

# Impact of blood plasma calcium on lifetime performance

The plasma calcium level around parturition has been shown to have a major effect on fertility. The economic impact of improving the calcium level at calving – obtained by supplementing the pre-partum animals with the product X-Zelit, as reported by Kerwin et al. (2018, 2019) – was simulated using the Simherd model.

## Reproduction and yield

Supplementing X-Zelit (Vilofoss) in the late part of the dry period is known to increase fertility (Fig. 1) and milk yield (Fig. 2). Fig. 1 shows the proportion of cows not pregnant. Median time to pregnancy was 19 days earlier for cows fed X-Zelit.

This highly improved reproduction result corresponds to a study in New Zealand in which pasture-fed multiparous cows were supplemented with X-Zelit. The cows which were given X-Zelit became pregnant 7.5 days earlier in lactation compared to the control group. In this study, pregnancy was also assessed in relation to when seasonal insemination begins, and it was found that cows in the X-Zelit group became pregnant 13.8 days earlier in the season compared to the control group.

Also, in a trial conducted by Martinez et al. (2012), the normocalcaemic group had 15 fewer empty days compared to the hypocalcaemic group. In the same trial, the probability of a positive pregnancy in normocalcaemic cows was estimated to be 1.61 times higher than the probability in hypocalcaemic cows.

	Reference farm	Improved reproduction scenario	Increased yield scenario	Improved reproduction and yield, simultaneously
Cows	200	0	0	0
Calving (heifers)	76	-12	0	-12
Calving (multiparous)	169	+8	0	+8
Rolling herd average	10.745	+32	+177	+209
Replacement (%)	38	-6	0	-6
Lactations/cow	2.6	+0.5	0	+0.5
Lifetime yield	28.418	+5.356	+421	+5.760
Youngstock (number)	220	-4	+1	-3
Heifers sold	22	+10	0	+10

Note: Assumptions behind the scenarios:

1) Improved reproduction only: Conception rate at insemination is 15% points higher for second parity and older cows. The 15% points were not a result of the trial, but by using 15% point in SimHerd, the proportion of cows getting pregnant at 150 days is 18% points higher, as found in the trial. 2) Increased milk yield only: Daily yield is 1.92kg higher in week three, 1.5kg higher in week four, and 0.85kg higher in the rest of the lactation of second parity and older cows. 3) Increased reproduction and increased milk yield, simultaneously: The two assumptions are simulated together in this scenario; both conception rate and yield are higher, as simulated in scenarios 1 and 2.

**Table 1. Technical results of improved reproduction and yield and how they affect a 200-cow farm. The results are shown as differences compared to the Reference farm.**

## Long-term effect on reproduction

The positive effect on reproduction of X-Zelit supplementation was also visible around day 150 (Fig. 2) in the trial in Cornell. At this point, 30% of all cows in the control group are still not pregnant, while only 10% of the cows in the X-Zelit group have not yet become pregnant.

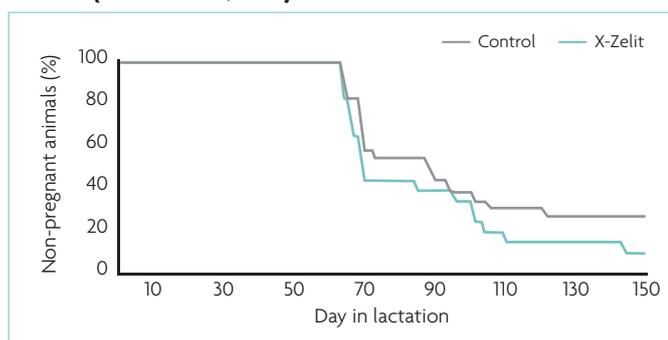
This corresponds to findings by Caixeta et al. (2017), who established about twice as many non-pregnant cows in the group of

hypocalcaemic cows compared to the group of normocalcaemic cows at 120 days into lactation. A previous Danish trial did not establish any differences in reproduction between cows supplemented with or without X-Zelit. However, it was found that multiparous cows supplemented with X-Zelit in the dry period had fewer cullings through lactation compared to cows not supplemented.

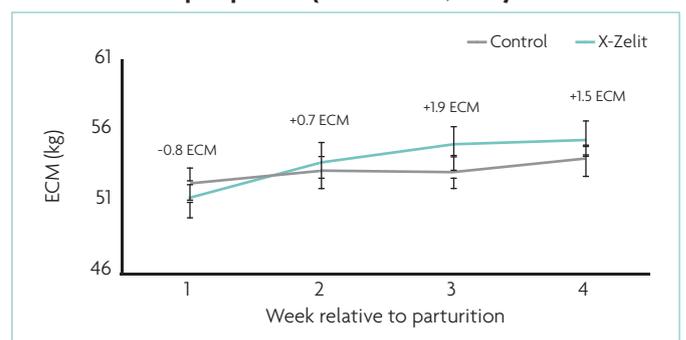
On average, the milk yield was 0.8 ECM

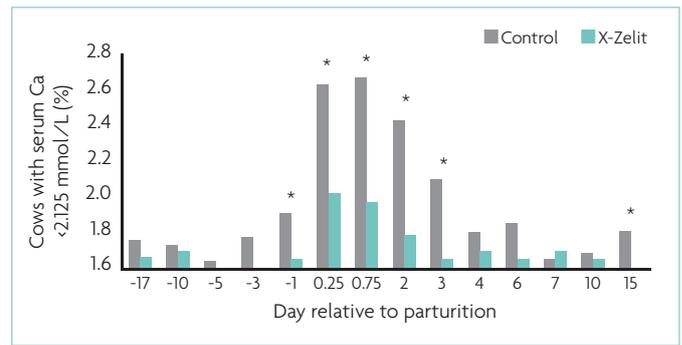
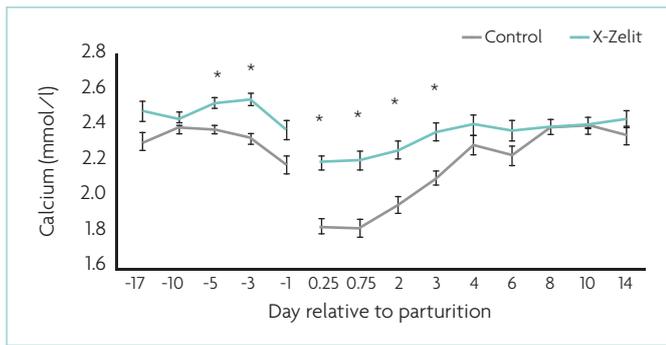
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**Fig. 1. The time to pregnancy by treatment group X-Zelit vs Control (Kerwin et al., 2019).**



**Fig. 2. Energy-corrected milk from X-Zelit or Control fed cows from week 1 to 4 postpartum (Kerwin et al., 2018).**





**Fig. 3. Serum Ca and percentage of cows with subclinical hypocalcaemia for multiparous cows fed a control diet or supplemented with X-Zelit postpartum.**

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higher during the first four weeks, reaching +1.9 ECM and +1.5 ECM compared to control animals during week three and four, respectively.

The positive effects on yield and reproduction are probably caused by the improved plasma calcium levels (Fig. 3).

The serum calcium level was significantly improved in the X-Zelit supplemented

group. On average, cows fed X-Zelit had Ca concentrations which were 0.4mmol/L larger than those in the control group during the first days in milk.

Differences in the Ca levels were also reflected in the percentage of multiparous cows being subclinical calcaemic.

Three times as many control cows had subclinical hypocalcaemia compared with the control animals.

### Simulation of farm economy

The information about these figures was used in the economic simulation shown in Table 1. As a means of better understanding the impact of X-Zelit on the herd, the economic impact is illustrated as individual effects as well as a total response.

In the reproduction scenario, the culling rate is lower, since fewer cows are culled due to failure to conceive. As the reproduction is better, fewer heifers are needed for replacement and more heifers can be sold. The animals will increase the number of lactations by an average of 0.5, which results in a 5.356 ECM higher lifetime performance. Rolling Herd Average increases by 32kg only, because of an increase in the proportion of dry cows (+1%) and an increase (+7 per 100 cows) in the disease (lameness and mastitis) incidence rate, due to a higher proportion of old cows in the herd.

**Table 2. Economic return per X-Zelit treatment (note: milk price €0.34/kg).**

	Reproduction scenario	Increased yield scenario	Both scenarios simulated simultaneously
Net return per treatment	€+57	€+55	€+110

### Economic result

It is interesting to observe that, basically, the improved reproduction and improved milk yield have the same economic values (Table 2). Earlier calculations of economic impact of metabolic diseases focus on loss of milk yield, but this study demonstrates that the loss of reproductive performance of the animals might lead to costs at around the same level.

X-Zelit both improves the reproduction and milk yield, thus, considering these two factors only, the return of the cows will amount to +€110 per treatment.

### Conclusion

X-Zelit improves reproduction and yield in dairy cows and, in turn, this increases the lifetime production of the animals. An economic analysis splitting up these two components concludes that the return of using X-Zelit on all multiparous cows will be +€110/treatment. ■

References are available on request  
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