

Press release

Low birth weight is a problem for later production efficiency in pig production

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The reproductive performance of sows has drastically increased over recent decades. This is due to targeted genetic selection for larger litters, and improved housing and health management, together with a better knowledge of the nutrient requirements of gestating and lactating sows. However, this increase in the number of pigs born alive has been accompanied by a concomitant decrease in average piglet birth weight. This, in turn, is associated with lower early life survival rates, impaired growth efficiency, reduced lean tissue deposition in the carcass and reduced meat quality. Thus, the benefits of improved sow reproduction appear to be partly annulled.

The observed lower survival rate of low birth weight pigs can be explained by their low vitality which makes it difficult for them to reach the teats and ingest sufficient sow milk. The observed effects on growth and on carcass and meat quality is pre-determined in utero, thus during the period of embryonal and foetal muscle development. Up to recently, it was believed that nutritional intervention after birth could not overcome this impaired prenatal muscle development in underprivileged pigs. However, there is increasing evidence that by supplying additional milk to large litters, the survival rate of the whole litter can be increased. Furthermore, recent experiments showed that supplementing milk replacer with specific amino acids positively affected muscle protein synthesis of artificially reared pigs. However, this latter experiment did not focus specifically on low birth weight pigs originating from large litters, which, in our opinion, require special attention. Thus, as part of the larger European FP7 project ECO-FCE (<http://www.eco-fce.eu/>), we are conducting targeted research investigating effects of different early nutritional strategies for low birth weight pigs on parameters linked to production efficiency.

How do we tackle this problem?

In the studies we have performed so far we used piglets from large litters (more than 15 piglets born) and with a body weight of less than 1.1 kg, which is around 250-300 g lower than the average piglet birth weight. These piglets were weaned at 7 d of age and allotted to 3 experimental treatment groups. The control group was offered an unsupplemented milk replacer. The other 2 groups were offered the same milk replacer but supplemented with either the amino acid 'arginine' or 'carnitine'. Both supplements have been shown to positively affect muscle metabolism either by increasing protein synthesis or by enhancing the metabolic pathway for metabolic energy generation. The milk replacer was offered from 7 to 28 days of age, which is a common weaning age.



What do we know so far?

Compared to the control group, piglets offered the arginine or carnitine supplemented milk replacer grew slightly faster. However, weaning weights remained rather low compared to those observed from pigs born with a normal birth weight. Interesting from a developmental point of view was the observation that the semitendinosus muscle was more mature in piglets in the arginine and carnitine treatments compared to the control group. Whether this greater muscle maturity will be beneficial for growth from weaning to slaughter warrants additional experiments.

What happens next?

Because both supplements displayed positive effects on growth and muscle development, and since both supplements play crucial roles in different important metabolic pathways of the muscle, current research is assessing the effects of a milk replacer supplemented with both arginine and carnitine. In a comprehensive study, this supplemented milk replacer will be compared with standard unsupplemented milk replacer, and also with sows milk, and effects on piglet survival and also on longer-term growth performance, carcass composition and meat quality will be assessed. This research will ultimately demonstrate in a holistic fashion whether supplemented or unsupplemented milk replacer will be beneficial for raising low birth weight pigs, not only with respect to survival rate but also to lifetime growth efficiency, carcass and meat quality.

