. It was used as a tracer of the digestive transit.

Faeces were collected by direct sampling in the rectum (partial collection) every morning and evening during the five following days. Faeces dry matter and ash contents were analysed (Fig. 1).

For the control group, it was

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The sow's digestive transit is affected by stress factors, such as change of housing.

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impossible to collect faecal matter during the first 12 hours following transfer – the rectums were empty and the sows did not defecate during transfer.

It thus appears that sow transfer stopped the digestive transit.

Later, the average ash content in control sows faeces showed a short peak before decreasing progressively. A second peak appeared at 96 hours. These two peaks were not the fact of sows sub-groups, as the individual values were quite random with high standard deviations, indicating a very irregular digestive transit in control sows following their transfer.

In the treated group, faeces excretion did not show any interruption. There was an early peak of excretion, higher than for the control group, followed by a regular and steady decrease of the ash content up to day five, when the ash content is back to baseline level.

Moreover, the standard deviations were small, reflecting an increased homogeneity amongst sows regarding excretion pattern.

This study confirms the duration of sow digestive transit – over five days are necessary for the excretion of all the diatomaceous earth.

It also shows the stress caused by the transfer of animals from one building to another (faecal excretion stops in the control group).

Finally, even if the sampling was partial, it was possible to conclude that digestive transit was more homogenous and shorter for the animals fed S. boulardii live yeast before farrowing.

In conclusion, live yeast enabled the impact of stress on sow digestion to be reduced.

While this was not investigated in this study, it is possible to link this to a reduction of dysfermentations and increased stability of the sow's digestive flora with S. boulardii I-1079 (see boxed text).

Quality of farrowing

The challenge today is not only to give birth to live piglets, but also to successfully wean those piglets. Colostrum intake must be optimised. This is directly related to the piglet vigour at birth, which in turn depends on the quality of the farrowing process (uterine efficacy, interruptions). The quality of the farrowing process depends on calcium and magnesium serum levels at farrowing, ocytocine secretion, as well as farmer intervention such as manual exploration or piglets extraction.

The negative impact of stress upon ocytocine synthesis by the hypophyse, in particular via catecholamine or adrenaline secretion, is well known. For this reason, injections of high doses of synthetic ocytocine towards the end of the farrowing process is often necessary.

This has negative side effects on the condition and survival of the newborn piglets. Bradycardia, foetal acidosis, and hypoxia lead to increased stillbirths. Sometimes, cramps of the uterine muscle can even lead to subcutaneous haemorrhages in piglets, due to the strength of the contraction.

A trial was set up in order to assess the potential effects of S. boulardii I-1079 on the farrowing process, in particular its duration.

Some 37 Topig sows were divided into two equivalent groups – control (18 sows) and probiotic (19 sows), which received 0.15g/sow/day of Levucell SB20 for three weeks before transfer to maternity, and then 1.0g/sow/day until day three after farrowing.

The average farrowing duration was calculated for both groups – 171.4mn for control sows and 159.3mn for the probiotic group.

Thus, the average time interval between two expulsions goes down from 16.9mn to 14.10mn with the live yeast supplementation (Fig. 2).

As shown in Fig. 3, the distribution of farrowing durations is strongly improved too. With live yeast, the proportion of farrowings under two hours strongly increased (37% vs. only 16% for control).

Moreover, the number of sows experiencing at least one interruption of over one hour is reduced from 50 to 9.1% with the probiotic.

To these statistic data, we must add the staff testimonials regarding this trial. Their observations confirmed that sows behaviour was improved with the live yeast supplement, they were calmer; and farrowing was more dynamic.

By improving sows digestive process and health, live yeast was able to improve the farrowing process.

As a result, we can expect a positive impact on piglets vigour and colostrum intake, at birth and thus on subsequent immunological and health status.

Reduce postnatal mortality

As mentioned earlier, hyperprolificacy has led to increased perinatal and pre-weaning mortalities. This can be explained by the growing number of very light piglets, sows behaviour and pathologies (agalaxia), as well as the rise of neonatal diarrhoeas.

One of the most strong and reproducible effects of S. boulardii I-1079 supplementation before farrowing and during lactation is the

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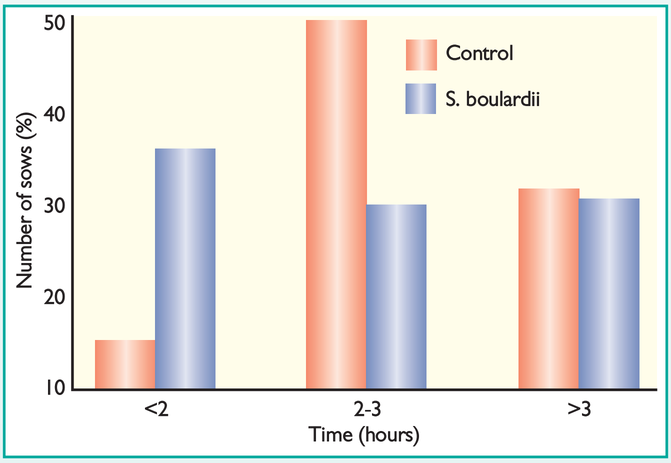
Fig. 3. Effect of Levucell SB on the repartition of farrowing durations.

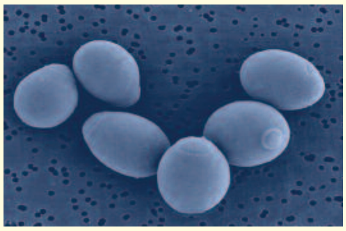


Saccharomyces boulardii: from man to pig

Live yeast of the S. boulardii sub-species is well known in human medicine and largely prescribed to prevent antibiotic associated diarrhoeas for example.

Its modes of action in the gut are well described and illustrated by around 150 scientific publications. Its action in the gut can be described as a shield effect that reinforces the gut microbial ecosystem and protects the animal's digestive tract, via three scientifically proven mechanisms:

- Limitation of damage caused by Clostridium difficile by producing a protease which destroys its toxins (A and B) in intestinal mucosa and helps limiting diarrhoea.



- Positive balance of the digestive microflora by agglutinating pathogenic flagellate bacteria, such as E. coli, salmonella, and expelling the complex through the faeces.
- Reinforcement of the mucosa and intestinal wall integrity, by stimulating enzymatic activities, improving epithelial cell maturity. As a result, immune response is enhanced and feed utilisation improved.

Additionally, studies by Di Giancamillo A. et al. (2003) showed that Levucell SB supplementation also favoured the development of the gut in pigs by increasing the height of microvilli, which increases the absorption surface and enables optimal use of the nutrients.

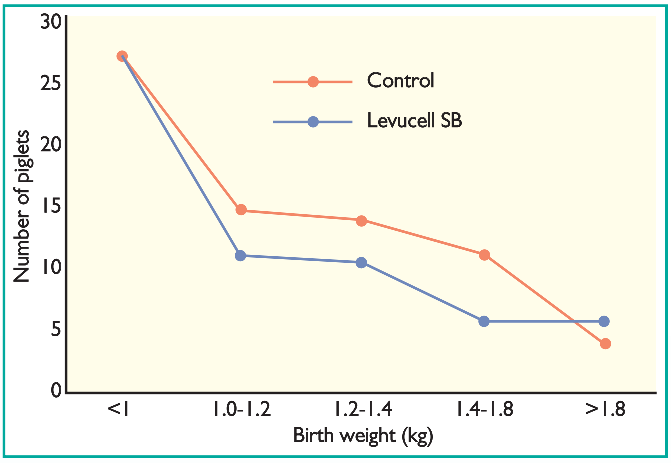


Fig. 4. Piglet mortality during lactation according to their birth weight (Lallemand, 2005).

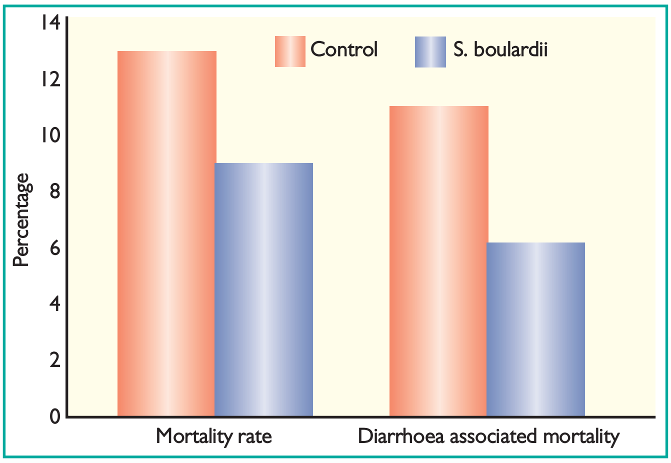


Fig. 5. Effect of S. boulardii on neonatal mortality rates, with a focus on litters affected by diarrhoea.

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reduction of these mortalities. A new trial was conducted over a period of four months in a farm of 400 sows. Some 18 batches of 20 animals each were involved in the trial (one batch per week going into maternity).

In each batch, 10 sows received a control diet, while 10 sows were supplemented with the live yeast (0.15g/sows/day of Levucell SB20).

It appeared that the probiotic yeast allowed mortality within every piglets class to be reduced, except for the heavier piglet, which only represent a low number of animals; and the lighter ones (<900g at birth).

We shall take into account that in this farm, the relative mortality of this last group is relatively low: only 27% compared to more than 50% in a 2004 study.

This can be attributed to the careful management of these very small piglets on this farm, which probably compensated for their extreme fragility.

Finally, the analysis of mortality rates for each litter confirmed that it was for piglets suffering diarrhoeas that the live yeast Levucell SB had the strongest effect in reducing mortality.

This is linked to its particular mode of action in the gut.

Conclusions

Hyperprolific sows can be economically very effective, as long as sow and piglet management and nutrition are carefully adapted.

The role and importance of digestive flora, upon sow health, but also behaviour, in particular around farrowing, and finally the condition of the piglets, has long been underestimated.

In this particular context, S. boulardii I-1079 live yeast appears as an effective tool to control and balance the digestive transit and flora of the sows around farrowing. It does improve the animal's digestive health and overall well being, thus optimising the farrowing process as well as piglet performance and short and long term survival. ■