9. Summary

Recent studies showed that supplementation of sows with L-carnitine during pregnancy and lactation improves their reproductive performance. One aim of this study was to investigate if this beneficial effect of L-carnitine lasts over repeated reproductive cycles. Therefore, we performed one study in an animal farm (experiment 1) and one study at the research facilities of the Martin-Luther-University Halle-Wittenberg (experiment 2), which were extended over 3 and 2 reproductive cycles, respectively.

In the first study 385 litters (control group: 190, L-carnitine group: 195) of 175 sows [Leicoma] (control group: 89, L-carnitine group: 86) were used. In the second study 54 litters (control group: 27, L-carnitine group: 27) of 30 crossbred sows [German land race x Large white] (control group: 15, L-carnitine group: 15) were used. In both studies sows of the control group and the L-carnitine group were fed a basic diet with a low concentration of native L-carnitine. 18 days before the insemination of the sows and from day 1 to 115 of pregnancy the sows of the L-carnitine group were each supplemented with 125 mg L-carnitine per day and during the lactation with 250 mg of L-carnitine per day.

In the first study, L-carnitine supplementation increased the body weight gain of the sows from day 1 to 85 of pregnancy (p<0.05). Total litter size, the number of piglets born alive and number of piglets fit for rearing as well as the piglet mortality rate was not influenced by L-carnitine. However, L-carnitine supplementation increased the litter weight at birth, the body weight gain of the litter during the suckling period and the litter weight at weaning (p<0.05). The effect of L-carnitine was independent of the sows´ age and remained during the three reproductive cycles, in which the sows were supplemented with L-carnitine.

In the second study the body weight gain and the back fat thickness of the sows was unaffected by L-carnitine supplementation during pregnancy and lactation. However, L-carnitine-treated sows had larger litters (p<0.01) and higher litter weights (p<0.05) than control sows. Piglets of L-carnitine-treated sows had lower birth weights (p<0.05) but grew faster during the suckling period and were heavier (p<0.05) at weaning than piglets of control sows. Moreover, L-carnitine-treated sows had higher milk yields on day 11 and 18 of lactation than control sows.
sows (p<0.05). There were no differences between the two groups concerning the constituents of the milk (fat, protein, lactose). Due to the higher milk yields the amount of protein and lactose in milk secreted on day 11 of lactation was higher in L-carnitine-treated sows than in control sows (p<0.05). Therefore, the amount of energy secreted with the milk tended to be higher in L-carnitine-treated sows than in control sows (p<0.10). Milk of L-carnitine-treated sows had higher concentrations of total and free carnitine than milk of control sows (p<0.01). During lactation the L-carnitine-treated sows had higher diet intakes than control sows (p<0.05). All these beneficial effects of L-carnitine on reproductive and rearing performance were measured in both observed reproduction cycles.

A second aim of this study was to investigate the effect of L-carnitine on the performance of sows at a sub-optimal energy supply during lactation. Therefore, we performed a third study (experiment 3) using 20 crossbred sows [German land race x Large white] (control group: 10, L-carnitine group: 10). From day 1 of pregnancy until parturition the sows were fed a energy reduced diet ad libitum. In order to gain a strong negative energy balance the sows were fed a "gestation diet" also during lactation with an energy content of 30 % below the recommendations of the GfE (1987) for lactating sows. During pregnancy sows of the L-carnitine group received each 125 mg L-carnitine per day and during lactation 250 mg L-carnitine per day. Total litter size, number of piglets born alive and number of piglets fit for rearing as well as the piglet mortality rate was not influenced by L-carnitine. Body and litter weight at birth tended to be higher in the L-carnitine group, however, due to the low number of animals no statistically significance was reached. L-carnitine supplemented sows showed a tendency to higher milk production compared to control sows (p<0.10). Litters from L-carnitine-treated sows had a higher weight gain during suckling and a higher weight at weaning than litters of control sows (p<0.05). Since there was no difference in body weight reduction between the two group, the increased milk production of L-carnitine-treated sows was realised through an increased back fat reduction (p<0.05).

In conclusion, this study shows that supplementation of sows with L-carnitine during pregnancy and lactation improves reproduction performance over repeated reproduction cycles. Moreover, it shows that supplementation of sows
with L-carnitine during pregnancy and lactation improves growth of piglets during the suckling period through increased milk production of the sows, which allows a higher intake of nutrients and energy by the piglets. At sub-optimal energy supply during the lactation period supplementation of sows with L-carnitine increases the milk production through mobilisation of depot fat. The endogenous L-carnitine synthesis at sub-optimal energy supply is probably not high enough to allow this kind of mobilisation.