

## 2019 LEVUCCELL SB INTERNATIONAL TECHNICAL MEETING INSTITUT PASTEUR, PARIS, 23<sup>RD</sup> OCTOBER 2019

*From the sow to the post-weaning piglet, addressing the challenges of modern pig production through gut microbiota management*

Over the past decade or so, pig production has tremendously evolved and the industry has had to adapt to face issues linked to sow hyperprolificacy and management practices. At the same time, antimicrobial usage reduction has become a worldwide concern within the “one health” context. Fifteen years ago, the usage of LEVUCCELL SB (*Saccharomyces cerevisiae boulardii* CNCM I-1079) was in its early days in swine, and the research and development journey was just starting. Today, from sow to piglets and now on to fattening pigs, the live yeast concept and applications of *S. cerevisiae boulardii* CNCM I-1079 benefit from sound science, with documented benefits along the whole production cycle. For this Special Edition of Lallemand LEVUCCELL SB International meeting, 130 professionals from 30 countries gathered at Institut Pasteur in Paris, to remind this journey and look into the future for the live yeast approach which remains more relevant than ever. Here are some highlights of the meeting.



### It all starts with the sow

Modern sows management and genetics, while optimizing production performance through hyperprolificacy, have generated new issues such as lower piglet vitality, increased incidence of piglet neonatal diarrheas etc., all detrimental to piglet health and future growth performance.

The meeting opened with Claudio OLIVIERO, an expert in sow health and particularly the whole farrowing phase, from University of Helsinki in Finland. He showed the link between large litter size and reduced piglets vitality, birth weight, as well as immunity. In their first days of life, while their own immune response is settling in, piglets defenses rely on passive immunity from the mother, through colostrum intake. As early as **6 hours post-farrowing**, the level of Immunoglobulins G (IgG) in sow colostrum is **halved**.



*Claudio OLIVIERO, University of Helsinki, spoke about “Effect of sow management and farrowing physiology on piglets’ vitality, immunity and growth.”*

Longer farrowing time delays the intake of the precious colostrum, hence its quality, while large litters impact the quantity received per piglet. Recent survey shared by Oliviero indicates that around one third of piglets receive insufficient colostrum (less than 250g/piglet). A reduced colostrum intake in the first 24 hours of life has negative effects on piglet survival and growth. Oliviero recommends to evaluate colostrum IgG level on farm using a refractometer: there is a documented correlation between colostrum IgG level and the Brix value (Hasan et al., 2016).



**Eduardo BERNAL**, Spin Colombia SAS, presented: "Effect of supplementation with specific live yeast in sows on Immunoglobulin G colostrum content".

It is actually this method that was used in Colombia by Eduardo BERNAL, from SpinVet in order to assess in farm settings the effects of *S. cerevisiae boulardii* CNCM I-1079 on sows colostrum immune quality. Sows (123 in total) from four different farms received either a control diet or LEVUCCELL SB supplementation for 30 days prior to farrowing. The Brix index showed an increase of the number of sows with adequate IgG level in the colostrum (Figure 1). Bernal concluded from this field trial that **the live yeast could potentially improve the transfer of passive immunity from the sow to the neonatal piglet** and that this improvement is especially interesting in young sows. Such farm results corroborate previous research that was presented by David SAORNIL, Product Manager - Swine applications, at Lallemand Animal Nutrition. This study showed, using lab IgG analysis methods (ELISA), a 21% improvement in the colostrum IgG level with LEVUCCELL SB (Guillou et al., 2011).

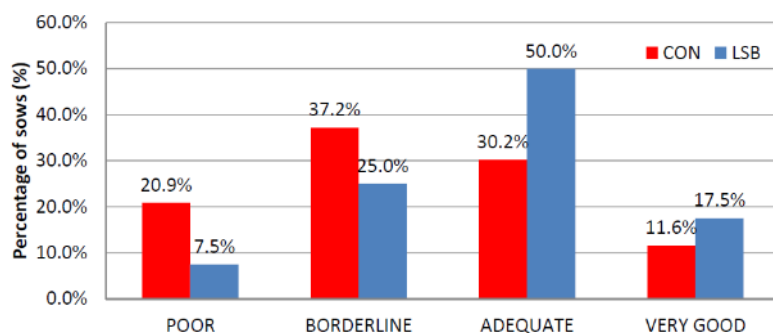


Figure 1: Percentage of sows among four farms according to their colostrum IgG level within 10 hours after the onset of parturition according to BRIX index (SpinVet trial, Colombia).

Oliviero reviewed some additional nutritional and management strategies that can help preserve piglet immunity in large litter. Concerning sow housing and management strategies, he recommends when possible to cater for the sow's innate nesting behaviour, for example by allowing more space and making available nesting materials prior to farrowing. Indeed, nesting behaviour is mainly driven by progesterone and prolactin, the same hormones responsible of the farrowing process and colostrum production. Oliviero mentioned that crated sows not allowed to perform this nest building behaviour experience longer farrowing, give birth to less vital piglets and produce less colostrum.

*Appropriate management of late gestation, farrowing and lactation are important keys to improve piglets' survival and growth.*

Claudio Oliviero

In terms of nutritional management, Oliviero stressed in particular the importance of feeding **high fiber diet in lactation**. The abrupt transition between high fiber maternity diet and high energy/low fiber lactation diet is detrimental to the sow's digestive function, transit (adding to the constipation trend around farrowing), as well as microbiota according to more recent data.

Yannig LE TREUT, General Manager for Lallemand Animal Nutrition, came back on the management of hyperprolific sow digestive balance in his presentation relating 15 years of LEVUCCELL SB research. He reminded the audience that LEVUCCELL SB can be an effective tool to help improve sow's transit and reduce constipation around farrowing. This was one of the very first benefits of the live yeast observed in swine, 13 years ago. Other benefits of the live yeast that were documented along the years include improved piglet vitality at birth and higher sow feed intake in lactation.



Today, Le Treut explains, thanks to new metagenomics techniques, such observations and our hypothesis about shaping the sow's intestinal microbiota with LEVUCCELL SB have been confirmed. Such recent studies indicate that the farrowing process strongly affects the sow microbiota. *S. cerevisiae boulardii* CNCM I-1079 supplementation, on the other hand, lead to a much more stable fecal microbiota around farrowing. How is this effect translated into performance of hyperprolific sows?



David SAORNIL and Yannig LE TREUT, Lallemand Animal Nutrition

Le Treut presented new results from a recent trial carried out with Danbred genetics in Spain, indicating that the live yeast improved performance parameters (sow body fat thickness gain in gestation and piglet growth) and that the best outcome is obtained by applying the yeast during both gestation and lactation, as compared to a double dose only in lactation.

**Preserving piglets gut health to manage neonatal diarrheas**

Neonatal diarrhea in piglet is also an issue linked to large litter size. Francesc ILLAS, from Grup Batallé, in Spain, estimates that, in a 1,000 sow level farm, neonatal diarrheas could cost producers at least 30,000€ in production losses (mortality and reduced growth).



Francesc ILLAS, Grup Batallé, presented: "Neonatal diarrhea in piglets. Causes and prevention strategies".

According to him, it is mainly a question of balance and various elements should be taken into consideration to aim for an **equilibrium between infection pressure, immunity and management of the facilities** (e.g. hygiene, ensuring comfort, especially in terms of temperature). The Batallé Group oversees 1,000 farrows every week. Today the group has in place some specific protocols for the prevention and treatment of neonatal diarrhea, while they aim for zero losses, to maintain weight at weaning and to send healthy piglets to nurseries in order to maximize the potential of their genetic.

David SAORNIL further discussed the issue and causes of neonatal diarrheas, stressing the importance of maternal transfer in terms of immunity and microbiota in piglet's early life, two crucial elements of the balance. He reckons that *"if we are able to modify the sow microbiota profile we can act on the piglet"*. Exploring the science behind *S. cerevisiae boulardii* CNCM I-1079 mode of action he continued the story and showed the various lever of action of the probiotic yeast on piglet, through the sow:

- Stabilization of the piglet intestinal microbiota, through potential microbial maternal imprinting
- Maintenance of the gut integrity
- Control of the inflammatory reactions
- Improved colostrum immune quality

These were confirmed via several trials showing that, under various conditions, LEVUCCELL SB has a positive impact on the newborn piglets, reducing either diarrhea incidence or its duration.



**Microbiota management: what about the brain-gut axis?**

Vassilia THÉODOROU, Director of the Neurogastroenterology & Nutrition Group and Head of INRA Toxalim in France, and an expert in human nutrition, draw the link between the gut, the brain and the microbiota in an enlightening presentation. There is now clear evidence that the brain-gut axis is a two-way communication route that also involves a third player: the microbiota. This has been demonstrated in both human and animals. Stress, for example, illustrates perfectly the bidirectional microbiota-brain-gut interplay. Stress can impair intestinal barrier function (leaky gut), visceral pain, and lead to gut microbiota dysbiosis. Conversely, prevention of gut leakiness can attenuate the hypothalamic pituitary axis response to stress. According to Theodorou, this suggests that modulation of the gut microbiota by probiotics may contribute to improve stress-related gut "leakiness", source of dysbiosis, visceral pain, or gut discomfort, through restoration of the microbiota-brain-gut axis. This could easily apply to pigs.



*Vassilia Théodorou, Director of the Neurogastroenterology & Nutrition Group and Head of Toxalim UMR INRA/INPT/ENVT/UPS, France, presented: "Gut-brain axis and gut barrier function."*

**Strengthening piglets immunity post-weaning**

Jeff CARROLL, research leader, USDA-Agricultural Research Service, in the USA, focused then on the piglets after weaning. He aims at searching for alternatives to medicated diets which could provide the immunological protection necessary to maintain a high level of productivity in pigs. His team conducted two studies to further elucidate a possible immunological priming effect of *S. cerevisiae boulardii* CNCM I-1079 in weaning piglets subject to an inflammatory challenge (lipopolysaccharide -LPS- and LPS + *Salmonella* challenges). Various inflammation biomarkers were analyzed around the challenge.



*Jeff CARROLL, from USDA-Agricultural Research Service, talked about: "Effects of S. c. boulardii CNCM I-1079 on piglets response to an inflammation challenge".*

Both studies combined indicated a real "immunological priming" effect of LEVUCCELL SB, with positive consequences on feed conversion. Carroll concluded that: "*S. cerevisiae boulardii* I-1079 could offer immunological protection to the young pig, thus allowing more nutrients to be diverted towards growth during this critical period of development." This direct immune priming effect is combined to the live yeast documented ability to bind undesirable bacteria in the gut and help prevent their accumulation in the gut, as seen in the *Salmonella* challenge model (reduced pathogen load).

Piglet immunity and reaction to an inflammatory challenge was further investigated by Imourana ALASSANE-KPEMBI, from INRA Toxalim in France, a specialist of mycotoxins in swine. He demonstrated that pigs are particularly sensitive to mycotoxins present on cereals. The digestive tract, in particular the intestinal barrier function, and immune system are two of the most sensitive targets of mycotoxin contamination in swine, with consequences on pig health.



*Imourana Alassane-Kpembé, from INRA-Toxalim presented: "Addressing mycotoxins in Swine through immunomodulation and intestinal barrier reinforcement".*

Both innate and acquired immune response are affected by mycotoxins, meaning an increased susceptibility to infectious diseases, but also a decreased vaccinal efficacy. Using transcriptomic techniques (analysis of the expression

*S. cerevisiae boulardii I-1079 could offer immunological protection to the young pig, thus allowing more nutrients to be diverted towards growth during this critical period of development*  
Jeff CARROLL



level of immune related genes within the piglet gut wall), Alassane showed that *S. cerevisiae boulardii* CNCM I-1079 supplementation to piglet can mitigate the detrimental effects induced by Deoxynivalenol (DON) at gene expression level in gut tissue by an attenuation of the pro-inflammatory effects of DON. He also showed that the live yeast is able to restore DON-induced alteration of lipid metabolism signaling.

The weaning piglet session was concluded by a commercial testimonial by Dr. Fu SHUANGXI, from Guangxi Yangxiang Agriculture and Animal Husbandry in China. The Yangxiang group sold two million pigs in 2018 and produces 1.2 million tons of feed. In 2020, China is ruling out antibiotic growth promoters in feed. To prepare for the ban, Yangxiang has carried out numerous trials, including four with LEVUCCELL SB. These Chinese trials confirmed in commercial farms and research stations settings that *S. cerevisiae boulardii* CNCM I-1079 could **effectively improve the feed conversion of post-weaning piglets**. Trials in sows show shorter farrowing duration, with positive consequences on piglet survival in lactation and health post-weaning. Based on their own results that corroborate numerous research studies, the group included LEVUCCELL SB as part of their integrated solutions to reduce antimicrobial usage since 2012 and they now use it in both sow and piglet diet.

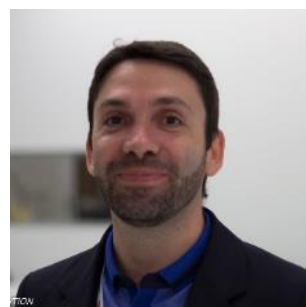


Dr. Fu SHUANGXI, from Guangxi Yangxiang presented: "Strategies for antibiotic reduction in post-weaning piglets".

### In conclusion

The meeting ended with forward-looking presentation of swine research and development within Lallemand Animal Nutrition, a research which is conducted in partnership with various experts in the field, by R&D Director Mathieu Castex. He showed that our knowledge of the roles of the intestinal microbiota is building up and our understanding of the interplay with the host physiology is also growing.

Castex concluded that the outlook for future research is bright, thanks to the access to new techniques such as OMICS or the development *in vivo* and *in vitro* models that shall allow to explore.



Mathieu Castex, Lallemand Animal Nutrition talked about: "Present and future of Lallemand Animal Nutrition R&D in swine."

