# Offering a boost to sow and piglet performance with L-carnitine

Over the last few decades, the reproductive performance of sows has improved considerably based upon advanced genetics, feed formulations and management techniques. The number of piglets born alive is one of the most important criteria, whilst the reduction of stillborn piglets is still an enormous challenge. The substantial increase of total born piglets is a potential productive advantage.

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Nevertheless, it usually goes hand in hand with a greater birth weight variability and more small and non-viable piglets (0.8-1.1kg and ≤0.8kg bodyweight respectively). The increase in prolificacy has not been accompanied by a proportional increase in the amount of colostrum, putting piglets with a lower birth weight at a disadvantage.

In recent years, L-carnitine has increasingly been used as a supplement in livestock animals. Trials consistently demonstrate the beneficial effects of dietary L-carnitine supplementation on performance characteristics in several animal species (pigs, chickens, cattle, horses). Impressive effects of L-carnitine supplementation have been observed in the reproductive performance of sows.

## Benefits of carnitine

Various metabolic processes take place in the liver and consequently make good liver function crucial for optimal performance. Carnitine and choline chloride are derived from dietary sources and endogenous biosynthesis. However, endogenous synthesis is insufficient to meet the metabolic requirement during gestation.

Both compounds are essential for fat metabolism and transport of fatty acids into the mitochondria. These structures are considered to be the powerhouses of the cells and provide energy. L-carnitine supplementation to sows also stimulates the glucose metabolism in the foetuses, providing extra energy for foetal development. This boost results in higher litter weight at birth.

Moreover, the higher milk production largely contributes to a better performance of the suckling piglets (Fig. 1).

## Improved foetal development

An enhanced efficiency of energy production in the foetus, besides an increased transfer of glucose through placenta from maternal to foetal blood, contributes to an increase in birth weight. Significantly fewer stillborn, non-viable and small piglets are born following sow supplementation with L-carnitine.

During gestation, the supply of the foetus with amino acids, glucose, minerals and fatty acids from the mother via the placenta is crucial for its development. Elevated maternal carnitine plasma concentrations lead to increased carnitine concentrations in foetal tissues like liver, skeletal muscle and heart.

Studies indicate that effects of carnitine supplementation during gestation could, at least in part, be mediated by alterations of the insulin-like growth factor system. This is a key hormone for intra-uterine foetal development and enhances foetal muscle fibre development.

The rate of fatty acid oxidation in the foetus is low. However, immediately after birth, this process becomes extremely important because of the disruption of the supply of glucose and the rapid exhaustion of the glycogen storage.

Piglets of sows supplemented with L-carnitine during gestation were able to switch on the oxidation of fatty acids quicker, due to their better carnitine status versus the piglets of the control sows. This improves their energy production and in turn, increases their suckling persistence during the first days after birth.

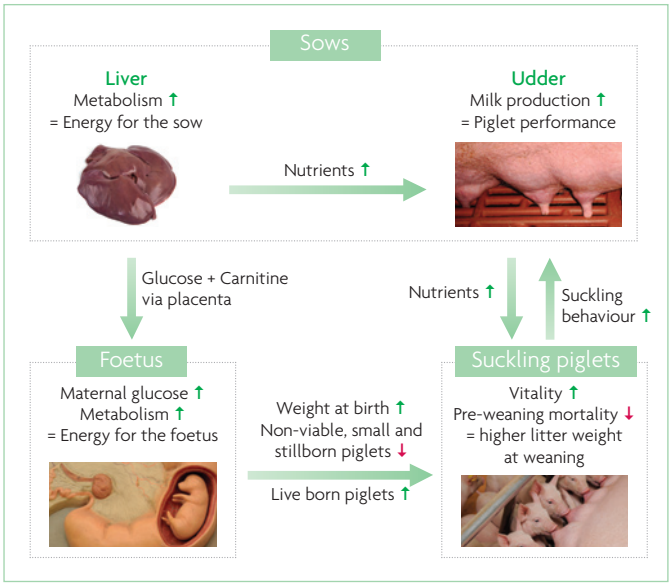


**Fig. 1. Benefits of Carnitol-L supplementation to sows in gestation.**

Furthermore, piglets born from sows supplemented with L-carnitine have a higher vitality at birth, also providing more vigour to suckle. An improved weight gain, higher litter weights at weaning and a lower pre-weaning mortality rate in piglets originating from sows supplemented with L-carnitine is noted. This favourable effect of L-carnitine supplementation is dose-dependent and is observed in sows across the whole range of parities.

Nutrition during foetal life and birth weights affect animal metabolism and performance in later life, which is also termed 'foetal programming'. Piglets of L-carnitine supplemented sows have more muscle fibres than those of control sows. It has been observed that low birth weights result in lower carcase weights and meat percentages at slaughter compared with high birth weights.

## Increased milk production

Sows supplemented with L-carnitine produce more milk than control sows. The improved suckling behaviour of piglets (longer suckling time per day and more vigour) born to L-carnitine supplemented sows causes the milk production to rise.

Consequently, more energy and nutrients are transferred from the sow to the piglets, with the milk leading to increased litter weights at weaning and lower pre-weaning mortality. Dietary L-carnitine supplementation of sows during lactation results in an increase of carnitine concentrations in plasma and milk.

The milk concentration is important for the development of the suckling piglets because they have a low capacity for endogenous carnitine synthesis, particularly during the first days after birth.

However, in sows that were not supplemented with L-carnitine during gestation, L-carnitine supplementation during lactation did not influence litter weaning weights.

## Complementary feed

Carnitol-L (Huvepharma) is a complementary feed. Its liquid and palatable formulation contains high concentrations of L-carnitine, choline chloride, sorbitol and

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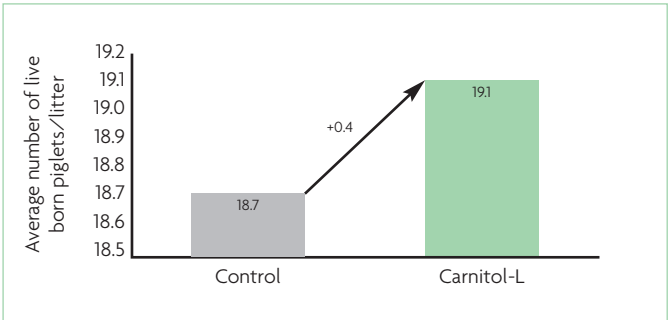


**Fig. 2. Average number of live born piglets in the supplemented group versus the control group.**

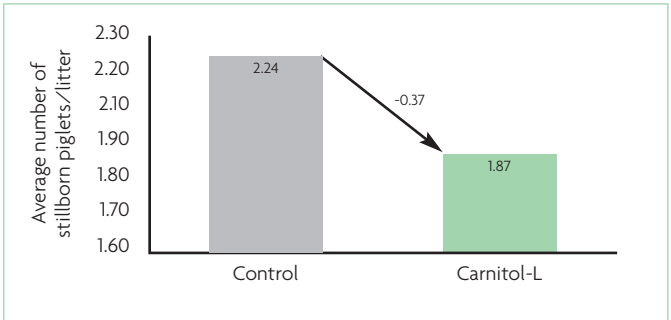


**Fig. 3. Average number of stillborn piglets in the supplemented group versus the control group.**

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selected plant extracts. These ingredients with hepatoprotective properties especially contribute to:

- Boost metabolic liver function and prevention of fatty liver in sows.
- Optimisation of the efficiency of energy production from feed.
- Detoxification and elimination of harmful waste products.
- Stimulation of appetite.

As a result, Carnitol-L substantially optimises reproductive performance and has no withdrawal time.

## Field trials

The benefits of the supplementation of Carnitol-L on the average number of live and stillborn piglets was investigated in a trial in a highly productive Danish sow herd (Table 1).

At entry in the farrowing crates, sows received 40ml Carnitol-L daily in the feed troughs for the last five days prior to farrowing. The daily dose per sow corresponded to 1.2g L-carnitine, 1.5g choline chloride and 11.4g sorbitol. Therefore, a specially developed and adjustable drench fitting on the product container was used (see photograph).

**Dosing drench for Carnitol-L (Huvepharma).**

**Table 1. Technical data of the sow herd.**

| | |
|---|---|
| Number of sows | 1,100 |
| Weaned piglets/sow/year | 39.2 |
| Number of litters/sow/year | 2.38 |
| Number of control farrowings | 267 |
| Number of Carnitol-L farrowings | 211 |

The average litter data of farrowings before (= control) and after the supplementation were recorded and compared.

Moreover, data was determined on an annual basis, taking the farrowing index into account.

Carnitol-L supplementation for the last five days before farrowing resulted in:

- An average increase of 0.4 live born piglets/sow/litter, corresponding to 0.95 (= 0.4 x 2.38) live born piglets/sow/year (Fig. 2)
- An average decrease of 0.37 stillborn piglets/sow/litter, corresponding to 0.88 (= 0.37 x 2.38) stillborn piglets/sow/year (Fig. 3).

The return on investment was 1:4.8 when comparing the control farrowings with the Carnitol-L supplemented farrowings.

The efficacy of Carnitol-L supplementation was also evaluated in two other trials in Danish sow herds:

- 120mg L-carnitine/sow/day for the four last weeks of gestation resulted in a significant increase of the bodyweight of piglets at birth with 33g/piglet.
- 60mg L-carnitine/sow/day for the first 12 weeks of gestation in combination with 120mg L-carnitine/sow/day for the last four weeks of gestation resulted in a significant reduction of the number of weak born piglets (-0.75), lower pre-weaning mortality (-0.28 piglets) and higher bodyweight at weaning (+0.2kg).

## Conclusion

Studies reported in the literature and recent field trials consistently demonstrate that dietary L-carnitine supplementation during gestation increases the reproductive performance of sows.

It was concluded that the supplementation of 40ml Carnitol-L in the last five days prior to farrowing results in a substantial increase in the number of live born piglets and a decrease in the number of still births. ■